



KORBA MUNICIPAL CORPORATION

**DESIGN, CONSTRUCTION, ERECTION, TESTING AND COMMISSIONING OF 20
MLD TERTIARY TREATMENT PLANT FOR NTPC KORBA INCLUDING
OPERATION AND MAINTENANCE OF ENTIRE SCHEME FOR 15 YEARS**

TENDER DOCUMENTS

**Form “F”
(Lump-sum Contract)**

E-Procurement Tender Notice
Portal: <http://eproc.cgstate.gov.in>

(PAC Rs. 16438.95 Lacs)

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

**OFFICE OF THE COMMISSIONER
MUNICIPAL CORPORATION, KORBA
CHHATTISGARH**

**Web site: www.KorbaMunicipal.in
E-mail: corporationkorba@gmail.com**

OFFICE OF THE MUNICIPAL CORPORATION, KORBA CHHATTISGARH

NOTICE INVITING TENDER

Main Portal: <https://eproc.cgstate.gov.in>

SYSTEM TENDER NO/193874(2nd Call)/NIT NO: 1507/Dated 20/06/2026

Online tender are invited by the Commissioner, Municipal Corporation, Korba for the following work in Form "F" for lump Sum contract from the bidders 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.

1.	Name of Work	Design, construction, erection, testing and commissioning of 20 MLD Tertiary Treatment Plant for NTPC Korba including operation and maintenance of entire scheme for 15 Years
2.	Probable amount of Contract	16438.95 Lacs (Capital work - 8,005.05 lacs, O&M - 8,433.90 lacs)
3.	Earnest money (EMD)	Rs 82.20 Lakh (Eighty two lakhs twenty thousand only) TDR/FDR in favour of Commissioner, Municipal Corporation Korba A/c No. 60257412448 Bank of Maharashtra IFSC Code: MAHB0001695. Branch Address: Plot No. 784, Main Road, Shubhash Chowk, Kosabari, Korba, Chhattisgarh 495677 Note: - The EMD should be valid for at least 12 months in auto-renewal mode. EMD will be returned to unsuccessful bidders after the award of contract.
4.	Time allowed for completion (Including rainy season)	24 months (including 03 (three) months trial run and rainy season)
5.	Cost of Tender document fee	Rs 15000/- (Rupees Fifteen Thousand only) in the form of DD in favour of Commissioner, Municipal Corporation, Korba
6.	Validity of Offer	120 days from the day of submission of financial offer
7.	Site Visit and Pre bid meeting	1. A Site visit shall be organized by the Commissioner/ Nodal Officer, Korba, Chhattisgarh (as per tender Notice) 2. A Prebid meeting in context of this project shall be held in the office of Commissioner office Korba, Chhattisgarh (as per tender Notice)

For further clarifications regarding Digital signature, 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 GoCG 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.

**Commissioner
Municipal Corporation,
Korba (C.G.)**

INDEX

DETAILED NOTICE INVITING TENDER.....	5
PRE - QUALIFICATION CRITERIA.....	12
INSTRUCTION TO BIDDERS.....	15
TENDER FOR A LUMP - SUM CONTRACT.....	35
CONDITIONS OF CONTRACT.....	36
ANNEXURE – A MODEL RULES RELATING TO LABOUR, WATER SUPPLY AND SANITATION IN LABOUR CAMPS.....	44
ANNEXURE – B BIDDERS LABOUR REGULATIONS.....	46
ANNEXURE – C FORM OF INCOME TAX CLEARANCE CERTIFICATE.....	47
ANNEXURE – D STATEMENT SHOWING THE LEAD OF MATERIALS.....	47
ANNEXURE – E SCOPE OF WORK & TECHNICAL SPECIFICATIONS	48
SCOPE OF WORK.....	60
ANNEXURE – E-I PROVIDING, SUPPLYING, ERECTING AND COMMISSIONING 20 MLD UF RO BASED TERTIARY TREATMENT PLANT AT KORBA WITH PEB STRUCTURE, ALL ALLIED TANKS AND EQUIPMENT.....	67
ANNEXURE – E-II SPECIFICATIONS FOR GROUND SERVICE RESERVOIR (GSR) CUM UF FEED SUMP OF 4000 CUM CAPACITY	127
ANNEXURE – E-III SPECIFICATIONS FOR TERTIARY TREATED WATER PUMPING MACHINERY FROM SUMP TO NTPC PREMISES.....	146
ANNEXURE – E-IV SPECIFICATIONS OF ELECTRIC SUBSTATION FOR TTP.....	156
ANNEXURE – E-V PROVIDING, LOWERING, LAYING, JOINTING SUCCESSFULLY TESTING AND COMMISSIONING. 500 MM DIA DI K-9 PUMPING MAIN FROM STP SUMP TO NTPC PREMISES	184
ANNEXURE – E-VI CONSTRUCTION OF 600 M LONG COMPOUND WALL AND MS GATES.....	205
ANNEXURE – E-VII OPERATION AND MAINTENANCE OF TERTIARY TREATMENT PLANT AND ALL COMPONENTS OF SCHEME FOR THE PERIOD OF 15 YEARS.....	221
ANNEXURE – F PAYMENT SCHEDULE	254
ANNEXURE – G (REVISED FORM OF BANK GUARANTEE BOND).....	268
ANNEXURE H – SPECIAL CONDITIONS	270
ANNEXURE – I GUIDELINES FOR BIDDERS ON USING INTEGRATED EPROCUREMENT SYSTEM GOVT. OF CHHATTISGARH. HTTPS://EPROC.CGSTATE.GOV.IN	278
ANNEXURE – J PRE CONTRACT INTEGRITY PACT	281
APPENDIX-1 QUALIFICATION INFORMATION.....	290
APPENDIX – 2 INFORMATION REGARDING MINIMUM ONE SIMILAR WORK, PERFORMED BY BIDDER.....	291
APPENDIX – 3 WORK PERFORMED BY BIDDER ON ALL CLASSES OF CIVIL ENGINEERING CONSTRUCTION WORKS OVER THE LAST FIVE YEARS.....	292
APPENDIX – 4 EXISTING COMMITMENTS AND ON-GOING ALL CLASSES OF CIVIL ENGINEERING CONSTRUCTION WORKS. (FOR CALCULATION OF COMPONENT B IN CASE OF BID CAPACITY).....	293
APPENDIX – 5 AVAILABILITY OF MAJOR ITEMS OF BIDDER'S EQUIPMENT PROPOSED FOR CARRYING OUT THE WORKS. LIST ALL INFORMATION REQUESTED BELOW.	294
APPENDIX – 6 LIST OF TECHNICAL PERSON TO BE DEPLOYED ON CONTRACT WORK- DETAILED REQUIREMENT AS GIVEN IN SCOPE OF WORK.....	295
APPENDIX – 7 FINANCIAL REPORTS FOR THE IMMEDIATE PREVIOUS FIVE YEARS.....	296
APPENDIX – 8 INFORMATION ON CURRENT CLAIMS, ARBITRATION, LITIGATION.....	297
APPENDIX – 9 MOU WITH REGISTERED SUBSTATION BIDDER.....	298
APPENDIX – 10 CONTACT PERSONS.....	300
APPENDIX – 11 AFFIDAVIT FOR NOT BEING BLACKLISTED	301

APPENDIX-12 DECLARATION	302
(ON NON-JUDICIAL STAMP OF RS. 100)	302
APPENDIX-13 AFFIDAVIT FOR CONFLICT OF INTEREST.....	303
APPENDIX-14 LIST OF SIMILAR WORKS	304
APPENDIX -15 NON-JUDICIAL AGREEMENT FOR TECHNOLOGY PROVIDER OF UF/ RO SYSTEM.....	305
APPENDIX-16 SAMPLE POWER OF ATTORNEY	306

**OFFICE OF COMMISSIONER
MUNICIPAL CORPORATION, KORBA
CHHATTISGARH**

DETAILED NOTICE INVITING TENDER

SYSTEM TENDER NO/193874 (2nd Call)/NIT NO: NIT/1507/W.S. Dated 20.06.2026

Online tender is invited by the Commissioner, Municipal Corporation, Korba for the following work in Form "F" for lump Sum contract from the bidders 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.

S.no.	Name of work	Probable amount of contract (Rs. in Lacs) (incl 15 years O&M)	Earnest money	Time allowed for completion (including rainy season)	Cost of Tender Document	Validity of the Offer	Class of the Bidder
1	2	3	4	5	6	7	8
1.	Design, construction, erection, testing and commissioning of 20 MLD Tertiary Treatment Plant for NTPC Korba including operation and maintenance of entire scheme for 15 years. i. Providing erecting and commissioning 20 MLD UF RO based Tertiary treatment plant at Korba with PEB structure, all allied tanks and equipment ii. Constructing and commissioning RCC RO Permeate tank cap. 4000000	16438.95 Lacs (Capital work - 8,005.05 lacs, O & M - 8,433.90 lacs)	Rs 82.20 Lakh in the form of TDR/FD R in favour of Commissioner Korba Municipal Corporation, Korba	24 months (including 03 (three) months trial run), and 15 (fifteen) years Operation and maintenance	Rs 15000/- (Rupees Fifteen Thousand only) in the form of DD in favour of Commissioner Korba Municipal Corporation, Korba	120 days	In Class A

	<p>lit for delivery at NTPC premises with all allied works</p> <p>iii. Providing installing and commissioning Pumping machinery Q=1000000 LPH and Head 26 m. at RO Permeate tank</p> <p>iv. Providing erecting and commissioning 1500 KVA/33/3.3 KV electric sub station</p> <p>v. Providing Laying Jointing and commissioning 500 mm dia. DI k-9 Pumping Main of 1300 m including any modification required at NTPC end from RO Permeate tank to NTPC Premises</p> <p>vi. Allied civil work</p> <p>vii. Operation & Maintenance for 15 Years for Tertiary treatment Plant, sump, pumping Main etc for all capital works under scope of project.</p> <p>Note: The quoted lump sum offer by bidder shall be deemed to be included of all the cost required for successful Survey, Design, Supply, installation, testing and commissioning of whole scheme including electro-mechanical, Electrical, instrumentations equipment's along with any other required accessories and cost of</p>						
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<p>Operation & Maintenance. The department will not entertain any extra financial claim on account of extra items, it is solely the responsibility to bidder to ascertain extra items required for successful commissioning of whole scheme and should include the rates in its quoted offer.</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 online. Thus, the Bidders are advised to obtain Digital Certificates. The registered bidders 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 Chhattisgarh.
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. The department reserves the right to change the key dates of the tender process.
7. Sufficient hindrance free space is available for construction.
8. 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 work etc. whether he inspects it or not. Site visit is compulsory and letter of compliance shall be submitted in Envelop B.
9. A Prebid meeting in context of this project shall be held as stated in NIT/Tender Notice. The bidders shall give their suggestions and conditions in writing based on which Corrigendum/Amendments/clarifications shall be framed and uploaded which will supersede the original NIT Conditions unless otherwise specified.

10. Cess @ 1 % (one percent) or latest shall be deducted at source from every bill of bidder under “Building and other Construction for workers welfare, cess Act-1996.
11. Bidders/tenderers should have to submit “Envelope A’ and “B” Physically (in sealed Envelope) as well as to be uploaded ONLINE also. “Envelope C’ shall be uploaded ONLINE only.

Physical Submission of Envelope A and Envelope B (in sealed Envelope) to be submitted by Registered Post/ Speed Post only. Submission through Courier Services and other means shall not be entertained.

Above documents must be submitted on or before the dates and time as indicated NIT/Tender Notice.

Address for Physical Submission:

Office of Commissioner, Municipal Corporation, Korba
Saket Bhawan, ITI Chowk, Rampur, Korba

Web site: www.KorbaMunicipal.in

E-mail: corporationkorba@gmail.com

- 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) A copy Non-Judicial Agreement from Technology provider/ integrator certified by Magistrate/Sub-Judge/Notary - Affidavit’s in Original (Non-Judicial Stamp paper 500 Rs.). (As per appendix -15)
- (iv) CG PWD Registration in appropriate Class In Unified Registration System (Single Window) on GoCG e-Procurement System Portal of (<https://cgeprocurement.gov.in>) through sub portal <https://uadd.cgeprocurement.gov.in> and (Partnership Deed, registration amendment certificate as the case may be).
- (v) Declaration for Not Being Blacklisted (Appendix-11). Affidavit’s in Original. (Non-Judicial stamp in 100 Rs.).
- (vi) Declaration as per (Appendix-12) -Affidavit’s in Original. (Non-Judicial stamp in 100 Rs.).
- (vii) Attested copy of PAN card issued by I.T. Department.
- (viii) Attested copy of Valid GST/ CGST Registration must be valid up to Bid due date.
- (ix) Valid Bank Solvency certificate of minimum value @15% of capital cost in Bank Letter Head. (Not Older than 12 Months) Mention the Bank Dispatch No. or Ref. No. or Verifiable unique number or Date otherwise tender will be disqualified while opening).

- b) **Envelop- 'B'(Technical Bid –Submit physically & online) -Also the Envelope 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/ (Appendix –16) - Affidavit's in Original (Non-Judicial Stamp paper in 100 Rs.)
- (ii) Partnership deed /MOA of company
- (iii) The Bidder/ All the Partners shall submit company registration certificates.
- (iv) Technical & Financial pre-qualification documents
- (v) Bid Capacity (bidder shall submit all the supporting documents as per Appendix-4)
- (vi) ITR of last five financial years (up to 31-03-25).
- (vii) The bidder should have a positive net worth in last five (05) financial years i.e. 2020-21 to 2024-25. The certificate from C.A. shall be attached.
- (viii) Bidder should submit annual turnover from Construction work in last five financial years i.e. 2020-21 to 2024-25 including the audited financial report. The certificate from C.A. shall be attached.
- (ix) As per Pre-Qualification Criteria mentioned in PQ document. (Appendix – 1 to 16) excluding ones submitted in envelope A.
- (x) Bidder should attach Site visit compliance letter along with GPS photographs as a proof of site visit.
- (xi) Bidder to provide Net output flow as given in Table 4: Guarantees to be given by bidder in SOW (Annexure E) on letterhead.

c) Envelop- "C" - Total Lump sum offer (Cost of capital works + cost of 15 yrs. O&M) (including GST, other taxes etc.) shall be submitted online only. In addition, breakup of the Lump Sum offer as per the **"Form F"** is required to be submitted/uploaded online only in "ENVELOPE "C" on Bidder's letter head with seal and signature. Physical submission of Envelope C shall not be considered.

Note:

- i. The tenderer who has been blacklisted will not be allowed to bid for this tender. The tenderer shall submit an Affidavit in this regard.
- ii. Bidder has to submit Certificate of Turnover of last 5 years clearly highlighting year wise Construction Turnover, duly signed by a Practicing Chartered Accountant along with seal and UDIN of CA issuing the certificate including the audited financial report. (For Calculation of Component A in case of Bidding Capacity). In the absence of above requirements, bids shall be rejected.
- iii. 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, Municipal Corporation Korba will restrict the bidder/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 will recommend 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.

- iv. 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 bidder 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

SYSTEM TENDER No. 193874 (2nd Call)

NIT No./1507/KMC/AMRUT 2.0/2026-27

Korba Dated 20/06/2026

Table 1: Key Dates

<u>Task</u>	<u>Date</u>	<u>Time</u>
Bid Start Date	20.06.2026	19:31
Date of Site Visit	-	11:30
Prebid Meeting	-	14:00
Bid Due Date	06.07.2026	17:30
Physical Doc Submission End Date	09.07.2026	15:30
Bid Open Date (Scheduled)	09.07.2026	17:00

**Commissioner
Municipal Corporation,
Korba (C.G.)**

PRE - QUALIFICATION CRITERIA

A. TECHNICAL QUALIFICATION

The minimum eligibility criteria in respect of particular experience to be fulfilled by the bidder are as follows:

S. No.	PQ Criteria
1	To qualify in the Tender bidder must have technical experience in last 7 (seven) years of following items:
(i)	Construction of at least one UF – RO waste water -based treatment plant of minimum 50% capacity of the tender capacity i.e. 10 MLD.
(ii)	Should have experience in Operation and Maintenance of UF-RO waste water -based treatment Plant for a period of 1 year.
(iii)	Should have supplied, laid, jointed, tested and completed MS/DI/CI pipes of 500 mm dia. or above to a minimum length 650 m.
(iv)	The Technology provider/ integrator of UF & RO waste water system shall submit Non-judicial agreement as a part of bid to the bidder.
(v)	The operator/contractor should go under non judicial agreement along with counter guarantee of Rs. 10 Lakhs from manufacturer of membrane and system integrator having experience of UF RO . The counter guarantee shall be submitted along with the Bid. <i>Note: Bidder shall submit MOU in bid with UF membrane manufacturer / authorised distributor. However the counter guarantee must be submitted by the successful bidder within 15 days of issue of LOA</i>
2	Joint Venture - Not Allowed

B. FINANCIAL QUALIFICATION

To qualify in the Tender bidder must have financial experience in last Five years.

S. No.	PQ Criteria	Value of work (Qualifying Value)	PAC Value
1	Experience for Last 5 years will be considered		
	Achieved in "any one financial year" a financial turnover (in all classes of Construction Works (Civil)), 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.	Rs. 9863.37 In Lacs	60%
	And Satisfactorily completed at least one similar work equal in value 50% (fifty percent) of the Probable amount of contract as on date of submission of financial offer.	Rs. 8219.475 In Lacs	50%
	Or Satisfactorily completed at least two similar works each costing minimum 40% (forty percent) of the probable amount of contract for which the tender is invited as on date of submission of financial offer.	Rs. 6575.58 In Lacs Each	40%
	Or Satisfactorily executing at least one similar work having received payment of value not less than 60% (Sixty percent) of the value of probable amount of contract as on date of submission of financial offer.	Rs. 9863.37 In Lacs	60%
2	Bid Capacity = (2.5 x A x N) - B Where A= Maximum value of works executed in any one financial year during the 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.		
Note: - 1. "Similar work" means- successfully completed Tertiary Treatment Plant UF-RO waste water system. 2. Contractor has to submit Certificate of Turnover of last 5 years clearly highlighting year wise Construction Turnover, duly signed by a Practicing Chartered Accountant along with seal and UDIN of CA issuing the certificate (For Calculation of Component A in case of Bidding Capacity). In the absence of above requirements, bids shall be rejected. 3. The turnover shall be indexed at the compounded rate of 10% (ten percent) for each earlier year.			

The value of completed work shall be updated to the values of current financial year @ compounded rate of 10% (Ten percent) per year from completion year of work. The completion year shall be taken as base year.

INSTRUCTION TO BIDDERS

1. “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, the Bidders will have to pay Service Providers Fees as required through online payments gateway service available on Electronic Tendering System. For the list of options for making online payments, the Bidders 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 Bidders 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 Bidders 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 website of concerned department.
- 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:**
The submission of Bids shall be preceded by the online preparation and submission of digitally signed Bid Hashes (Seals) in accordance with the Tender Time Schedule (Key Dates) published in the Detailed Notice Inviting Tender.
The Bid Data shall be prepared using the templates provided. The templates may include form-based, extensible tables, and / or uploadable document formats. In the form-based type of templates and extensible table type of templates, bidders are required to input the relevant data and encrypt it using a valid the Digital Certificate.
In the case of uploadable document type of templates, the bidders are required to select the relevant document / compressed file(s) (containing multiple documents) that have been pre-uploaded in the designated briefcase.
The submission process must be completed in strict adherence to the time schedule and the formats specified to ensure the acceptance of the bid

Notes:

- A. The bidders are required to upload a single document or a compressed file containing multiple documents for each uploadable option specified in the tender.
- 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 Bidders 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@cgswan.gov.in or they may contact to Mr. Shailesh Kumar Soni, Sr. Manager, Chhattisgarh Infotech 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 Bidders shall not be permitted make any change / addition to the bid data. However, the bidder may modify the bid prior to the deadline for Bid Preparation and Hash Submission, as specified in the Time Schedule outlined in the Tender documents.

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

After the expiry of the cut – off time for the Bid Preparation and Hash Submission stage, the tender will be closed the Tendering Authority. Following this, the Tendering Authority shall generate and digitally sign the Super Hash.

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

After the time for generating the Super Hash values by the Tendering Authority has lapsed, the bidders are required to make an online payment of Rs. towards the Service Provider's fees.

After making online payment towards the Service Provider's fees, the bidders 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 cross-checked during the Technical Opening stage.

At this time, the bidders are 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 bidders 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 for uploading the relevant documents from Briefcase. Bidders who fail to submit their Bid Preparation and Hash Submission stage within the stipulated time will not be permitted to decrypt / re-encrypt the Bid data / submit documents during the Decryption and Re-encryption stage of Bid submission (submitting the Bids online).

2. Bid Opening and Evaluation

Bid Opening

- i. The bids received (except those submitted late) will be opened by the Commissioner of Municipal Corporation Korba in the event that the specified bid submission date is declared a holiday for ULB, the bids will be opened at the same 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. If the cost of the bidding documents is not provided or incomplete, the remaining bid documents will not be opened, and the bid will be rejected.
- iii. In all other cases, the amount of Earnest Money, the required forms and validity shall be announced. Thereafter, the names of the bidders' and any other details deemed appropriate by the Commissioner will be announced during the opening.
- iv. The evaluation of the technical bids, with respect to bid security, qualification information and other required information furnished in the bid pursuant to the relevant Clause of the Instructions to Bidders (ITB), shall be carried out and completed. A list will then be prepared of the responsive bids, whose financial bids are eligible for consideration.
- v. The Commissioner shall inform the bidders, whose technical bids are found responsive, of the date, time, and place of the financial bid opening, as stated in the NIT, via email or through the e-procurement portal.
- vi. In the event that the specified date is declared a holiday for the Commissioner, the bids will be opened at the same time and location on the next working day. Bidders, or their representatives, may attend the meeting of opening of financial bids.
- vii. At the time of opening the 'Financial Bid', (**Envelope ‘C’**), the names of the bidders whose bids have been found responsive in accordance with relevant clause of the Instructions to Bidders (ITB) will be announced. The financial bids of only these responsive bidders will be opened. The names of the responsive bidders, their bid prices, the total amount of each bid, and any other details may consider appropriate will be announced by the Commissioner at the time of bid opening.
- viii. **Process to be Confidential:** All Information related to the examination, clarification, evaluation, and comparison of bids and recommendations for the award of a contract, shall remain confidential and shall not be disclosed to

bidders or any other individuals not officially involved in the process until the award has been announced to the successful Bidder. Any attempt by a Bidder to influence the Commissioner ULB/or his representatives in the processing of bids or award decisions may result in the rejection of bidder's Bid.

- ix. Clarification of Bids and Contacting the Commissioner KMC-
No Bidder shall contact the Commissioner or any other official on any matter relating to its bid from the time of bid opening until the contract is awarded.
- x. Any attempt by a bidder to influence the Urban Local Body officials/representatives during bid process by any means, bid evaluation, bid comparison or contract award decision, may result in the rejection of their bid.

3. Examination of Bids and Determination of Responsiveness

- 1) During the detailed evaluation of "Technical Bids" (**Envelope 'B'**), the Commissioner KMC will determine whether each Bid
 - (a) meets the eligibility criteria defined in 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 assessed. To assist in the examination, evaluation, and comparison of bids, the Employer may, at their discretion, request any bidder to provide clarification of their bid, including a breakdown of unit rates. All request for clarification and response shall be provided in writing or via email.
- 2) A substantially responsive "Financial Bid" is one that 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 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 Commissioner, Municipal Corporation Korba 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 COMMISSIONER KMC for any arithmetic errors. Errors will be corrected by the ULB 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 shall be adjusted by the COMMISSIONER of the ULB in accordance with the prescribed procedure for errors correction of and shall be considered as binding upon the Bidder. If the Bidder fails to accept the corrected amount, the Bid shall be rejected, and the Earnest money shall be forfeited as per the relevant Clause of the Instructions to Bidders (ITB).

1.2 Evaluation and Comparison of Bids

- (1) The Commissioner, Municipal Corporation Korba 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 COMMISSIONER shall determine the evaluated Bid price for each bid by adjusting the Bid price, by incorporating corrections, if any, for errors, in accordance with the relevant clause of the Instructions to Bidders (ITB).
 - (3) If the Bid of the successful Bidder is determined to be significantly unbalanced **in relation to the PAC for the work** to be performed under the contract, the COMMISSIONER may require the Bidder to submit a detailed price analysis for any or all items of the Bill of Quantities to demonstrate the internal consistency of quoted prices with the proposed construction methods and schedule.
- Based on the evaluation of the price analyses, the COMMISSIONER may require an increase in the amount of performance security as stipulated in the relevant Clause of Instructions to Bidders (ITB).

4. Earnest Money

I. FORM OF EARNEST MONEY:

To be deposited as stated in NIT

II. EARNEST MONEY IN SEPARATE COVERS

The Earnest Money shall be deposited as specified in the Notice Inviting Tender (NIT) / Detailed Notice Inviting Tender (DNIT). If the Earnest Money is not submitted in the prescribed manner, the tender shall not be opened.

5. IMPLICATION OF SUBMISSION OF TENDERS

- i. Bidders are advised to visit the site well in advance of the submission deadline to familiarize themselves with the site conditions. The bidder shall be deemed to have full knowledge of all relevant documents, site conditions, and other factors affecting the work, regardless of whether they have conducted a site inspection.
- II. The submission of a tender by a bidder shall be deemed to imply that the bidders has read and fully understood the Notice Inviting Tender, conditions of the tender, and all contract documents. The bidders acknowledges full awareness of all latest standards and specifications, including those prescribed in the relevant IS specifications, IRC specifications, the Manual on Water Supply and Treatment, and Annexure-E, which

outlines the scope and specifications of the work. The bidder shall be deemed to have inspected the site of the works.

- III. The bidder shall be responsible for making his own arrangements for supply of water required for construction purposes. No payment shall be made for lead and lift for any material, including water. The tender offer should be inclusive of all leads and lifts for the materials. The bidder is required to verify the leads and royalty charges of various materials independently before submitting the tender.

6. LIST OF WORKS IN PROGRESS

Tenders must be accompanied by a list of Contracts currently held by the tenderer at the time of submission, both within 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.

7. RELATIONSHIP

The bidder shall not be permitted to submit a tender for works within the Nagar Nigam/Nagar Palika Parishad/Nagar Panchayat responsible for award and execution of the contract if a near relative of the contractor is posted. The bidder must disclose the names of any near relatives employed in the State Government and the concerned Urban Local Body. Additionally, the bidder shall provide details of any individual employed by also intimate the name of person working with him in any capacity who is near relatives of a Gazetted Officer in the State Government and Urban Local Body. Any violation of this condition shall render the bidder liable for removal from the approved list of bidders of the Urban Administration and Development Department (UADD).

NOTE: - The term “near relative” shall include the bidder’s spouse (wife or husband), parents, son, grandson, brothers, sisters, brothers-in-laws, father-in-law, and mother-in-law.

8. OPENING AND ACCEPTANCE OF TENDERS

9. PLACE AND TIME OF OPENING

The tenders shall be opened at Municipal Corporation Korba.

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 bidders, who choose to be present.

After short listing of prequalified bidders, their online financial offers shall be opened. The bidder having quoted lump sum offer in prescribed online proforma with minimum cost shall be declared as the **lowest bidder**.

I. POWER OF THE COMMISSIONER

The Commissioner 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 bidders of penal action under section 8 of Chhattisgarh Vinirdishta Bhrashtachara charan 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 COMMISSIONER

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 concerned Urban Local Body 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.

10. 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 competent authority/Urban Local Body.

11. TIME OF COMPLETION

The time allowed for carrying out the work as stated in NIT/DNIT including rainy season shall be strictly observed and shall be reckoned after 30 days 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.

12. TIME SCHEDULE

The work shall be done by the bidder 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 bidder.

13. DEFECT LIABILITY PERIOD

Defect Liability period of 18 months and fifteen years O&M of all components of whole scheme shall start concurrently after successful completion of 03 months trial run (i.e. completion of capital work) as certified by Engineer-in-Charge/Competent authority.

14. 3 MONTHS TRIAL RUN OF COMPLETE WORK AFTER COMPLETION OF WORK

3 (Three) months Trial run: Trial run will start after completion of all the works under this contract. The trial run of 03 months of whole scheme is included in the 24 months duration of the contract.

- a) The tender must be inclusive of operation of the plant for the 3 (three) months trial run period free of charge by bidder'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 bidder free of cost. The cost of electrical energy and pay to departmental staff will be paid by the Department. Cost of all chemicals, Consumables and Bidder's staff etc. shall be borne by the bidder including replacement and warranty of any item component/spares during the period of trial run.

Performance Guarantee must be demonstrated within the trial run period of 3 months.

- b) The electricity cost during trial period to be borne by ULB.

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 during trial run period. 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 treated water quality (physical, chemical and biological parameters) and that of the tertiary treated water rendered from the proposed TTP shall be maintained.

Each day/part of the day when TTP does not deliver as per the norms of Contract Agreement and NGT guidelines means that the trial run will be extended by that many days without any extra cost to KMC.

15. 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**.

16. PRICE ADJUSTMENT / ESCALATION

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

17. 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

bidder.

- (i) Specifications given in the Annexure-E as enclosed in Scope of Work.
- (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 sewerage and tertiary treatment (latest edition) published by CPHEEO, New Delhi.
- (iv) The characteristics of tertiary treated water are as per requirement of NTPC.
- (v) Any other specifications, not covered under the above said standards, shall be decided by the Engineer-in-Charge

CHANGE IN SPECIFICATIONS

Nothing in earlier clause shall, However, curtail the right of the Engineer-in-Charge 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 bidder and the Engineer-in-Charge, the matter will be decided by the Commissioner & JOC which shall be binding to the bidders.

18. STATUS OF ENVIRONMENTAL CLEARANCE

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

Consent to Establish: Shall be taken by KMC, however all the relevant data and checklists shall be filled by the Contractor.

Consent to Operate: Shall be taken by the contractor as and when required, however the fees to be paid to **Chhattisgarh Environment Conservation Board (CECB)/Central Pollution Control board** shall be borne by the KMC.

19. SUBLETTING WORK

The bidder shall not, without the prior approval of the authority who has accepted the tender in writing, sublet or assign to any other party or parties, any portion of the work under the contract to any other party. If such approval is granted, the bidder shall remain fully responsible for the due performance of all obligation, duty and responsibility under the contract. Subletting shall be allowed up to exceed 25% of the contract value.

Before subletting the Engineer in Charge shall verify the technical & financial capacity of the Sublette.

The Sublette shall be a registered bidder in appropriate class under unified registration system (e-registration) of Chhattisgarh or elsewhere in similar capacity, as recognized by public works department and shall also have a technical and financial capacity corresponding to the work proposed to be sublated.

The contract may be rescinded and security deposit forfeited for subletting the work beyond permissible limits as mentioned above or if the bidder becomes insolvent.

The contract shall not be assigned or sublet without prior written approval of the competent authority in writing. If the bidder assigns or sublets any parts of the contract for more than permissible limits specified in clause above, or attempt to do so, or become insolvent, or

initiates any insolvency proceeding, or make any composition with his creditors, or attempt to do so; or if any gratuity, gift, loan, perquisite, reward, or advantage pecuniary or otherwise, shall either directly or indirectly be given, promised or offered by the bidder, or any of his employee or agents or to any public officer or person in the employ of Government in any way relating to his office or employment, or if any such officer or person becomes directly or indirectly interested in the contract the Executive Engineer may, by written notice, rescind the contract. Upon such rescission, the Security Deposit (SD) of the bidder shall be forfeited and shall be absolutely at the disposal of Government. The same consequences shall follow as if the contract had been rescinded under clause 3 thereof, and in addition, the bidder shall not be entitled to receive or be paid for any work actually performed under the contract up to the date of rescission.

Any such assignment/subletting within the limit of 25% by the authority who has accepted the tenders.

If the bidder gets item/items of work executed on a task rate basis without materials this shall not amount to subletting of the contract.

Any subcontracting work done anywhere in India, during last five years, with prior approval of competent Authority (Govt/Semi Govt/Corporations), such sub bidder will also get the credit for work towards his experience.

Experience of Work done by way of subletting directly from Prime bidder without prior approval of competent authority will not be considered.

The authority accepting the tender shall be empowered to terminate any contract if the bidder sublets the work to some other person on the basis of power of attorney.

Subletting of work shall result in reduction in experience of the main bidder to extent of the sublet.

20. INSURANCE

The Bidder shall take all such insurance in connection with the work in accordance with the tender condition as acceptable to COMMISSIONER. The cost of all the insurance premiums shall be paid by the Bidder.

21. LEGAL JURISDICTION

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

22. BLASTING

In case limited/suppressed blasting resorted to by the bidder in excavation of trenches, it will be the responsibility of the bidder 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.

23. TAXES

(i) All tendered rates shall be inclusive of any tax, levy or cess applicable on last stipulated date of receipt of tender including extension if any. No adjustment i.e. increase or decrease

shall be made for any variation in the rate of GST, Building and Other Construction Workers Welfare Cess or any tax, levy or cess applicable on inputs. However, effect of variation in rates of GST or Building and Other Construction Workers Welfare Cess or imposition or repeal of any other tax, levy or cess applicable on output of the works contract shall be adjusted on either side, increase or decrease. Provided further that such increase including GST shall not be made in the extended period of contract for which the contractor alone is responsible for delay as determined by authority for extension of time under Schedule F.

(ii) The contractor shall keep necessary books of accounts and other documents for the purpose of this condition as may be necessary and shall allow inspection of the same by a duly authorized representative of the Government and/or the Engineer-in-charge and shall also furnish such other information/document as the Engineer-in-Charge may require from time to time.

(iii) The contractor shall, within a period of 30 days of the imposition of any such further tax or levy or cess, or variation or repeal of such tax or levy or cess give a written notice thereof to the Engineer-in-charge that the same is given pursuant to this condition, together with all necessary information relating thereto.

24. 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 bidder to whom it shall not be refundable.

If the Bidder fails to produce the Royalty clearance certificate from concerned department within 30 days, then COMMISSIONER/EE/Nodal will be at liberty to deduct the royalty charges from his bills as per the prevalent Govt orders/rates.

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

The bidder 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.

26. FAIR WAGES

The bidder(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)

27. WORKS IN THE VICINITY

The Commissioner 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.

28. 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 be used by the bidder. If the materials of required Specification is not available in the nearby area/quarry, the bidder shall have to arrange the same from the place where it is available.

29. REMOVAL OF UNDESIRABLE PERSONS

The bidder shall on receipt of the requisition from the COMMISSIONER/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.

30. AMOUNT DUE FROM BIDDER

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

31. TOOLS & PLANTS

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

32. 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 bidder will be bound to comply with the order of the competent authority without any claim for compensation or higher rates for additions and alterations.

33. LABOUR REPORT

Bidder 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.5000/- will be deducted from each running bill. Total recovery on this account may be affected on the final bill.

34. LABOUR LICENCE

Every bidder 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, bidder shall execute any work without obtaining licence, contravention of above is punishable and bidder 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.

35. LABOUR HUTMENT

The bidder 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.

36. NOTICE TO BE GIVEN BEFORE WORK IS COVERED UP

The bidder 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 bidder's expense or in default thereof no payment or allowance shall be made for such work or materials with which the same was executed.

37. SITE ORDER BOOK

An order book, to be called, as site order book shall be kept at the Site office of Urban Local Body where the work has been going to be executed or as per the direction of Engineer in Charge. As far as possible, all orders regarding the work are to be entered in this book. All entries shall be signed and dated by concerned Urban Local Body/PMC officers in direct charge of the work and noted by the bidder 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.

38. BIDDERS PROJECT MANAGER AND BIDDERS STAFF

The bidder 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 Bidder's Project Manager shall be held to have been given to the bidder. The bidder 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.

39. 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 Bidder submits to the Engineer-in-Charge through PMC 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 Bidder. 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 Bidder 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 Bidder to the Engineer-in-Charge through Project Management Consultants (PMC) 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 Bidder 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 Bidder.

Manufacture's and Bidder'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 Bidder.

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 equipment's shall be subjected to approved third party inspection at place of manufacture, at bidder's cost.

Transit insurance of all equipment's shall be the bidder's responsibility.

Bidder shall have to take the certificate from the Electrical Inspector for regarding all electrical equipment's 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 Bidder shall provide record drawings including those drawings submitted by the Bidder 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 Bidder 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 Auto CAD Software and in .pdf form. When reports, drawings are furnished to Urban Local Body, 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 Urban Local Body on CDs, Pen drive, data base preferable on MS office and Auto CAD latest versions and in .pdf form.

40. PROGRAMME OF WORK

The works to be carried out under this Contract form an important part of the execution of this 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 bidder 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 Bidder 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
- Commissioning and trial run

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

41. PROGRESS

The Bidder 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 Bidder'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 COMMISSIONER or Engineer-in-Charge of concerned ULB 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 Bidder shall attend such meetings.

The Bidder 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 Bidder 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.

42. 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 bidder 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.

43. EXECUTION OF AGREEMENT

The Tenderer whose tender has been accepted shall have to execute the agreement within 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.

44. CHANGE IN SITE

No claims shall be paid on account of reasonable change in site, alignment or orientation of the proposed work, within the work site marked on plan attached to the tender as the circumstances may call for.

45. WORKMEN

The bidder shall at all times enforce strict discipline and good order among his employees and shall not employ on the works any unfit person or anyone not skilled and experienced in the assigned task. The Bidder shall in respect of labour employed by him comply with or cause to be complied with the provisions of various labour law and rules and regulations as applicable to them in regard to all matters provided therein and shall indemnify the owner in respect of all claims that may be made against the owner for non-compliance thereof by the Bidder. In the event of the bidder committing a default or breach of any provisions of labour laws and rules and regulations, the Bidder shall without prejudice to any other liability under the acts pay the owner a sum as decided by the engineer.

46. LAND FOR THE USE BY THE BIDDER FOR STORING MATERIALS ETC.

As far as possible the bidder shall be allowed to use the Municipal Land without any charge, in possession of Korba Municipal Corporation (KMC) for stacking his materials, stores, erection of temporary structures, sheds etc with prior written permission of Engineer in charge. The location of the temporary structures to be erected shall be got approved from the Engineer in charge and all the products obtained after cutting the same shall be stacked at suitable place as directed by Engineer in charge. All KMC land occupied by the bidder for temporary use shall be handed over back in good conditions to the entire satisfactions of the KMC as and when demanded by him. Any damage or alterations made in the area shall be made good by the bidder. If the departmental land is not available the bidder has to make his own arrangements of land on hire or otherwise at his own cost.

47. WORK THROUGH OTHER AGENCY IN THE SAME AREA

The Engineer in charge KMC shall have the right to execute the works, not included in this contract, but within the premises occupied by the bidder for the purpose of this contract, through any other agency.

48. CARE AND USE OF SITE

The Bidder shall not commence operations on land allotted for work without prior approval of the Engineer in charge. If these lands are not adequate the Bidder may have to make his own arrangements for additional lands required for his use. The bidder shall not demolish, remove or alter any of the structures, trees or other facilities on the site without prior approval of the Engineer. All the area of Bidder's operations shall be cleared before returning them to the Engineer in charge.

49. USE OF EXPLOSIVES

The Bidder shall comply with the laws, ordinances, regulations, codes, orders, other governing the transportation, storage and use of explosives, shall exercise extreme care not to endanger life or property and shall be responsible for all injury or damage resulting from the use of explosives for or on the work.

50. PROTECTION

The bidder shall take all precautions and furnish and maintain protection to prevent damage, injury or loss to other persons who may be affected thereby. All the works and all materials and equipment to be incorporated therein whether in storage or on the site, under the care, custody or control of the bidder or any of his sub-bidders and other improvements and property at the site or where work is to be performed including building, tools and plants, pole lines, fences, guard rails, guide posts, culvert and works markers, sign structures, conduits, pipelines and improvements within or adjacent to streets, right-of-way, or easements, except those items required to be removed by the Bidder in the contract documents. The Bidders protection shall include all the safety precautions and other necessary forms of protection, and the notification of the owners of utilities and adjacent property.

The bidder shall protect adjoining site against structural, decorative and other damages that could be caused by the execution of works and make good at his cost any such damages that could be caused by the execution of works and make good at his cost any such damages.

51. UTILITIES AND SUB-STRUCTURES

Before commencing any excavations, the Bidder shall investigate, determine the actual locations, and protect the indicated utilities and structures, shall determine the existence, position and ownership of other utilities and substructures in the site or before the work is performed by communication with such property owners, search of records, or otherwise and shall protect all such utilities and substructures.

52. RESTORATION AND REPAIR

Except for those improvements and facilities required to be permanently removed by the bidder, the bidder shall make satisfactory and acceptable arrangements with the appropriate owners, and shall repair, restore all improvements, structures, private and public roads, property, utilities and facilities disturbed, disconnected, or damaged as a result or consequence of his work or the operations of those for whom he is responsible or liable, including that caused by trespass of any of them, with Bidder or without his knowledge or consent, or by the transporting of workmen, material or equipment to or from the site.

53. OPTIONAL MATERIALS

Only one brand, kind or make of material or equipment shall be used for each specific purpose through-out the works, notwithstanding that similar material or equipment of two or more manufacturers or proprietary items may be specified for the same purpose unless and otherwise permitted by engineer in charge.

54. USE OF APPROVED SUBSTITUTIONS OR EQUALS

The bidder shall bear all extra expenses resulting from providing or using approved substitutions or equals where they affect the adjoining or related work, including the expenses of required engineering, redesigning, drafting and permits where necessary, whether the Engineer's approval is given after receipt of tenders.

55. 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	Bidder's Labour Regulations
Annexure C	Form of Income Tax Clearance Certificate
Annexure D	Statement showing the Lead of Materials
Annexure E	Scope of Work and Technical Specification
Annexure F	Price Schedule including payment breakup in concerned annexures
Annexure G	Revised form of 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 Bidder's Equipment proposed to carry out the works.
Appendix 6	Qualifications of each Technical Personnel of Bidder proposed for the Contract
Appendix 7	Financial reports for the previous 05 years (up to 31-03-24)
Appendix 8	Information on current claims, Arbitration, Litigation in which Bidder is involved.
Appendix 9	MOU with registered Substation Bidder
Appendix 10	Contact persons
Appendix 11	Affidavit (Declaration for Not Being Blacklisted)
Appendix 12	Declaration (Declaration for complete knowledge of project

	etc.)
Appendix 13	Declaration of conflict of Interest
Appendix 14	Information regarding Similar works
Appendix 15	Joint Venture Agreement (deleted)
Appendix 16	Power of Attorney

**Commissioner
Municipal Corporation
Korba (C.G.)**

Design, construction, erection, testing and commissioning of 20 MLD Tertiary Treatment Plant for NTPC Korba including operation and maintenance of entire scheme for 15 years

Tender for a Lump - Sum Contract

(To be submitted online **only in Envelope-C on Bidder's Letter head with seal and signature)**

Sr. No.	Particulars	Lump Sum Cost
A	Lump Sum offers for Design, construction, erection, testing and commissioning of 20 MLD Tertiary Treatment Plant at NTPC Korba and other works as per the scope of work specified in NIT	Rs.
B	Lump Sum offers for 15 Years Operation and Maintenance cost for the entire scheme.	Rs.

Grand total 'C' = A + B = Rs.....

(Rupees.....)

Note: Offer is inclusive of GST and all other applicable taxes etc

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

Online offer **only shall be considered only**

“We do hereby tender to execute the whole of the work described in the Scope of work and according to the annexed specifications for the sum of Rs. -----

----- (Rupees -----) as per breakup given above:

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 Urban Local Body_____, the penalties of sums 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 Urban Local Body_____.

The _____/20__

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

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 **Commissioner, Municipal Corporation Korba/Urban Local Body Korba** and the **Bidder**.
- 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 may be allotted or used for the purpose of carrying out the contract.
 - (c)** The “COMMISSIONER KMC” means Commissioner of the Korba Municipal Corporation, where work will be executed
 - (d)** The “Engineer-in-Charge” means the Executive Engineer or equivalent who shall supervise and be in charge of the work and who shall sign the contract on behalf of the Urban Local Body.
 - (e)** Competent Authority means Commissioner, Municipal Corporation Korba where work is going to be executed
 - (f)** The term “Chief Engineer” means the Competent Authority from UADD
 - (g)** The term "Superintending Engineer" means the Superintending Engineer of the KMC
 - (h)** The term "Assistant Engineer" means the Assistant Engineer of concerned ULB
 - (i)** The word "Sub Engineer" shall mean "Sub Engineer " of the concerned ULB
 - (j)** The term “TIA” means tender inviting Authority means Commissioner Korba.
 - (k)** The term “ULB” means Urban Local body, where the work will be executed.
 - (l)** The term “JOC” means Joint Oversight Committee (JOC) comprising of four members, two (02) representatives each from - Korba Municipal Corporation (KMC) & NTPC Korba established to share information and coordinate to fulfil each Party's interest as per agreement. In case of any constitutional dispute/Technology Selection/Vendor selection/Payments, the decision of JOC shall be final and binding on the contractor.
 - (m)** The Intended Completion Date shall be 24 months from the Start Date which consist Construction period of 21 months and trial run 3 months. Duration of PG test during trial run shall be executed for 72 uninterrupted operational hours

Operation and Maintenance O & M Period = 15 years. Bidder has to enter into separate agreement for O & M work after completion of trial run.

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 bidder(s), which expressions shall unless excluded by or repugnant to the context include his heirs’ executors, administrators’ representatives and assigns) shall permit

Govt at the time of making any payments to him for the value of work done under the contract to deduct Security deposit as under.

The Security Deposit to be taken for the due performance of the contract under the terms & conditions printed on the tender form will be the earnest money plus a deduction of 5 percent from the payment made in the running bills, till the two together amount to 5 percent of the cost of work put to tender or 5 percent of the cost of the works executed when the same exceeds the cost of work put to tender.

2. The Bidder(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 Engineer in Charge/Commissioner and the bidder(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 Engineer in Charge/ Commissioner is to decide which shall be followed.
- 2 (a) The Bidder(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 bidder(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 bidder(s) is/are to leave to works in all respects clean and perfect at the completion thereof.
- 2(b) All inspection charges will be payable by the Bidder.
3. Complete copies of the drawings and specification signed by the SE/EE of concerned regional office of KMC are to be furnished by him to the bidder(s) for his/their own use, and the same or copies thereof are to be kept on buildings in charge of the Bidder(s) agent who is to be constantly kept on the ground by the bidder(s) and to whom the instructions can be given by the Commissioner. The Bidder(s) is/are not to sublet the works or any part thereof without the consent in writing of the competent authority
4. The Engineer in Charge/ Commissioner is to have at all times access to the works which are to be entirely under his control. He may require the bidder(s) to dismiss any person in the Bidder(s) employ upon the works that may be incompetent or misconduct himself and bidder(s) is/are forthwith to comply with such requirements.
5. The Bidder(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 Engineer in Charge/ 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 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.

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 Engineer in Charge/ 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 Commissioner /Engineer in Charge of concerned KMC will fix the rates to be paid.
7. All work and materials brought and left upon the ground by the Bidder(s) or his/their orders for the purpose of forming part of the works are to considered to be the property of Urban Local Body and the same are not to be removed or taken away by the Bidder(s) or any other without the special license and consent in writing of the Commissioner of ULB 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 bidder(s).
9. If in the opinion of the Engineer in Charge / Commissioner any of the works are executed with improper materials or defective workmanship, the bidder(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 bidder (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 bidder(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 / Engineer in Charge to be amended and made good by the bidder(s) at his/their

own cost unless the Commissioner/ Engineer in Charge shall decide that he/they ought to be paid for the same and in case of default the Commissioner may recover from the bidder(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 bidder's(s) charge. The bidder(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 KMC harmless from any claims for injuries to persons or for structural damage to property happening from any neglect, default, want of proper care of misconduct on the part of the bidder(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 bidder(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 bidder(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 received of the work order by Commissioner. The whole work, including all such addition 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 **24 months** (Construction Period 21 Months (including Monsoon) and Trial & Run Period 3 Months) from the reckoned date (The period will be reckoned from the 15 days after the date of Work order in case of completion period is up to six months and 30 days in case of completion period is more than six months). The work shall throughout the stipulated period of contract be proceeded with all due diligence, keeping in view that time is the essence of the contract. The bidder shall be bound in all cases, in which the time allowed for any work exceeds one month, to complete 1/8th of the whole work before 1/4th of the whole time allowed under the contract has elapsed, 3/8th of the work before 1/2 of such time has elapsed and 3/4th of the work before 3/4th of such time has elapsed. In the event of the bidder failing to comply with the above conditions, the Executive Engineer shall levy on the bidder, as compensation an amount equal to: 0.5% (zero-point five percent) of the value of work (contract sum) for each week of delay, provided that the total amount of compensation under the provision of the clause shall be limited to 6% (six percent) of the value of Construction work and 10% (ten percent) of the value of Operation and Maintenance (O&M) work.

Provided further that if the bidder fails to achieve 30% (thirty percent) progress in 1/2 (half) of original or validly extended period of time the contract shall stand terminated after due notice to the bidder and his contract finalised.

If the bidder shall desire an extension of time for completion of work on the ground of his having been "UNAVOIDABLY" hindered in its execution or on any other ground, he must apply giving all and complete details of each of such hindrances or other causes in writing, to the Executive Engineer/ Commissioner

positively within 15 days of occurrence of such hindrance(s) and seek specific extension of time (period from.....to.....). If in the opinion of Executive Engineer, such reasonable grounds are shown, the Executive Engineer shall himself grant extension of time, if the extension of time sought by the bidder is for one month or 10% (ten percent) of the stipulated period of completion, whichever is more. If the extension of time sought is more than above period mentioned, then the Executive Engineer shall refer the case to the Superintending Engineer with his recommendation and only after his decision in this regard, the Executive Engineer shall sanction extension of such time as decided by the Superintending Engineer.

Once the Commissioner has decided the case of extension of time with reference to the particular application of the bidder, it will not be competent for them to review/change such a decision later on. However, the Superintending Engineer shall give the bidder an opportunity to be heard (orally and or in writing), before taking any final decision either of granting extension of time or permitting the bidder to complete the work by the delayed date or before refusing both.

Provided further where the Commissioner has recommended grant of extension of particular time of the contract or has refused to recommend extension of time but has recommended permitting the bidder for delayed completion, the bidder shall continue with the work till the final decision by Superintending Engineer of the concerned zone.

Failure on the part of the bidder for not applying extension of time even within 30 days of the cause of such a hindrance, it shall be deemed that the bidder does not desire extension of time and that he has "Waived" his right if any, to claim extension of time for such cause of hindrance.

Once the Commissioner has heard (oral and or in writing) the bidder on this subject matter of extension of time and if Commissioner fails to communicate his decision within a period of 30 days of such hearing, it shall be deemed that the bidder has been granted extension of time for the period as applied by him. Provided that the Bidder(s) shall not be entitled to any extension of time in respect of the extra work involved in the extra depth of foundation mentioned clause 5.

13.1 Compensation Events for consideration of extension of time without penalty:

The following mutually agreed Compensation Events unless they are caused by the bidder would be applicable.

- (a) The Commissioner does not give access to a part of the site.
- (b) The Commissioner modifies the schedule of other bidder in a way, which affects the work of the bidder under the contract.
- (c) The Commissioner orders a delay or does not issue drawings, specification or instructions /decisions/approval required for execution of works on time.
- (d) The Commissioner instructs the bidder to uncover or to carry out additional tests upon work, which is then found to have no defects.
- (e) The Commissioner gives an instruction for additional work required for safety or other reasons.

- (f) The advance payment and or payment of running bills (complete in all respect) are delayed.
- (g) The Commissioner unreasonably delays issuing a Certificate of Completion
- (h) Other compensation events mentioned in contract if any

14. Action when the work is left incomplete abandoned or delayed beyond the time limit permitted by the Commissioner /Executive Engineer:

- (i) The Commissioner may terminate the contract if the bidder causes a fundamental breach of the contract.
- (ii) Fundamental breach of contract shall include, but not be limited to, the following: -
 - a) The bidder stops work for four weeks, when no stoppage of work is shown on the current programme, or the stoppage has not been authorised by the Executive Engineer.
 - b) The Executive Engineer gives notice that failure to correct a particular defect is a fundamental breach of contract and the bidder fails to correct it within reasonable period of time determined by the Executive Engineer in the said notice.
 - c) The bidder has delayed the completion of work by the number of weeks [12 (Twelve) weeks] for which the maximum amount of compensation of 6% of contract sum is exhausted.
 - d) If the bidder has not completed at least thirty percent of the value of construction work required to be completed in half of the completion period (Including validly extended period if any).
 - e) If the bidder fails to appoint the technical staff and if appointed do not function properly for 4 weeks even after due written notice by the Executive Engineer.
 - f) If he violates labour laws.
 - g) Any other deficiency which goes to the root of the contract Performance
- (iii) If the contract is terminated, the bidder shall stop work immediately, make the site safe and secure and leave the site as soon as reasonably possible.
- (iv) The Engineer in Charge shall cause recording and checking of measurements of all items of work done (taking into account quality and quantity of items actually executed) and prepare the final bill after adjusting all previous outstanding dues. Such recording of measurements shall be done after due notice regarding time and date of recording measurement and directing the bidder to either remain present himself or his authorised representative so as to satisfy himself that the recording of measurement is just and proper. Failure on his parts either to attend and or refusing to acknowledge the measurement so recorded in the department measurement book, shall be at his sole risk and responsibility.

The Commissioner shall forfeit the earnest money and or security deposit and further recover/deduct/adjust a compensation @ 10% (ten percent) of the balance value of work left incomplete either from the bill, and or from available security/performance guarantee or shall be recovered as "Arrears of land revenue"

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 bidder(s) is to be conclusive evidence of the works having been duly completed and the bidder(s) is/are entitled to receive payment of the final balance, but without prejudice to the liability of the bidder(s) provision of clause 10.
17. **ARBITRATION CLAUSE:** Except as otherwise provided in this contract all question and dispute, relating to the meaning of the specifications designs, drawings and instructions herein before mentioned and as to thing whatsoever, in any way, arising out of or relating to the contract, designs, drawings, specifications, estimates, concerning the works, or the execution or failure to execute the same, whether arising during the progress of the works or after the completion abandonment thereof shall be referred to the Commissioner shall give his written instructions and/or decisions within a period of 60 days of such request. This period can be extended by mutual consent of the parties.
Upon receipt of written instructions of decisions, the parties shall promptly proceed without delay to comply such instruction or decision, If the Commissioner fails to give his instructions or decisions in writing within a period of 60 days or mutually agreed time after being requested or if the parties are not satisfied with the decision of the Commissioner, they may within 60 days refer and appeal to the Chief Engineer UADD who shall afford an opportunity to the parties of being heard and to offer evidence in support of his appeal. The Chief Engineer UADD will give his decision within 90 days. If any party is not satisfied with the decision of the Chief Engineer UADD, he can, refer such dispute for arbitration governed as per “The Chhattisgarh Madhyastha Abhikaran Raipur”
18. If at any time before or after the commencement of the work, Commissioner 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 contemplated: OR
 - 18.2 Not required the whole of work as specified in the tender to be carried out,The bidder(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 bidder(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 bidder-If the bidder 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 14 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. **Limitations of Liability** - Except in cases of criminal negligence or wilful misconduct. (a) the bidder shall not be liable to the Employer, whether in contract, tort, or otherwise, for any indirect or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs, provided that this exclusion shall not apply to any obligation of the Bidder to pay liquidated damages to the Employer and (b) the aggregate liability of the Bidder to the Employer, whether under the Contract, in tort or otherwise, shall not exceed 100% of the contract price, provided that this shall not apply to the cost of repairing or replacing defective equipment, or to any obligation of the Bidder to indemnify the Employer with respect to patent infringement.
21. **Indemnities** -The Bidder shall indemnify and hold harmless the Employer, the Employer's Personnel, and their respective agents, against and from all claims, damages, losses and expenses (including legal fees and expenses) in respect of:
- (a) bodily injury, sickness, disease or death, of any person whatsoever arising out of or in the course of or by reason of the Bidder's design (if any), the execution and completion of the Works and the remedying of any defects, unless attributable to any negligence, wilful act or breach of the Contract by the Employer, the Employer's Personnel, or any of their respective agents, and
 - (b) damage to or loss of any property, real or personal (other than the Works), to the extent that such damage or loss arises out of or in the course of or by reason of the Bidder's design (if any), the execution and completion of the Works and the remedying of any defects, unless and to the extent that any such damage or loss is attributable to any negligence, wilful act or breach of the Contract by the Employer, the Employer's Personnel, their respective agents, or anyone directly or indirectly employed by any of them.

The Employer shall indemnify and hold harmless the Bidder, the Bidder's Personnel, and their respective agents, against and from all claims, damages, losses and expenses (including legal fees and expenses) in respect of (1) bodily injury, sickness, disease or death, which is attributable to any negligence, wilful act or breach of the Contract by the Employer, the Employer's Personnel, or any of their respective agents, and (2) the matters for which liability may be excluded from insurance cover.

Date:

Signature of the Bidder

**Commissioner,
Municipal Corporation, Korba
District Korba (CG)**

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 M 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 overhead storage tank shall be provided with a capacity of five Liters a 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, a 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 place 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 wastewater 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. Also it shall be the responsibility of contractor for safe disposal of all the materials/Components/Membranes throughout the Contract period in line with

prevailing statutory norms of Central/State Pollution control board

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 aid. All the medical facilities mentioned above shall be for 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

Bidders Labour Regulations

The bidder 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 bidder 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-bidder 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 bidder 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 bidder any sum required or estimated to be required for making good, the loss suffered by a worker or workers by reason of non-fulfilment 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 bidder 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-bidder.

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 conduct.

The bidder 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 fulfil this requirement shall attract the penal provisions of this contract arising out of the resulted non execution of the work assigned to the bidder.

Special Additional Condition

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

It is mandatory for the bidder(s) to get himself/themselves 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

Not required

ANNEXURE – D
Statement showing the Lead of Materials

S. No.	Description	Lead
1.
2.Not required.....
3.
4.
5.

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

ANNEXURE – E SCOPE OF WORK & TECHNICAL SPECIFICATIONS

Terms of Reference

1. GENERAL

Introduction

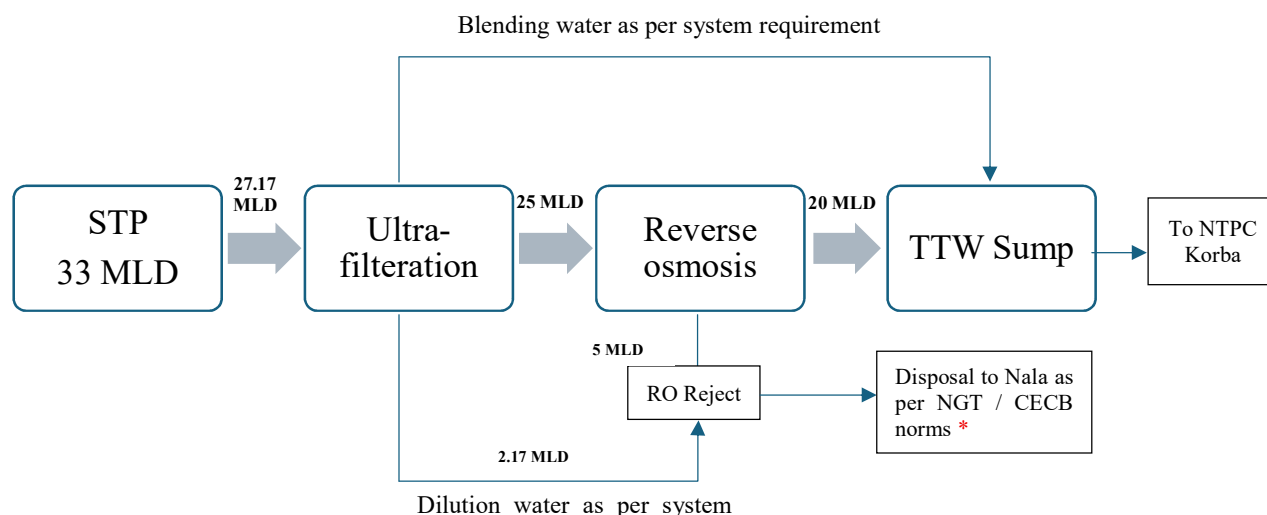
Korba is located in Chhattisgarh State and known as a major hub for its coal reserves and thermal power plants, is a District headquarter. All the civic activities are governed by the Korba Municipal Corporation (KMC). The city is divided in two parts by the river Hasdeo which flows through the city. The Municipal Corporation Korba has started construction of a 33 MLD sewage treatment plant under AMRUT 2.0 mission.

The project for construction and installation of STP with allied works (which is not in scope of this tender) has been taken up by KMC under AMRUT 2.0. The project is under execution from July 2025 and the timeline of the project is 27 Months (including 3 months trial run).

Korba Municipal Corporation and NTPC Korba have entered into an agreement for the reuse of 20 MLD of treated water for non-potable use by NTPC Korba.

Out of the 33 MLD treated STP water, the system shall be designed for minimum 20 MLD TTP output at NTPC's end. The treatment facility will be established at Pragati Nagar for which the land has been handed over by NTPC to KMC Korba. It is proposed to install TTP facilities within the premises of STP. The geo- coordinates for proposed TTP are: 21°15'25.84" N, 81°32'44.27"E.

Figure 0-1: Proposed minimum mandatory water balance for TTP.



* Note: The TDS concentration in **UF-RO** reject tank for disposal into the nallah shall be <2100 ppm as per EPA 1986. Bidder shall adhere to compliance as per CECB directives in

addition to NGT Norms. Additional water for dilution if required may be provided by KMC from the STP outlet.

The proposed components which are to be constructed and installed (but not limited to) under the scope of this contract including survey, geotechnical and hydro-geological investigations, detailed hydraulic and structural designs are as below:

Annexure - E		
S.No.	Annexure	Components
E 1	Providing, supplying, erecting and commissioning 20 MLD UF RO based Tertiary treatment plant at Korba with PEB structure, all allied tanks and all equipments	<ol style="list-style-type: none"> 1. UF feed tank with feed pump 2. UF membrane with complete permeate, backwash, CEB and CIP system 3. UF permeate cum RO feed Tank with overhead wash water tank and backwash/CIP pumps 4. RO System 5. RO feed pumps 6. RO modules 7. Complete arrangement for permeate flush/ rinsing, Feed flush/ rinsing, and CIP system. 8. Dosing system for chlorine and pH correction 9. RO reject tank 10. PEB structure for housing all installations of UF/RO with air-conditioned monitoring room with internal and external electrification 11. Reject water management and Safe disposal arrangement of UF, RO and all other reject water as per the norms of NGT to Hasdeo river
E 2	Constructing and commissioning RCC RO Permeate tank cap. 4000000 lit for delivery at NTPC premises with all allied works	<ol style="list-style-type: none"> 1. RCC RO permeate tank
E 3	Providing installing and commissioning Pumping machinery Q=1000000 LPH and Head 26 m. at RO Permeate tank	<ol style="list-style-type: none"> 1. TTW pumping machinery with Overhead pumphouse and all allied electro-mechanical installations for conveyance of recycled water to NTPC
E 4	Providing erecting and commissioning 1500 KVA/33/3.3 KV electric sub station	<ol style="list-style-type: none"> 1. Transformer, Substation, DG set
E 5	Providing Laying Jointing and	<ol style="list-style-type: none"> 1. Pipeline from RO Permeate tank to NTPC

	commissioning 500 mm dia DI k-9 Pumping Main of 1300 m from RO Permeate tank to NTPC Permises	discharge point with all fixtures.
E 6	Allied civil work	<ol style="list-style-type: none"> 1. PLC Scada & automation for entire installation 2. Required civil structures for all the components 3. Allied civil work such as boundary wall with gate and security cabin, CCTV camera surveillance system 4. Area development, landscaping and beautification
E 7	Performance Guarantee Test	
E 8	Comisisoning and Operational Acceptance by KMC & NTPC Korba	Comisisoning of entire plant and operational acceptance.
E 9	Defect liability period	18 months
E 10	Operation & Maintenance for 15 Years for Tertiary treatment Plant, sump, pumping Main etc for all capital works under scope of project	<ol style="list-style-type: none"> 1. 3 Months Trial run 2. Operation and maintenance for entire facility for 15 years

The tentative area for layout of TTP is provided in this tender. However, successful bidder shall have to prepare & submit their layout plan and hydraulic flow diagram etc. after the award of tender. Any modification required to complete the system as per the tenders scope and good engineering practices at NTPC premises shall also be in bidders scope.

SECONDARY TREATED SEWAGE / TTP FEED WATER CHARACTERISTICS AND TTP TREATED WATER CHARACTERISTICS

The Bidder shall design the process considering treated sewage characteristic at the inlet of TTP as follows:

Table 2: Inlet parameters of TTP

Sr. No.	Parameters/ Pollutants		Values after secondary treatment
1	pH	:	6.5 to 9.0
2	Biochemical Oxygen Demand (BOD ₅)	:	≤ 10 mg/l
3	Chemical Oxygen Demand (COD)	:	≤ 50 mg/l
4	Total Suspended Solids (TSS)	:	≤10 mg/l
5	Total Phosphorous (TP)	:	≤ 1mg/l
6	Total Nitrogen (TN)	:	≤ 10 mg/l
7	Ammoniacal Nitrogen (NH ₃ -N)	:	≤ 5 mg/l
8	Faecal Coliform (MPN/100 ml)	:	≤ 230 MPN/100 ml
9	TDS	:	632 (system to be designed for 1000 ppm)
10	Chlorides	:	333.7 (system to be designed for 350 ppm)
11	Hardness	:	218 (system to be designed for 600 ppm)

Bidder has to provide treatment for secondary treated water in proposed TTP to achieve the following:

Table 3: Required Outlet parameters at TTP

Sr. No.	Parameters/ Pollutants		Allowable limits for TTP
1	pH	:	6.5 to 9.0
2	Biochemical Oxygen Demand (BOD ₅)	:	≤ 10 mg/l
3	Chemical Oxygen Demand (COD)	:	≤ 50 mg/l
4	Total Suspended Solids (TSS)	:	≤ 5 mg/l
5	Total Phosphorous (TP)	:	≤ 1 mg/l
6	Total Nitrogen (TN)	:	≤ 10 mg/l
7	Ammoniacal Nitrogen (NH ₃ -N)	:	≤ 5 mg/l
8	Faecal Coliform (MPN/100 ml)	:	BDL
9	TDS	:	<100 ppm
10	Chloride	:	<30 ppm
11	Total Hardness	:	<60 ppm
12	Turbidity	:	≤ 5 NTU

Bidder to provide electricity consumption & Net output flow as per table below along with Technical bid (Envelope B).

Table 4: Guarantees to be given by bidder

Details	As per Tender	To be guaranteed by bidder
Net output Flow	Min. 20 MLD	_____
<ol style="list-style-type: none"> 1. Guarantees to be given by bidder on letterhead to be submitted in Envelope B. 2. The offer of the bidder showing less net output flow than the tender shall not be considered for evaluation and their bid shall be summarily rejected. 		

Note: Bidder has to ascertain and analyse Ionic balance for RO design as per water quality. RO & UF permeate shall be provided as net outflow

2. Breakup of work

Part A : Capital works of 20 MLD Tertiary treatment plant

Construction of 20 MLD Tertiary Sewage Treatment Plant including all the works related to Civil / Electrical / Mechanical / Instrumentation / automation or any other field of Engineering, all inter-connecting piping, Supply & Installation of equipment's etc., including all the required materials & labour etc., including trial run of the proposed plant, on turn-key basis., complete (but not limited to) as per terms & conditions, and specifications of this tender, with all the duties, taxes, charges, surcharges and any other levies of Government/ Local body which are presently prevailing including GST.

Part B : Operation & Maintenance of O & M 20 MLD Tertiary treatment plant with PLC / SCADA.

The operation and Maintenance of entire facility for both fixed cost and variable cost including all the required consumables such as manpower, chemicals housekeeping, security but excluding electrical energy charges and fuel. The scope of operation and maintenance shall contribute to labour/manpower cost, routine maintenance cost and major and minor spare part cost, required periodic replacements consumables and chemical cost etc., wherein the tenderer shall quote their lump-sum price for the duration of 15 years including GST and all other taxes.

Part C: For part A plus B, the tenderer shall quote a separate Lump-sum price in Form F.

$$\text{PART C} = \text{Part A} + \text{Part B}$$

For Operation and Maintenance, "Scope of work for Operation & Maintenance" of proposed plants and "Terms & Conditions" for the same are described in Chapter defined elsewhere in tender of this Tender document.

3.1 Terminal Points: (PLEASE READ CAREFULLY)

The scope of this tender shall start from the outlet of STP. The contractor shall make all the necessary arrangements for interconnection with bypass arrangements for taking the STP water in their proposed facility. The final tertiary treated effluent shall have to be **minimum 20 MLD** and the same shall be collected and shall have to be pumped to NTPC premises. An appropriate outfall arrangement inside NTPC premises shall be designed and constructed to avoid erosion. Reject water from the TTP, shall be utilised / disposed as per the prevailing

norms specified by Chhattisgarh Environment Conservation Board (CECB) and Hon'ble NGT board in coordination with KMC. The work of appropriate drainage arrangement up to the disposal point shall be in the scope of contractor.

3.2 Basic Engineering Package

Basic engineering package shall be submitted after the award of contract by successful bidder to obtain approval from KMC.

Basic design engineering documents like process design calculation, General arrangement drawing, P&ID or any other document as desired by NTPC Korba shall also be reviewed by NTPC Korba and the compliances if any shall be incorporated by bidder.

Design calculations and drawings shall be submitted in sequence as per schedule to be drawn and agreed upon mutually, immediately after submission of the general arrangement drawing. The entire process of submission of all such documents by the Contractor in initial copies and final copies after approval of the Engineer In-charge shall be completed within 90 days from the date of the work order. These documents shall cover:

- Layout (General layout to the scale) of TTP
- P&ID
- Hydraulic flow diagram.
- Hydraulic design calculation along with Mass/Chemical balance for TDS and other critical parameters
- Detailed progress bar chart and report showing physical and financial achievement at every first of calendar month.
- Detailed planning of all units.

It will be mandatory on the part of the contractor to prepare the detailed designs and the Basic Engineering Package (BEP) from the same institute.

3.3 Detail Engineering

Detailed Design Calculation, structural detailed drawings, working drawings etc. for all plant and pumping units. The entire construction shall be in M30 grade reinforced cement concrete Fe 500 TMT steel and as per IS 3370. RCC Platform/Walkway, minimum 1.20 m wide with Hand Railing as per specifications shall be provided. RCC Staircase, minimum 1.20 m wide with Hand Railing as per specifications shall be provided for access from Finished Ground Level to the top of the Unit & to the Operating Platform/Walkway. Plinth protection along periphery shall be provided as per technical specifications.

- Detailed structural design and good for execution drawings pertaining to all components of the plant and other associated works.
- Architectural Drawings
- GA drawing of each / individual unit
- Drawings showing the size, position and other necessary details of all mechanical and electrical equipment and fixtures.
- Wiring diagrams, pressure control, pumps and motor control gear particulars.

- Details of foundations, position of openings, etc., for the pumps, motors, starting cubicles, LT/HT panels, etc.
- Elementary diagram and manufacturers' shop and part drawings for all equipments.
- Services like internal illumination and ventilation, building water supply, sanitation and plumbing, area lighting, etc.
- Landscaping & Plant beautification plan
- Detail piping and instrument or engineering flow diagram for process and utility showing all equipments, machinery piping and instrumentation. All piping should be indicated with diameter material of construction, pipe class, pipe number and fluid flowing through it.
- Detail installation drawing for mechanical equipments and other instruments.
- Light fitting and wiring diagrams, drawings for panels, earthing layout etc.
- Data and guaranteed power and chemicals consumption for the TTP.
- Detailed bill of material as per the requirement of the KMC.
- Any other drawing / data / details required by the owner, consultant appointed by owner or his authorized person
- Details of plant interconnecting pipe network along with supports etc.
- During commissioning of the plant the bidder shall submit draft copies of Instruction manual for operation and maintenance of the various TTP units giving analytical procedures for various parameters, technical literature, leaflet, wiring diagram etc. On approval and amending the same as per plant conditions, the bidder shall submit ten copies of final Instruction Manual in proper binding, giving details of plant also.
- Singal line power diagram and power flow.
- Cable Layout and Cable Schedule.
- Scheduled replacement cycle for various membranes
- PLC Scada and automation software with fully automatic logic control and monitoring.
- Any other design and drawings to fulfil the KMC/ NTPC's requirement.

3.3.1 Submittals

The submittals include but is not limited to work required to comply in accordance with general and specified procedures for transmittal of submissions; submission review and subsequent actions; schedule of submissions; resubmission; construction schedule; coordination of drawings; submission of drawings; insert and sleeve location drawings; reproduction of submitted drawings; sample; and construction photocopies.

3.3.2 Design, Drawings, Documents and Data

The Contractor shall carry out, and be responsible for, the design of the Works. Design shall be prepared by qualified designers/professionals who comply with the criteria stated in the KMC's Requirements. The Contractor undertakes that the designers shall be available to attend discussions with the Engineer In-charge at all reasonable times during the Contract Period. The designs and drawings shall be got approved from IIT/NIT, prior to the final approval from the competent authority at the cost of the contractor. If during the approval any change or suggestion is made by the competent authority then the same has to be got corrected by IIT/NIT and then the final approval shall be given.

3.3.3 Basic Design Parameters

The bidder is required to examine and check the KMC's design criteria, specifications etc., as included in the Bid documents to confirm their correctness in its bid and to assume full responsibility for them.

3.3.4 Submission of Design Calculations, Drawings and Other Documents by the Contractor

- a. After signing the Contract, within 28 days from the date intimated by the KMC to proceed with the work, the Contractor shall supply to the Engineer In-charge 6 (six) hard copies (along with workable soft copies in a CD) each of the design calculations for the process and sizing of all components of the plant including mechanical and electrical equipment, supported by flow diagrams, and general arrangement drawings, reference catalogues /literature of manufacturers, other reference documents used for the design purpose, for approval of the Engineer In-charge . The Contractor shall incorporate all necessary comments of the Engineer In-charge in the above design and drawings, if any, and shall re-submit further 6 (six) copies each of the revised design and drawings within 14 (fourteen) days for final approval of the Engineer In-charge. The Contractor shall thereafter submit 6 (six) copies each of the approved design and workable soft copies of all approved designs, calculations and drawings. The entire cost shall be borne by the Contractor and the KMC does not hold reliability on this account at any cost and any time.

3.3.5 Format of Drawings

All drawings submitted for approval shall be ISO standard size sheets. Every drawing shall have a title block in the bottom right corner showing:

KMC's Name	:
Contract No.	:
Consultant	:
Contractor	:
Project	:
Drawing Title	:
Drawing Number	:
Revision Number	:
Date	:

Each drawing shall bear the signature of the Project Manager on behalf of the Contractor to the effect that the drawing whether his own or from any other source has been checked by the Contractor before submission to the department.

Each revision shall be properly recorded to show the number, date, specific description of revision(s) carried out, and signature of the Project Manager in the revision block. The Contractor shall be responsible for incorporating all the comments issued by the Engineer In-charge.

3.3.6 As-Built Drawings

The Contractor shall prepare, and keep up-to-date, a complete set of "As Built" records of the execution of the Works, showing the exact "as built" location, sizes and details of the work as executed, with cross references to relevant specifications and data sheets. These records shall be kept on the Site and shall be used exclusively for the purposes of this Sub-clause. Two hard copies shall be submitted to the Engineer In-charge prior to the Tests on Completion.

In addition, the Contractor shall prepare and submit to the Engineer In-charge “As Built drawings” of the Works, showing all Works as executed. The drawings shall be prepared as the Works proceed, and shall be submitted to the Engineer In-charge for his inspection. The Contractor shall obtain the consent of the Engineer In-charge as to their size, the referencing system, and other pertinent details.

Prior to the issue of substantial completion Certificate, the Contractor shall submit to the Engineer In-charge one soft copy, workable CD, one full-size original copy of the relevant “As Built Drawings”, and any further Construction Documents specified in the KMC’s Requirements. The Works shall not be considered to be completed for issue of substantial completion certificate until such documents have submitted to the Engineer In-charge.

3.3.7 Coordination Drawings

Coordination drawings shall be prepared and shall comprise composite section drawings showing coordination of mechanical and electrical work to structural work. The composite drawings shall be in sufficient detail to show overall dimensions of ductwork, piping, conduit, and related items and clearance between structural members, lighting and related features for review and approval of relative locations of work in allocated spaces. The drawings shall indicate any conflicts of clearance problems between various trades. Coordination drawings shall be submitted to the KMC's Representative. Coordination drawings will not be submitted for approval but for review only.

3.3.8 Equipment and Interconnection Diagram

Equipment room layout drawings shall be based on actual requirements of equipment furnished and be consolidated for all trades, shall be to scale and shall show all pertinent structural and penetration features and other items, such as electrical cabinets, which affect available space. All mechanical and electrical equipment including electrical conduits, accessories, ductwork and piping shall be shown to scale in plan and Also, in elevation and / or section and resolve any conflicts or clearance problems. Physical descriptions of the various mechanical and electrical items shown on these drawings shall be submitted concurrently.

3.3.9 Quality

Proof of quality of manufacture and reliability in field application. Such proof will normally constitute evidence that the product / equipment has been manufactured by the manufacturer, or fabricator of the quality assured for a unit or item over a period of time and has an established field service record. It shall include installation locations, dates and year of operating service. If there is no experience for an identical unit or item it may relate to a similar unit or item by the same manufacturer.

3.3.10 Manufacturer's Data

Manufacturer's data shall include catalogue cuts, brochures, circular, specifications, equipment operations and maintenance manuals and other printed information in sufficient detail and scope to verify compliance to the requirements.

3.3.11 Performance Data

Performance Data shall include certified curves of equipment responses and performance characteristics as required.

3.3.12 Parts and Special Tools Lists

- a) Parts lists shall include a complete list of component parts of an item of equipment together with an expanded view or equivalent means to identify the parts.
- b) Special Tools lists shall include all tools and devices required for assembly, disassembly, operation and maintenance of the equipment and an indication of the use of each item.
- c) The lists shall further identify the sources of manufacture and supply of consumable supplies and those parts, special tools and supplies that are normally furnished with the purchase of the equipment or are specified to be furnished.
- d) In additions, a list shall be provided showing items recommended by the manufacturer to support normal maintenance based on the manufacturer's anticipated life cycle of the part for continuous normal operation.

3.3.13 Certificates of Compliance

Certificate of compliance shall include material or product manufacturer's statement that the supplied items or systems conform to the specifications.

3.3.14 Test Reports

Test reports shall be provided as required and as follows:

- a) Shop tests shall show the results of required shop tests of equipment or systems certified in writing by the manufacturer or its authorized Representative. However, the KMC / its representative along with consultant is free to visit and inspect the equipment and systems at manufacturing unit before dispatch. The cost toward such inspections shall be borne by the contractor.
- b) Field test reports shall show the results of required field tests and compliance with approved procedures and shall be certified in writing.

3.3.15 Maintenance Instructions

Maintenance instructions shall cover finish material including but not limited to hard-surfaced materials. Instructions shall include cleaning, tarnishing, dents and stains from various chemicals.

3.3.16 Submission Review and Subsequent Action Procedures

- i) Submission will be returned by the KMC's Representative to the Contractor indicating the appropriate action to be taken by the Contractor as follows:
 - a) Except in cases where local jurisdictional authority approval is required to validate a particular submittal, fabrication, manufacturer, construction or purchasing may proceed.
 - b) The submission does not comply with contract requirements, and fabrication, manufacturer and construction shall not proceed. The Contractor shall make revisions and resubmit. The Contractor has 14 calendar days from date of receipt of advice of the Engineer In-charge as to compliance with his comments and to resubmit drawings evidencing such compliance.

- ii) Failure of the Contractor to process submissions for review shall not relieve the Contractor of his responsibilities under the contract.
- iii) Do not proceed with work dependent on submissions until the submissions have been verified by the Contractor and reviewed by the KMC. Making good work which has proceeded in error because of non-compliance with these requirements shall be at the Contractor's expense. Review of Resubmissions shall not relieve the Contractor of his responsibility for execution of the works in accordance with contract document.
- iv) The Contractor shall not be relieved of responsibility for deviations from the contract or errors of any kind in the submissions or from the necessity of furnishing work required by the contract which may have been omitted from the submissions reviewed by the Engineer In-charge. The Engineer In-charge's review of individual items in submissions shall not be constructed as a review of the complete assembly in which it functions.
- v) No authorization of an increase in total contracting price or time or completion shall be implied by comments marked on submissions or submission transmittals by the Engineer In-charge.
- vi) Review of submission shall not absolve the Contractor from the responsibility of correctly locating all items in the works.
- vii) KMC's approval of substitutions, alternatives and deviations:

Whenever and wherever the Contractor proposes to make substitutions to the specified construction method or process or proposes the use of non-specified manufacturer's, products or to deviate from the material specified, the Contractor must make a full submission as required in the contract. The Contractor is advised that only the KMC has the final authority to approve or reject proposed substitutions, alternates and / or deviations from the contract.

3.3.17 Construction Photographs

- i) Work shall include progress photographs for each work of construction taken each month made by a professional photographer.
- ii) Photographs shall show general extent of the works by both exterior and interior views. Each viewpoint will be selected and the number of monthly repetitive photographs taken from exactly the same viewpoint as decided by the owner's authorized representative.
- iii) Submit six 200mm x 254mm glossy colour prints of each photograph to the KMC authorized representative at the first of each month duly attached / pasted in the Progress Report.
- iv) Title and mount each photograph per the KMC's authorized representative's requirements. As a minimum include on title: Project name, direction of view, and date when taken.
- v) Video shooting during major construction stages of plant or at least once every month must be carried out by the contractor and shall be submitted to the KMC / authorized representative.

The Bidder shall ensure the technical feasibility of his Offer submitted after visiting the Site. **It must be clearly understood that as the Contract is a "Turnkey Contract", the Bidder shall design and execute every such Item(s) of Work(s) which are considered required**

or necessary for the satisfactory completion and functioning of the entire Plant including Operation & Maintenance of the plant even if such Item(s) of Work(s) are not specified in the Bid documents but are essential for the performance of the Plant.

3.4 Extent of capital works

The capital work shall consist of Civil Works and Electro-Mechanical and instrument equipments. Civil Works of the TTP units as described in the data sheets with all channels, interconnecting piping etc and shall include all R.C.C., C.C., Brick masonry, wood works and iron works etc. completed pertaining to the structure. Electromechanical shall include the delivery at site and erection of all mechanical and electrical equipments including pipes, valves, electrical units, motors switches, control gears, and other instruments etc. so as to make the plant self-contained in all respects.

All internal wiring for power and lighting for the plant and buildings and external premises shall be provided by the bidder as per prevailing Indian Electricity Rules/Act and as per the rules of Chhattisgarh Electricity Board. The MCC shall be provided for taking power for various units of the plant and for lighting in the various pump house. Main switch board, meters, fuses, switches etc shall be provided by the bidder and all further cables, wires suitable for each equipment shall be provided and fixed by the Bidder. The bidder shall specify the connected H.P. each of his power consumption units and shall also give the total power required to run the plant including lighting arrangements to all structures.

For the period of eighteen months of defect liability period, after certified date of successful completion of three months trial run, the bidder shall have to give guarantee for smooth running of the plant. During guarantee period if any component or components of mechanical equipment, or electrical, or electronic instruments and or measuring equipments or valves or pipes or specials etc. gets out of order or found to be malfunctioning the same shall have to be replaced by the bidder at his cost and for the replaced article, the guarantee period shall be twelve months from the date of re-commissioning.

SCOPE OF WORK

The scope of work will be in general but not limited to Design & Detailed Engineering, Procurement, Civil, Mechanical, Electrical, Instrumentation, and Interconnecting Pipe works including erection, testing, trial runs, commissioning, guaranteeing and operation and maintenance (including major and minor spares) of plant as per detailed technical specifications and data sheet. The scope also includes geotechnical survey of plot to derive soil bearing capacity, strata classification and detail study of water table etc.

The scope shall also include internal roads, storm water drains, development of lawns, landscaping, and plantation along the periphery of the proposed site for construction of TTP including maintenance of all during entire O&M period.

Complete construction of plant with allied works including operation and maintenance after successful completion of trial run, commissioning and acceptance of the system by JOC shall be in the scope of the bidder. Only secondary treated sewage and electricity shall be supplied free of cost by KMC during trial run and O&M period and rest all expenses including chemicals, consumables, spares, manpower, etc. shall be borne by the successful bidder.

Wherever reference is made of the employers design, drawings, or concept, it may be understood that these are concepts of the employer and the responsibility for correctness of designs, drawings and safety of equipment/structure shall rest on the bidder. Bidders are advised to inspect the site for further clarifications and to understand the scope of work. It is the bidder's responsibility to carry out all the works required to complete the scheme under this project whether it has been mentioned or not.

The bidder shall consider in his offer, TTP of 20 MLD and other works as specified in scope of work. The scope of the work shall include but not be limited to the following:

- 1) Design, supply, construction, erection, testing and commissioning UF RO based TTP of 20 MLD average flow.
- 2) Topographical and Geotechnical Survey including Subsoil Investigation for Water Table and Safe Allowable Bearing Capacity for TTP Site & highest flood levels of the Nalas and Hasdeo River. All the Investigation shall be carried out by the Bidder through a reputed and specialist firm approved by Engineer in charge for confirmation of Geotechnical data.
- 3) Site Development including but not be limited to the following works:
 - a. Cutting of unwanted Tress, Plants, Bushes and Shrubs etc. and removing the same from Site. **However, necessary approval for the same shall be arranged by the KMC.**
 - b. Demolishing the existing Structures if any and removing the debris from Site.
 - c. Shifting of Pipe Lines, Cables and Poles etc. if required.
 - d. Construction of approach road from the existing BT road up to the site of construction.
 - e. Site filling by means of suitable earth, if required, as per site condition. Finished ground Level shall be above HFL.
 - f. Levelling and grading to improve the aesthetics and to facilitate the vehicular movement.
 - g. Construction of Site Offices (One for KMC's Staff and one for Bidder's Staff) with required Furniture, Air-conditioners, Personal Computers and Printers, Wi Fi/ Internet facility etc. **Site office with all the amenities as mentioned shall be provided by the bidder till the completion of DLP. During O&M the office arrangement for KMC/NTPC officials shall be made in the AC monitoring room**
 - h. Arranging Construction Power & Water.
 - i. Pilling work/Area improvement work including stone columns if any.
 - j. Construction of temporary Labour Shelters nearby Site.
 - k. Preparation of Process, Hydraulic, Civil, Mechanical, Piping, Electrical and Instrumentation Design and Drawings including Construction, Architectural and As-built Drawings.
 - l. Construction of Civil Engineering Works for all the Process Units, Buildings, Roads & Pathways, Plant Drains, Storm Water Drains, Boundary walls along periphery of plot etc. as detailed in Civil Specifications. Layout shall be made in such a way that all Process Units and Buildings are interconnected and can be accessed from one Point.

- m. Providing Plinth Protection with DPC and termite proofing along the periphery of all the Process Units & Buildings shall be provided as detailed in Civil Specifications.
 - n. Providing Internal and External Plaster to Buildings as detailed in Civil Specifications.
 - o. Providing Internal Black Anti Corrosive Bitumastic Paint and External synthetic emulsion paint to all Process Units.
 - p. Providing Internal Acrylic Washable Emulsion Paint and External Acrylic Smooth Exterior Paint to all Buildings.
 - q. Providing Rolling Shutters, C-PVC Doors, Windows and Ventilators in all Buildings.
 - r. Providing External Epoxy Paint to all Steels Works made of MS or GI.
 - s. Providing GI Hand Railing along all the Stairs and Walkways of all Process Units
 - t. Providing Coloured GI Sheet Roofing over all the Stairs and Walkways of all Process Units.
- 4) Supply, Erection, Testing & Commissioning of all the Mechanical Equipment as detailed in Mechanical Specifications.
 - 5) Obtaining incoming HT Power Supply from State Electricity Authority from nearby Source to the TTP Site **compound wall / entrance gate**. However, necessary Deposits and Documents shall be arranged by the KMC.
 - 6) Supply, erection, testing & commissioning of all the Piping, Gates & Valves as detailed in Mechanical Specifications.
 - 7) Supply, Erection, Testing & Commissioning of all the Electrical Equipment including HT and LT Equipment as detailed in Electrical Specifications.
 - 8) Supply, Erection, Testing & Commissioning of all the Instrumentation Equipment as detailed in Electrical & Instrumentation Specifications.
 - 9) PLC/ SCADA based Automation System for the entire Plant as detailed in Specifications.
 - 10) Supply, Erection, Testing & Commissioning of Safety Equipment at required locations including Safety Showers, Sand Buckets, Fire Extinguishers, Fire Alarms, smoke detectors etc.
 - 11) Providing Laboratory with required Laboratory Equipment, Instruments, Chemicals & Reagents and Furniture.
 - 12) Landscaping and lawn covering the front area of building. Planting of Trees and Plants on the remaining area including area for future expansion.
 - 13) Trial Run of the constructed & hydraulically tested Plant along for a period of three (3) months and Operation & Maintenance (O&M) of TTP for 15 years after Trial Run as per Tender specifications.
 - 14) Supply of all Spares, Tools & Tackles required during Performance Run and O & M Period.
 - 15) Repairing & reconditioning of all the Equipment in the concluding year of the Operation & Maintenance Period to such a condition that they are in running condition with regular preventive and recommended maintenance.

- 16) Providing “on the job” training to the KMC’s personnel.
- 17) Defects Liability Period of 12 months from the date of successful completion of capital works including trial run.
- 18) Preparation and submission of As-Built Drawings and Operation & Maintenance Manuals for Mechanical, Electrical & Instrumentation Items.
- 19) Providing demonstrations to the guests and students within the O&M period and displaying of models and actual working of TTP.
- 20) Preparation of working 3D model of TTP with proper display at TTP.
- 21) Preparing and display of video film with drone photography from starting to end of the execution period with professional commentary with photography during construction as per the instructions of engineer in charge.
- 22) Aesthetic treatment such as Aluminium cladding to the external faces of admin building of TTP.
- 23) Analyser unit at TTP with Digital Display of Treated water and RO reject Tank for the parameters such as BOD, COD, TSS, Conductivity, TDS, TS & pH with additional LED digital display board of appropriate size at the front side of TTP Entrance. An online continuous effluent monitoring system shall be considered at RO Reject tank outlet and RO permeate tank.
- 24) Rain water Harvesting of All the Buildings.
- 25) All interconnecting pipes, channels, valves, fixtures, appurtenances.
- 26) Supply, erection, testing, commissioning of various mechanical, piping, electrical
- 27) Any other item not indicated above but necessary, essential or incidental to the completion of the above works and making them operational / All other accessories, whether specified or not, but required for complete shall form part of bidders scope.
- 28) Preparation of plant layout; process design/unit sizing calculations; hydraulic calculations and flow diagram including pump head calculations; P&I Diagram; civil, mechanical, piping, electrical & instrumentation design, drawings, data sheets, sizing calculations, etc. as applicable including architectural drawings for construction after review and approval and as built drawings.
- 29) Obtaining statutory approvals for the entire TTP facility including Chhattisgarh Environment Conservation Board (CECB) clearance (NOC and Consent to establish (CTE) and Consent to Operate (CTO)), electrical inspector, chlorine tonner storage & filling, etc. Only the applicable statutory fees shall be borne by KMC.
- 30) Operation and maintenance of all components of project for the defined period of operation and maintenance after successful trial run for defined period and commissioning.
- 31) Providing inspection and testing of all equipments and materials required for execution of the work at his own cost.

Any other Items which have not been specifically mentioned in specifications but are necessary for construction of the Plant as per good engineering practice, safety norms and successful operation and guaranteed performance of the entire Plant shall be deemed to be included within Scope of Work and shall be provided by the Bidder without any extra cost to the KMC. Bidder shall consider all the technical specifications

for reference purpose only. Bidder need to ascertain and finalize design post detail Engineering as per the quality and quantity required at the Product outlet of TTP

The Bidders are to adopt the same nomenclature used for various treatment units in their design report as used in the Tender documents. Bidder is required to fill up/complete the technical schedules presented in Technical Bid as a part of Tender submission. Any Bid without filled in the technical schedules shall be considered as non-responsive and will be summarily rejected.

The above works shall be completed within 24 months (including Monsoons) from the commencement date including by 3 months of Trial & Run and Operation & Maintenance (O&M) for 15 years.

3. Performance Guarantee

5.1 Ultrafiltration (UF) System

- a. Net permeate flow rate from each UF train shall be guaranteed for design capacity meeting the effluent quality as mentioned below.
- b. SDI for any 24-hour shall be limited to 3. It is understood and agreed that dissolved contaminants / organics in dissolved form that contribute to SDI readings will not be rejected by this Membrane solution & Filtrate SDI will be measured at the nearest filtrate outlet point in the system to avoid contamination.
- c. Life of Ultrafiltration membranes shall have warranty to cover the total membrane life of minimum 15 years. **It is responsibility of bidder to run the entire plant for 15 years including all the guarantees ,warranties and replacements for successful performance of the entire plant.** ~~The first 5 years of Warranty must be cliff (full replacement warranty/ no cost warranty) while the remaining 10 years shall be pro-rated replacement warranty.~~
- d. For the guaranteed water quality and the permeate water capacity, UF plant shall give an undiminished recovery of **90%** up to the end of 15 years of operation with replacement guarantee of membrane elements.
- e. Process recovery: The UF system shall achieve a minimum product recovery of **90%** percent (minimum) on a daily average basis (even under worst case scenario as defined by the feed water analysis). Product recovery is defined as net filtrate produced over a 24-hour period divided by the raw water fed to the process over the same time 24-hour period. The Contractor shall provide calculations that show an individual UF stream, can achieve a minimum recovery of **90%** based on the duty membrane loading rate, the minimum expected backwash interval and the maximum volume of water discharged during the backwash cycle.

- f. Bidder shall provide required NSF/ANSI or equivalent certifications for UF membrane to assure better performance of UF in order to achieve better RO performance.

5.2 Reverse Osmosis (RO) Plant

- a. Net permeate flow rate from each RO train shall be guaranteed for design capacity meeting the effluent quality as mentioned below.
- b. TDS of RO permeate shall not be more than 100 ppm at ambient 40 deg C.
- c. For the design water quality and the permeate water capacity, RO plant shall give an undiminished recovery of 80% up to the end of 3 years of operation with replacement guarantee of membrane elements.
- d. Performance of Cleaning, Flushing System arrangement shall be demonstrated.
- e. Life of RO membranes shall be guaranteed for minimum three (3) years subject to no variation in feed water.
- f. For power guarantee purpose, RO High Pressure Pumps shall be designed at 20 deg C.

5.3 Pumps

- a. Capacity, head, and power consumption of all the pumps at the rated duty point (to be demonstrated and proved at shop with the respective job motors) and to operate in accordance with the approved pump characteristic curves. During the shop test no negative tolerance in the guaranteed capacity, head and efficiency of the pump shall be allowed. The test shall be witnessed by JOC. Test certificate for Duty condition shall be provided.
- b. Current, Voltage, Motor input Power, Frequency, Speed, Bearing/ Motor winding Temperature, Vibration and noise level of pumps and drives and parallel operation (as applicable) without hunting & abnormal noise and with load sharing within 10% of each other at the rated duty point of pumps shall be demonstrated at site as a part of Performance & Guarantee test.

5.4 Membrane integrity test (MIT)

- a. The UF system will incorporate an MIT system. The membrane integrity test system will be based on some variation of the bubble point pressure concept. The membrane integrity test shall be automatically initiated based on a pre-set time interval.
- b. The UF system shall allow the membrane integrity test to detect leaks in individual membrane modules (physically).
- c. Results from the membrane integrity test shall be displayed on the SCADA in the form of pressure decay as a function of time. The results of the membrane integrity test shall be directly comparable to the results of the factory testing of the membrane modules.

5.5 UF Membrane

- a. The maximum design flux for the UF system shall be the flux rate required to support an average daily rated Plant product water capacity of required 27.17 MLD of treated water achieved over any continuous 24-hour period with one UF train in standby/Cleaning mode. This capacity of required 27.17 MLD shall be the gross output without the consideration of all Plant downtime for backwashing / cleaning in-place (CIP), chemically enhanced backwashing (CEB), membrane integrity test/replacement etc., which are required for effective and efficient operation of the Plant.
- b. **For PVDF membranes:** Instantaneous design flux values used in the system shall be based on previous experience on similar waters. The design avg flux (Corrected at 25 °C) shall be minimum 25 LMH when all (N) trains are in operation, however in order to achieve continuous output, when one train is under backwash CEB/CIP, the design instantaneous flux shall not be more than 35 LMH, i.e. when (N-1) trains are in operation. The Contractor shall provide evidence to justify the flux values proposed for the design, i.e. design calculation/projection provided by the membrane supplier.
- c. **For Ceramic membranes:** Instantaneous design flux values used in the system shall be based on previous experience on similar waters. The design avg flux (Corrected at 25 °C) must not exceed 80 LMH when all (N) trains are in operation, however in order to achieve continuous output, when one train is under backwash CEB/CIP, the design instantaneous flux shall not be more than 150 LMH, i.e. when (N-1) trains are in operation. The Contractor shall provide evidence to justify the flux values proposed for the design, i.e. design calculation/projection provided by the membrane supplier

Note: The bidder must ensure the average feed flow into the UF system remains constant even in the instance of streams going out of service for cleaning, i.e. for a plant with N number of streams the plant must continuously deliver the same output even in N-1 condition.

Annexure E – I

Providing, supplying, erecting and commissioning 20 MLD UF RO based Tertiary treatment plant at Korba with PEB structure, all allied tanks and equipment

The major works proposed to carry out for 20 MLD capacity TTP comprise of the following as minimum requirement. The list presented below is indicative only, however the necessary addition in the proposed scheme shall have to be carried out by bidder at his own cost so that the complete TTP shall run to deliver total from TTP of 20 MLD. The work shall be carried out as defined under this tender.

The main components of the project for Tertiary treated water Supply System for NTPC Korba Thermal Power Plant are as under:

Table 5: List of components

	Type	MOC	Quantity	Flow
UF feed sump	Underground	RCC M-30	1	Min. 4000 m3
UF Feed pump	Submersible/ Vertical turbine	SS316	As per design, with 100% standby	As per design
UF system with UPVC piping	Out to in Alumina flat plate	Noryl with fiberglass reinforcement / SS316 (Skid)	As per design with 1 train standby	As per design
UF FEED STRAINERS	Punched hole (1 mm) type rotating drum, Automatic	SS 316	As per design, with 50% standby	As per design
UF Backwash Pump with VFD	Horizontal Centrifugal	SS 316	As per design, with 50% standby	As per design
Dosing System for UF	Motorised diaphragm dosing pump	10000 litre each LDPE	separate sets for HCl, Caustic and Hypochlorite CEB	As per design
UF CIP PUMPS	Submersible	FRP / GRP	As per design, with 100% standby	Min. 10 m3
Feed piping	450 mm NB	SS 304/ UPVC/CPVC	1 lot	Capable of handling feed flow + 20% at velocity less than 2.5 m/s

UF Permeate tank		RCC	1 No.	Min. 1000 m3
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RO System				
Feed pump		SS / As per Design with VFD	As per design with 50% standby	As per design
RO Micron Cartridge Filter	5 µm, Double open-end cartridge	SS 316	As per design	As per design
Dosing System for RO	Electronic diaphragm dosing pump	1000 Liters LDPE 1 tank	As per design	As per design
High pressure pump for RO	Vertical Multi Stage Centrifugal VFD	SS 304	As per design with 100% standby	Min. 150 m3/hr at 100 mwc
RO Module		High pressure pipes in SS 304		Min. 150-180 m3/hr per train
RO Permeate		RCC	1 No.	Min.1000 m3
UF Backwash tank		RCC with acid-proof tile lining	1 No.	Min. 50 m3
UF and RO reject water sump		Underground RCC M-30		
CIP Tank	Cleaning chemicals required for cleaning of RO Membranes	MSEP or LDPE	1 No.	As per design
CIP Pump	Horizontal split casing / Centrifugal	SS 316	As per design, with 100% standby	As per design with 100% standby
Pressure tube	Multi-element vessels (6 elements per vessel) arranged in stages parallel and series to achieve desired recovery and flow. Side port, multiport orientation and	Fiberglass-reinforced plastic (FRP) or stainless steel (SS316) for corrosion resistance.	As per Design	As per Design

	multi size configuration type for easy membrane replacement.			
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Tertiary Treatment Plant (TTP) Construction

Designing, construction, and commissioning of a Tertiary Treatment Plant (TTP) tailored to meet the specific water quality requirements of the NTPC Korba Thermal Power Plant for non-potable applications. The major components shall be Ultra filtration and Reverse osmosis with disinfection arrangement by Chlorine di-oxide. The layout of the system shall be done considering all the pumps, tanks holding the racks of UF and RO systems above the slab of the storage tank with ease of operation.

Table 6: Details of TTP

Sr. No.	Particulars	Unit	Details
1.	Design Period	Years	25
2.	Actual Life	Years	30
3.	Capacity	MLD	20
4.	Location	-	Pragati Nagar NTPC Korba

i. Civil Components

- Incoming secondary treated water line
- PEB Shed for entire UF / RO system
- RCC UF feed tank
- RCC UF permeate cum RO feed tank
- RCC RO Permeate tank (as per annexure E2)
- Backwash / Reject Collection Tank
- Admin / control room with Laboratory
- Electrical Substation / Transformer yard (As per Annexure E4)
- HT Room (As per Annexure E4)
- All MCC room and transformer yard (As per Annexure E4)
- Reject disposal
- Foundations for all equipment / Tanks / Pump Houses

ii. Mechanical Components

- Ultra-filtration (UF) system comprising of membrane modules, backwashing system, Chemical enhanced backwash system (CEB), cleaning-in-place system (CIP), etc.
- Chemical dosing system (Coagulant, pH correction, etc.) for UF operation, if required.
- Strainers/ Filters in UF backwash line
- UF backwash-cum- Reverse Osmosis (RO) feed tank
- RO Feed pumps

- De-chlorination facility to RO Feed Water
 - RO System with membranes modules, cleaning and flushing system
 - Chemical dosing system for RO operation and cleaning.
 - Bidder shall provide suitable energy recovery devices in RO systems
- iii. **Interconnecting piping work**
- All piping, valves, flanges, fittings and hardware's including pipe support structures between various treatment units as per requirement.
- iv. **Electrical works (As per Annexure E4)**
- HT Room
 - HT panel
 - HT panel (1 I/c + 2 O/g)
 - Transformers with 100% standby capacity
 - MCC panels
 - APFC panel (Power Factor >0.98)
 - HT & LT Cable
 - Indoor and Outdoor lighting
 - Change over system to proposed TTP
 - Earthing systems
 - Push buttons
 - Plant and room lighting
 - Cable trays and tray supports, related civil work including cable trench etc.
- v. **Instrumentation works**
- As per process requirement for proposed TTP including PLC control system and related civil work.
 - Tools and Devices - The Contractor shall supply any special tools required for assembly/ disassembly of membrane Module for repair/ replacement after an integrity check identifies a membrane failure.

1. ULTRA FILTRATION (UF) SYSTEM PROCESS

The ultra-filtration stage is to condition the combined treated wastewater so that the reverse osmosis plant will operate with as little downtime for CIP as possible. Expected water quality from the STP is to be of low turbidity; however, the fouling nature of this on reverse osmosis membranes is still high, and so the ultra-filtration is required to lower the colloidal fouling potential to acceptable levels. In practice, this is measured using the SDI15 fouling index measurement technique. The feed water to the RO will be designed to have an SDI lower than 3 following the ultra-filtration.

The fifteen-minute Silt Density Index (SDI15) of the filtrate shall not exceed 3.0 during 95 percent of the time and shall never exceed 4.0.

To achieve the above objectives the pre-treatment plant scope of works includes:

- Chlorination (Provision for chlorination upstream filtration shall be provided to oxidise feed sufficiently before filtration.)

- Manual strainer
- Coagulation
- Ultra-filtration
- Filtered water storage.
- UF backwash pumps
- UF CEB system
- UF CIP system

a. **Manual Strainer:**

The Filtering process, raw water enters the filter inlet through the coarse screen which protects the cleaning mechanism from large debris. The water passes through the fine screen, trapping dirt particles that accumulate inside the filter. Clean water flows through the filter outlet.

The gradual dirt buildup on the inner screen surface causes a filter cake to develop, with a corresponding increase in the pressure differential across the screen. A pressure differential switch senses the pressure differential and when it reaches a pre-set value, the cleaning process begins. The Strainer shall be auto-cleaning wedge wire type and shall have a maximum rating 1 mm automatic screen typically rotary screen with punched holes shall be provided

b. **Coagulation:**

This step is provided to form flocks of suspended and colloidal impurities so that the same can be trapped on the membrane surface and form a firm layer, which will further reduce the fouling of the membranes due to penetration of micro impurities in the membrane pores.

c. **Ultra-Filtration:**

Ultra-filtration shall be provided to filter the screened, coagulated clarified water. This will remove many of the colloidal particles remaining in solution and produce filtered water with low SDI and turbidity. The primary purpose of the UF system is to remove sub-micron particles, including bacteria, large colloids, and other suspended solids from the treated effluent to improve the performance of the downstream RO process by reducing fouling and minimizing the chemical cleaning requirements. The secondary purpose of the UF System is to serve as one of the “multiple barriers” to the microorganisms.

Space shall also be provided in the layout for installing one additional skid at a later date, if required.

d. **Guaranteed Performance Requirements:**

The filtrate turbidity for any 24-hour period shall not exceed 0.5 NTU.

The fifteen-minute Silt Density Index (SDI 15) of the filtrate shall not exceed 3.0 during 90 percent of the time and shall never exceed 4.0.

e. **Flushing**

The UF system shall be configured such that individual trains can be flushed or

backwashed with UF permeate water during periods of extended reduced flow or standby.

f. **Spare Capacity**

The sufficient space shall also be provided for the possible future addition of one (1) complete UF system

g. **UF Backwash Water Storage:**

Water from this UF permeate tank shall be used as Feed water to the RO trains. Some of the water is used to backwash the Ultra Filtration trains to maintain the operating flow/flux of the membranes.

h. **UF CEB/ CIP system**

A CEB and CIP system is provided for the Ultra-Filtration plant. This can be used to undertake maintenance, or recovery cleans of the UF membranes to maintain plant performance.

In order to feed the Reverse Osmosis system with desired and consistent quality of water Ultra-Filtration is selected as pre-treatment.

i. **UF SYSTEM OPERATION**

The UF system consists of the following modes of operation:

j. **Service Cycle:**

The UF membrane system will operate on an out-to-in mode where the feed stream flows on the outside of the membrane with the filtrate flowing through the inside. The Membrane system operates on a dead-end configuration with intermittent membrane tank drain cycles. The system shall be designed on a constant flow condition which means in case of down time of 1-2 membrane tanks the UF system shall be capable of providing the constant design flow to RO system.

k. **UF Backwash (BW) Cycle:**

With the accumulation of solids during filtration, the resistance to flow will increase, which can be overcome by subjecting the membrane to a reverse flow, with the product water. Air-scouring is also introduced concurrently to improve the effectiveness of the Backwashing. This backwashing operation shall be carried out periodically, which can be predetermined by either total flow, TMP or elapsed time. The overall system will be controlled such that only one train will undergo backwashing at any one time. The backwash stream is discharged to the waste sump.

l. **Maintenance Cleaning (MC) or CEB:**

To maintain optimum filtration efficiency, periodic chemical cleaning of the membranes is required. MC/ CEB is an automated sequence meant for short-term regaining of permeability, which is a short-duration cleaning with chlorine and citric acid as per a pre-set schedule with minimum stoppage of the system. The frequency of maintenance cleaning is dependent on the raw water quality and its

variation. The expected frequency of this short-term cleaning is 4-8 hours.

m. Recovery cleaning (RC) or CIP:

An extensive cleaning procedure requires a longer stoppage on a process train for permanent regaining of the membrane permeability and performance. The membranes are subjected to a regime of soak and flush cycle which will remove the foulants or contaminants that cannot be removed by backwashing alone. Similar to MC/CEB, the frequency of RC/CIP is dependent on the feed water quality and its variation; the expected frequency of this long-term cleaning is once in 30-60 days.

n. UF CIP SYSTEM

A dedicated cleaning in place system will be provided for the Ultrafiltration system, which consists of chemical preparation tanks, CIP pump & its necessary accessories.

o. ACID, SMBS AND ANTISCALANT DOSING SYSTEM

The UF product water is then dosed with acid (if required) for bringing down the pH is aimed to reducing the LSI as per the membrane manufacturer's recommendation, which will enhance the life of membranes and in case any chlorine passes though, the Oxidation Reduction Potential (ORP) meter senses the free chlorine and trips the RO High pressure Pump. This automation is to ensure that the chlorine water will not enter the RO Plant as the chlorine will hydrolyse the RO Membranes. Further to ensure that the RO membranes are protected from any accidental exposure to Chlorine (free), SMBS dosing shall be provided at the RO inlet. This SMBS dosing shall be mandatory. **Premium grade antiscalent which can handle silica upto 250 ppm in reject with good LSI tolerance shall be provided**

The RO feed water has high scaling potential especially due to Silica, CaCO₃, CaSO₄ and CaF₂, which are harmful to membranes and hence an on-line anti-scalant dosing is provided for controlling the scaling and fouling tendency of the feed water. The Sodium hypo chlorite reacts with the ammonia present the water produces the chloramines. Chloramine can further react with sodium hypochlorite and gives sodium hydroxide and dichloramine which minimize/prevent bio fouling in reverse osmosis system.

1.1 UF FEED TANK (As per annexure E2)

1.1.1 Provision of UF and RO reject water sump (i.e. underground RCC M-30 tank) of required capacity for collecting UF / RO reject water and then transmitting it to river with necessary electrical / mechanical instruments, inter connecting pipe and **all the structures shall be Underground**

1.1.2 Approach shall be provided with RCC - M-30 staircase having 1.5 mt width with 1.00 M high **GI** Railing approved by Engineer In Charge.

1.1.3 Outside 20 mm thick double coat sand faced plaster in two coats and inside acid resistant tiling shall be provided as per tender specifications. At bottom 40 mm thick water proof IPS shall be **provided**.

1.2 UF FEED PUMP

	Type	MOC	Quantity	Flow
UF Feed pump	Submersible/ Vertical turbine	SS316	As per design, 1 Working + 1 standby	As per design

1.2.1 Scope

This specification covers the design, materials of construction, features, performance and testing of vertical multistage centrifugal pump. Pump shall be suitable for the purpose they are intended.

1.2.2 Codes and Standards

The design, material, construction, manufacture, inspection, testing and performance of vertical multistage pumps shall comply with all currently applicable statutes, regulations and safety codes in the locality where the Equipment will be installed. The Equipment supplied complies with the latest applicable Standards. The work in this section is subject to the requirements of applicable portions of the following standards:

EN 809 Pumps and pump units for liquids – Common safety requirements

ISO 9906 Roto-dynamic pumps - Hydraulic performance acceptance tests- Grade1, 2 & 3
ISO 10816

Mechanical vibration - Evaluation of machine vibration by measurements on nonrotating parts

EN 1092-2 Flanges standard used for cast iron pump flanges dimensions.

1.2.3 General

The pumps shall be vertical multistage, in-line design which enables installation in a horizontal one-pipe system where the suction and discharge ports are in the same horizontal level and have the same pipe dimensions. This design provides a more compact pump design and pipework. The pump, electric motor, coupling and coupling guard shall be factory assembled at the pump manufacturer's facility. Installation instructions shall be included with pump at time of shipment. The pump manufacturer shall have complete unit responsibility.

1.2.4 Features of Construction

Pump Base / Housing

Pump Base shall be a robust construction with integrally-cast support in order to transmit pipe load to the foundation. Liquid passages in the casing shall be smooth finish to ensure high Efficiency. Pump base shall be EN-JL1030 or EN-JS1050 grade Cast Iron according to BS EN 1561: 1997 and capable of withstanding to the maximum pressure developed by the pump. Flange dimensions are in accordance with EN 1092-2. Pump base shall have tapped hole provision for draining.

Impeller

The impeller shall be AISI 304 stainless steel enclosed type with smooth surface finishes for minimum frictional loss. This ensures high Efficiency. Impeller shall be fixed to the shaft by means of a split cone and a split cone nut/union nut. The direction of rotation of the impeller is counter clockwise when viewed from the motor.

Shaft

Shaft shall be AISI 316 or AISI 431 stainless steel with splined design, and shall be adequately sized to withstand all stresses, hydraulic loads, vibrations and torques coming in during operation. Shaft shall be provided with Mechanical seal as default fitment to provide leak free operation.

Mechanical Seals

The liquid cavity shall be sealed off at the pump shaft by an internally-flushed mechanical seal with Silicon carbide seat and Silicon carbide seal ring, suitable for continuous operation at 120 Deg C. The mechanical shaft seal shall be cartridge type for maintenance free operation and balanced which is suitable for pressure up to 30 Bar.

Bearing Rings

The bearing rings shall be in silicon carbide.

Pump Sleeve

The pump sleeve shall be AISI 304 or AISI 316 stainless steel and fitted between the pump head and the base and kept in place by means of stay bolts. The gaps between the sleeve and the base/pump head are sealed by means of O-rings.

Pump Head & Motor stool

Pump base shall be EN-JL1030 or EN-JS1050 Cast Iron according to BS EN 1561: 1997. Pump head, pump head cover and flange for motor mounting shall be made in one piece. Pump head shall have a tapped hole provision for priming and air vent.

Coupling

Pumps shall be provided with rigid coupling which consist of two halves and capable of absorbing torsional vibration, shall be employed between the pump and motor. Coupling guard shall be bolted to the pump head/motor stool.

Motors

Motor shall be a vertical, face / flange mounted, totally enclosed fan-cooled, standard squirrel cage induction motors with main dimensions according to IEC standards. Electrical tolerances are to IEC 60034. Motor shall be energy efficient type. Motor shall be to with IP 55 enclosure. The class of insulation shall be F with temperature rise limited to Class B.

Motor shall be suitable for operation on a 415 V ($\pm 10\%$ variation), 50Hz $\pm 5\%$, 3phase AC supply. Motor shall be suitable for both DOL and / or STAR/DELTA starting. **DOL starters are to be considered for motors rating upto 11kW, Star/Delta starters for motors rating above 11kW, Soft Starters for motor 55kW and above. VFD starters shall have to be considered for all pump motors above 22kW.** Pump and motor shall be factory aligned, and shall be realigned by the contractor as per factory recommendations after installation.

Name plates

Each pump shall be provided with a name plate indicating the following details:

1. Pump type designation

2. Pump Model
3. Rated flow
4. Rated head
5. Rated speed
6. Power P2
7. Pressure rating/max temperature
8. Serial Number
9. MEI (Minimum Efficiency Index)

Working pressure

Maximum allowable working pressure (MAWP) for all the pressure containing parts shall in no case be less than the maximum discharge pressure produced by the pump at shut off (including tolerances), at the max suction pressure, for the maximum impeller diameter and the maximum continuous speed.

Vibration

The pump(s) vibration limits shall conform to ISO 2372 (10816) for recommend acceptable vibration limits for pump.

Painting

The equipment shall be thoroughly cleaned and greased. All rust sharp edges and scales shall be removed. All external and exposed cast iron parts of pumps have an epoxy-based coating made in a cathodic electro deposition (CED) process which is high-quality dip-painting process and which would prevent rusting and corrosion. The colour code for the finished product is NCS 9000/RAL 9005. The coupling and shaft shall not be painted.

1.2.5 Pump & Motor Selection

The pump(s) selection shall be in Preferred Operating Region (POR) unless otherwise approved by the engineer. The pumps shall be factory manufactured, assembled and hydrostatically tested as per Hydraulic Institute standards in an ISO 9001 approved facility. Motor should be selected as non-over-loading type.

1.2.6 Inspection & Testing of Various Items:

Before effective delivery of the equipment, following inspections and tests as per ISO 9906 standards shall be carried out.

For Pumps:

1. Hydrostatic Testing
2. Performance Test (Single point / Duty point)

1.2.7 Drawings

The following drawings shall be submitted by the Contractor / Vendor along with their Bids.

1. Preliminary outline dimensional drawing of pump and motor (Suction and discharge connections and foundation details shall also be indicated).

2. Performance curves (capacity Vs total head, efficiency, NPSH and KW requirement) ranging from zero to maximum capacity.
3. Technical Data sheet for Pumps

1.3 ADVANCED ULTRAFILTRATION MEMBRANE WITH COMPLETE PERMEATE, BACKWASH, CEB AND CIP SYSTEM

The primary purpose of the Advanced Ultrafiltration System is to remove sub-micron particles including suspended solids, bacteria, and large colloids from secondary treated wastewater sufficiently, to serve as conditioned feed for the downstream process i.e. reverse osmosis system.

Required features of ultra filtration system:

	Type	MOC	Quantity	Flow
UF system with UPVC piping	Out to in Alumina flat plate	Noryl with fiberglass reinforcement / SS316 (Skid)	As per design with 1 train standby	As per design
UF FEED STRAINERS	Punched hole (1 mm) type rotating drum, Automatic	SS 316	As per design, with 50% standby	As per design
UF Backwash Pump with VFD	Horizontal Centrifugal	SS 316	As per design, with 50% standby	As per design
Dosing System for UF	Motorised diaphragm dosing pump	10000 litre each LDPE	separate sets for HCl, Caustic and Hypochlorite CEB	As per design
UF CIP PUMPS	-	FRP / GRP	As per design, with 100% standby	Min. 10 m3
Feed piping	450 mm NB	SS 304/ UPVC/CPVC	1 lot	Capable of handling feed flow + 20% at velocity less than 2.5 m/s

- The UF treated water is stored in a UF Permeate storage tank to provide hold up and store water required during UF back wash and chemical enhanced backwash steps.
- Membranes trains of Min. **180 m3/h each shall be provided** and filtered water to be collected in **1000 m3 tank** adjacent to primary collection tank. **The bidder must ensure the average feed flow into the UF system remains constant even in the instance of streams going out of service for cleaning, i.e. for a plant with N number of streams the plant must continuously deliver the same output even in N-1 condition.**

- Back wash effluent of membrane modules shall be collected, treated and disposed safely with RO reject. All arrangements for equalisation tank and Submersible pumps shall pump water to membrane based tanks cleaning membranes (CIP) and chlorine dosing (ClO_2) is proposed for cleaning membranes and disinfecting treated water. Bidder should provide membranes with high hydrophilicities to remove of hydrophobic water contents, like oil. High flux operation at very low pressure should be given in modules.
- The integrated sprinkler system to spray water jet to enhance the removal of cake layers during on air backwash. At lower flow rates, the sprinkler shall be used for an efficient chemical cleaning by spraying concentrated chemicals over the flat sheet membrane surface (on-air cleaning). Due to the capillary force of the membrane pores, the chemicals suck into the membrane (Cap Clean mode).
- Pre-conditioning of feed, which may involve dosing of Acid/Alkali for pH correction (if required), coagulants such as PACl, FeCl_3 & dosing of oxidants such as NaOCl. Adequate tanks & chemical dosing pumps shall be provided for this purpose owing to operational reliability.
- Efficient and complete mixing of chemicals using some form of flash mixer before the conditioned feed enters the reaction Chamber.
- Homogenization & provision of sufficient residence time (approximately 60 minutes) for the reaction & formation of micro-flocs in the reaction Chamber which ideally is a tank and baffle arrangement.
- Pre-screening by drum/equivalent screen to trap particles above 3mm to protect the membranes.
- The material of construction of such a screen shall be SS316/equivalent to avoid corrosion. The screen should allow easy access for cleaning and maintenance on a predefined interval. Screens with automatic cleaning capability shall be preferred.
- The Ultra Filtration (UF) system shall preferably be submerged in tanks (for ease of installation).
- UF shall be modular and expandable comprising of single filtration Modules composed of a glass fiber reinforced resin housing/tough non-metallic equivalent material, to provide mechanical strength, chemical and temperature resistance. The entire housing, as well as all accessories, must be free of any metals for corrosion free operation and therefore usable in harshest applications while achieving a longer life which can be supported by the appropriate extended product warranty.
- No surrounding frames or hose connections between individual modules to ensure smooth connection and easy maintenance.
- The complete UF system must be split into 04 independent streams with each stream comprising several trains to provide 3 (4-1) functionalities. The bidder must ensure the average feed flow into the UF system remains constant even in the instance of streams going out of service for cleaning, i.e. for a plant with N number of streams the plant must continuously deliver the same output even in N-1 condition. Each stream must be equipped with a dedicated backwashing, chemical cleaning & aeration system.
- Backwash & chemical dosing pumps must have a minimum of 100% standby pumps installed (1 duty, 1 standby).
- A common standby (50%) must be provided for Filtration for each stream, either hot standby or store standby. UF system shall be designed with one train standby (N-1)
- Main Chemical preparation & transfer tanks can be common for all streams for safety and ease of preparation.

- The system must be designed to ensure constant filtrate production flow, and each train must be controlled by a flow transmitter and flow control valve, pressure transmitter and pressure control valve to ensure that pressure does not breach the specified trans membrane pressure (TMP) limit by the manufacturer and the system does not operate at higher fluxes than what are warranted.
- The UF system must be designed to achieve Filtrate with Turbidity <0.5 NTU, TSS <5 , SDI <3 .
- The UF system must be designed at a flux as mentioned for Ceramic and PVDF membranes. The system must be designed to ensure that when one train/skid is in backwash or chemically enhanced backwash (CEB) and another train is out of service for CIP or mechanical maintenance (not exceeding 24 hours on continuous basis), the required filtrate flow is generated without exceeding the specified maximum design flux value.
- The offered system must have been in operation for wastewater tertiary application plants of the same scale or size in India primarily or in other locations.

1.3.1 Minimum design criteria for UF System

- Preconditioning
- Pre-screening
- Submerged in Tank Configuration for tackling high TSS, Turbidity & organics
- The Filtration Module shall be equipped with membranes with exchangeable nature.
- Pore size of the Membrane must be $< 0.1 \mu\text{m}$ (Nominal) to always ensure Turbidity of filtered water of <0.5 NTU, SDI <3 (100% time), SDI 3.5 (95% of time).
- Modules must be capable of
 - being backwashed using filtered water at 1.2 kg/cm² maximum backwash pressure.
 - being cleaned using sprinkling/chemical enhanced backwash or spray of chemical (Acid/ Alkali/ Oxidant) solution onto them to ensure effective, easy and quick cleaning with minimum requirement of chemicals and downtime.
 - Air Scouring (using an adequate arrangement specified by manufacturer) during backwash/ CEB/ CIP.
- Each module should be
 - around 40kgs (Max dry weight) for ease of handling.
 - have active filtration area of between 5 to 7m²/ module.
 - Have a temperature tolerance of Max 40 Deg C
 - Each Module must be able to house between 30-40 plates with the gap between the plates not less than 5-8 mm for ease of operation, cleaning and easy cleaning or replace ability during maintenance.
- Modules/ Towers should contain an inbuilt lifting arrangement for ease of lifting them out of the tank easily using lifting devices, when necessary.
- Single plates must have active filter/membrane layer on the outside with double-sided end caps for high flux operation.

- The double-sided end caps must further have provision to mount double O-rings (EPDM/Equivalent) for total leak proof operation, and they must be self-degassing (filtered water outlet at top of end cap).
- The material of construction for the UF membrane shall be Alumina (Al_2O_3), Zirconia (ZrO_2) or titanium dioxide-Ceramic **membrane or PVDF membrane** while the end cap material shall be glass fiber reinforced PPS /Equivalent material to allow for expansions and movements in plates during operation & cleaning.
- The material shall always allow operation between pH of 2-10 range and cleaning between pH of 1 to 13
- Minimum recovery (at all instances) must be >90%
- Common backwash system for all trains in one stream
- Chemical sprinkling /dosing system shall be independent for each train/skid.
- Air Integrity testing facility shall form part of the supply scope.
- All fasteners, couplings and accessories used on / with the Modules shall be preferably non-metallic.
- All plant operations shall be Automatic, designed for simplicity of operation, and must be automatically controlled vide PLC/ DCS system
- It must be possible to tag each Module with an identifier digital tag to track the origin & date of manufacturer.

1.3.2 Scope of Supply

The scope of supply for the UF system shall consist of, but not be limited to, the following:

a. Feed Preconditioning Tanks & Dosing System:

- Chemical dosing tanks & pumps for pH correction (if required)
- Chemical dosing tanks & pumps for Coagulant ($\text{PACl}/\text{FeCl}_3$) dosing – System to be designed for a typical Al/Fe Concentration of around 5 ppm
- Chemical dosing tanks & pumps for Oxidant (NaOCl) dosing – System to be designed for a typical FRC Concentration of around 0.5 ppm
- Reaction tank with baffles (15-20 minutes retention time)
- Pre-screening (Drum/ equivalent)- SS316 material punch holed type to prevent particles over 2mm from passing to the membrane tanks.

b. UF Membranes:

The UF System shall use a membrane sheet made of microporous amorphous membrane structure, manufactured from either Alumina (Al_2O_3), Zirconia (ZrO_2), titanium dioxide – **Ceramic membrane or PVDF membrane**

c. Membrane Modules:

Multiple sheets shall be arranged either horizontally or vertically (as per manufacturer's standard) with a defined gap in between the plates to form one membrane element/ module. Surface area of each tower/cassette should follow 66-90 m² of membrane area per tower/cassette. Nomenclature adopted by the Manufacturer may be Element/Module/ Cassette.

d. System Configuration:

The UF system shall consist of multiple process units. Each process unit shall contain multiple flat sheet elements, which are housed in Modules/ cassettes and further stacked together in the form of Towers (with multiple modules/ cassettes). Multiple towers must be then connected through a common header to cater to the flow quantities/output required from each train and to ensure that such towers fit the existing sand filter basin and bed area in the existing plant, with minimum modifications/ dismantling of the existing structure.

Contractors shall be fully responsible for the detailed design and layout, and provide all associated equipment, pumps, tanks, and controls to provide a fully functional operating system that meets specified performance requirements. Each array/ train shall be capable of operation, independent of the other trains/arrays. These independent operations include filtering, backwashing (backwashing is a common system), and membrane cleaning. Each train shall have a local control interface with control from a control panel or fully integrated local PLC, inlet and outlet connections, process and filtrate quality monitoring systems to provide an independent operating unit that is fully functional. Each train shall have its own membrane integrity test and monitoring system (including pressure decay testing and monitoring/ recording system).

e. Access to Modules/ trains:

The Contractor shall provide clear space around each train that allows for unobstructed access to the membrane modules/ cassettes as required for installation inspection, integrity profiling, in-situ maintenance, and removal of elements. The contractor shall provide lifting arrangements to ensure that Modules/towers can be efficiently loaded/ unloaded into the tank during installation, commissioning, maintenance, etc. The Contractor is responsible for the design, certification, supply and installation of the overhead /other form of craneage required to remove membranes from an array. The Contractor shall submit all calculations, detailed drawings, and certifications that indicate that the provided craneage is structurally sound and safe to operate for review and approval to the consultant/ end user before installation. The Contractor shall supply all tools and devices required to safely and efficiently remove the membrane elements.

f. Membrane Element Life

Contractor shall provide a warranty to cover the total membrane life of 15 years. ~~The first 5 years of Warranty must be cliff (full replacement warranty/ no cost warranty) while the remaining 10 years shall be pro-rated replacement warranty.~~

The Contractor is advised that the following criteria shall be used for the purposes of defining membrane module life:

Failure to meet the specified filtrate quality criteria.

Failure to meet specified integrity test requirements; and

Failure to restore the permeability of the membrane to allow the system to achieve the specified CEB/ CIP/ Other Cleaning frequency requirements at the design feed characteristics & feed flow.

The Contractor shall provide all details of such a warranty as required in the Technical Particulars required for Process Equipment and the Technical Particulars required for Equipment Performance Guarantee.

1.3.3 Membrane Element Life and Warranties

- a. Membrane modules purchased by the Contractor/system integrator or otherwise provided under this Contract or as a future membrane replacement shall be provided with the same warranty as the membrane modules provided as part of the original equipment installation.
- b. The Contractor warrants that the membrane modules will be free from non-conformance in:
 - (i) Materials
 - (ii) Workmanship
 - (iii) Membrane integrity failure
 - (iv) Irreversible flux loss
- c. After final acceptance, if the membrane modules are determined to be nonconforming with respect to membrane integrity, the Contractor shall remedy and/or replace in accordance with the Contract.
- d. The Contractor is responsible to provide to the end user a listing of the operational data points that are to be electronically logged if needed as a provision of the warranties.
- e. Contractor is responsible for the control programming of data points that are to be electronically logged.
- f. Contractor shall identify minimum frequencies of logging of all operational data points required by the Contractor to maintain membrane module warranty provisions
- g. The Contractor shall establish the alarm and shutdown limits that would result in the operation of the equipment outside of Contractor acceptable limits
- h. The Contractor shall be responsible for the identification and programming of system interlocks that would result in the operation of the system outside of the parameters required by the Contractor.
- i. Contractor is responsible for the identification of water quality parameters, instrumentation and control programming required to satisfy and maintain membrane module warranty provisions for operation and cleaning. For example, if the membrane has a tolerance for pressure, pH, temperature, etc, instrumentation and control logic will be provided to maintain the provisions of the warranty. The Contractor shall establish the instrumentation alarm and shutdown limits to prevent operation of the equipment outside of Contractor established limits.
- j. Subject to the approval by the Contractor/ System integrator, the Contractor may provide membrane replacement modules in the future that embody changes in module design and construction features, under the following conditions:

1.4 UF permeate Tank cum RO feed tank with overhead wash water tank and backwash / CIP pumps

	Type	MOC	Quantity	Flow
UF Permeate tank		RCC	1 No.	Min. 1000 m3
UF Backwash tank	-	RCC with acid-proof tile lining	1 No.	As per design
CIP Tank	For Cleaning	MSEP or LDPE	1 W+ 1SB	As per design

	chemicals required for cleaning of UF Membranes			
CIP Pump	Submersible	SS 316	As per design, with 100% standby	150 m ³ /hr at 25 mwc

UF filtered water shall be collected in tank adjacent to primary collection tank.

MOC – RCC with acid proof tile lining

Provision of backwash pump shall have to provide for UF backwash facility with necessary electrical / mechanical instruments, inter connecting pipe, with necessary arrangements of knife gate valves/ penstock gates and UF clarified water – backwash pumping arrangement by **SS304/UPVC/GRP** pipeline upto UF.

1.4.1 Backwash Requirement

Modules must be capable of:

- being backwashed using filtered water at 1.2 kg/cm² maximum backwash pressure.
- being cleaned using sprinkling/chemical enhanced backwash or spray of chemical (Acid/ Alkali/ Oxidant) solution onto them to ensure effective, easy and quick cleaning with minimum requirement of chemicals and downtime.
- Air Scouring (using an adequate arrangement specified by manufacturer) during backwash/ CEB/ CIP.
- Backwash & chemical dosing pumps must have a minimum of 100% standby pumps installed (1 duty, 1 standby). **All Operation of UF including Filling, Filtration and cleaning must be with pumps for control of operation. Gravitational flows shall be used for draining only**
- The system must be designed to ensure that when one train/skid is in backwash or chemically enhanced backwash (CEB) and another train is out of service for CIP or mechanical maintenance(not exceeding 24 hours on continuous basis), the required filtrate flow is generated without exceeding the specified maximum design flux value.

	Type	MOC	Quantity	Flow
UF Backwash Pump with VFD	Horizontal Centrifugal	SS 316	As per design, with 50% standby	As per design

1.4.2 Cleaning-in-Place (CIP) System

	Type	MOC	Quantity	Flow
CIP Tank	-	MSEP or LDPE	1 No.	As per design
CIP Pump	Submersible	FRP / GRP	1 W+ 1SB	Min. 10 m ³

- **Purpose:** **Mandatory** Periodic cleaning of RO membranes to remove fouling and scaling.
- **Components:**
 - CIP tank (SS316 or FRP, minimum 5000 L capacity).
 - Dedicated CIP pump (SS316, flow rate to match RO system requirements).
 - Heaters: To maintain cleaning solution temperature (30–40°C).
 - Filters: To remove debris from cleaning solution.
- **Chemicals:** Citric acid, caustic soda, and proprietary membrane cleaning agents (NSF/ANSI 60 certified).
- **Automation:** **100%** Automated CIP cycle with programmable logic controller (PLC) integration.

Note: The bidders is free to install any additional component as they may feel to be required for successful operation of the plant, They may consider the cost of such equipment's in their offer. However the necessity of such components shall be once again verified during design approval stage. No extra payment on this account shall be admissible to KMC

2. Reverse Osmosis (RO) System

Reverse Osmosis process is a membrane process in which a synthetic semi-permeable membrane is used to separate water from dissolved impurities. When a semi-permeable membrane separates a dilute and concentrates solution of salts, due to osmosis, the water from the dilute solution side passes through the membrane to the concentrated side till osmotic equilibrium is attained. Now, if the pressure is applied and increased gradually on the concentrated side, the flow of water continues to reduce till the applied pressure reverses the direction of flow of water and water from the concentrated side enters the dilute side. This process is called the Reverse Osmosis. It is very essential to ensure that the water fed to reverse osmosis membranes is free from particulate matter to prevent membrane fouling. Also, the water should be free from organic matter, heavy metals and oxidizing agents like free chlorine. Thin Film Composite Semi Permeable Membranes under the influence of external pressure will undergo the process of Reverse Osmosis separating high TDS water into Very Low TDS Permeate (more than 99% salinity rejection) and Very Highly TDS Reject streams. The RO system consists of minimum 4 trains. The RO membrane shall be selected as low pressure / high pressure type as design requirement.

In TTP, the partially blending of the RO permeate with UF filtered water will make suitable treated water quality as required for design purpose. However, bidder may blend the UF permeate quantity as per requirement to achieve desired TDS level in final reject of RO.

Note: Bidder can offer any advanced upgraded technology like CCRO to meet system requirements without any financial implication as an alternative technical offer (Keeping base offer as same as NIT). However, JOC Shall reserve the right to accept or reject the

proposed advanced technology.

LIMITING CONDITION OF FEED WATER TO RO UNIT

• SDI	:	<3
• Temperature	:	40 deg. C (max.)
• Free chlorine	:	Nil or as per design
• Oil and grease	:	Nil or as per design

a. SILT DENSITY INDEX

The SDI of feed water to RO shall be kept below 3 for a continuous operation of the RO plant. The SDI is a measure of colloidal particles in the feed water and hence SDI value of 3 indicates that the feed water has very low content of colloidal particles. This ensures minimal colloidal fouling of RO membranes. This test shall be carried out daily and its value recorded.

b. BACTERIAL CONTAMINATION

The feed water to RO shall be free from bacterial contamination. The check for bacterial content (CFU per ml) shall be carried out once a day and action initiated to minimize membrane fouling.

c. ORGANIC CONTAMINATION

To minimize organic fouling of membranes, it is necessary to monitor this parameter once a day and cleaning of membranes as per recommended procedure should be followed. The frequency of cleaning will have to be determined by RO plant operating conditions. If organic contamination is more, then water shall be recycled back to STP premises.

d. OIL & GREASE

The Oil & Grease should be NIL or as per membrane design requirements. The presence of it in the feed water to RO, severely affects the membrane performance. The presence of Oil and Grease physically fouls the membrane and make it ineffective, which is then very difficult to remove even by cleaning. Analysis of water if the oil and grease is present in the sample, then oil and grease trap shall be proposed by the contractor without any extra cost.

e. DISSOLVED IRON

Dissolved iron must be analysed by bidder, if present then shall be mitigated. Iron removal unit shall be proposed without any extra cost.

f. TEMPERATURE

The operating temperature of feed water shall not be exceeding 40 deg. Celsius or as per design requirements.

(i) FREE RESIDUAL CHLORINE (FRC)

FRC at inlet to RO shall be monitored at least once a shift and recorded, as presence of FRC is detrimental to the performance of membrane.

(ii) RO CIP SYSTEM:

Reverse Osmosis membranes need periodic cleaning and servicing. For optimal performance specific chemicals are required, depending on the cause of the pollution.

(iii)Scaling

Scaling is concerned with the seclusion of suspended inorganic particles, such as calcium carbonate, barium sulphate and iron compounds.

(iv)Fouling

Fouling is concerned with the seclusion of organic, colloidal and suspended particles. Bacteria and other microorganisms that decompose these particles will create substrates. As a consequence, they will grow and develop further.

It is very important to purify the membrane preventively. In many cases regular mild cleaning is better than cleaning periodically with an aggressive cleaning product. The membrane will last longer.

Sr. No	Type of scaling	Cause
1.	Calcium Carbonate Scaling	Mainly Occurs with the high presence of Calcium
2.	Bio-film Formation	Growth of micro-organism on the membrane
3.	Organic Deposits	Oil & Organic Substance formation

A dedicated cleaning in place system will be provided for reverse osmosis system which consists of one number chemical preparation tank with agitator, Two (1W + 1 S) numbers of CIP pump.

i. REJECT CUM WASTEWATER TREATMENT

The reject from UF / RO will be subject to chemical treatment for rejection of mainly Suspended Solids and Organic matter. For this, the chemical treatment system shall be provided which includes Chemical Dosing System. The system will be designed considering reject flow and wastewater flow from TTP. The reject flow will be pumped for chemical treatment.

After RO treatment, the permeate of 20 MLD shall be sent to NTPC for reuse. The reject of RO shall be disposed to the nearby water body only if the required parameters are fulfilled.

General Requirements RO system

- **Purpose:** To remove dissolved solids, salts, and other contaminants from UF treated wastewater to produce high-quality water suitable for industrial reuse and reject safe discharge as per CPCB guidelines.
- **Capacity:** 20 MLD (20,000 m³/day) of treated water output, accounting for recovery losses.
- **System Design:** Modular RO system with redundancy (N+1 configuration) to ensure continuous operation.
- **Compliance:** CPCB standards for reject water quality (e.g., TDS <2100 mg/L, BOD

<10 mg/L, COD <50 mg/L), Environment (Protection) Rules, 1986, and amendments.

- **Design Life:** Minimum 20 years for major components, with membranes replaceable every 3–5 years.

Pre-Treatment for RO

- **Micron Cartridge Filters:** 5–10 micron rating, to protect RO membranes from residual particles.
- **Chemical Dosing Systems:**
 - Antiscalant: To prevent scaling from calcium, magnesium, and silica.
 - Sodium Metabisulfite (SMBS): To neutralize residual chlorine (if present).
 - pH Adjustment: Acid dosing (e.g., HCl) to optimize feed water pH for membrane performance.
- **Dosing Pumps:** Metering pumps with precise flow control, SS316 or PVDF construction.

2.1 RO feed pumps

	MOC	Quantity	Flow
RO Feed pump	SS / As per Design with VFD	As per design with 50% standby	As per design

2.1.1 High-Pressure Pumps (applicable to all high pressure pumps)

The pump shall be of vertical-in-line multistage centrifugal type suitable for speed up to 2900 rpm. The suction and discharge shall be in line with one another. The maximum operating liquid temperature for the pump shall be able to withstand up to 90 deg C.

Pumps shall also be able to modify with original add on modules to suit other applications if necessary. Such applications can be increase in operating temperature up to 180 deg C, pumping aggressive liquid, horizontal mounting, belt driven, low NPSH, high inlet pressure and high pressure pumping, etc.

Documentation shall include data booklet, pump curves, pump and motor technical data, Installation and operation manual, service and part lists, service video if any. All documentation must be available on line.

The motors shall be vertically stool mounted on top of the pump casing and the pump casing shall be designed to take the dynamic load of the motor. **The motor shall be provided with thrust bearing (Angular Contact Bearing) to cater for the downward thrust of the pump.**

All pumps c/w more than 7.5kw motor size shall have design which have extended pump head, this will enable the changing of the shaft seal without lifting of the motor. A hard-wearing CARTRIDGE SEAL and Spacer coupling shall incorporate in the pump for easy replacement. No special tool is required during maintenance. As such, minimum labour is involved in maintaining the pump.

The Impeller shall be Laser welded and be fitted to a splined shaft OR rounded shaft with split cone and split cone nut. Renewable wear rings shall be provided and cater for wear and tear. The rotating coupling shall be protected by means of a Stainless steel coupling guard.

The pump component shall comply with the following material requirements:

A) Pump Shaft	- Stainless Steel AISI 316
B) Pump Impeller	- Stainless Steel AISI 316
C) Pump Outer Sleeve	- Stainless Steel AISI 316
D) Pump Intermediate Chamber	- Stainless Steel AISI 316
E) Pump Base	- Stainless Steel AISI 316
F) Staybolt	- Cast Iron (with Cathaphoresis coating)
G) Coupling Guard	- Stainless Steel AISI 304
H) Pump Head	- Cast Iron ASTM 25B (with Cathaphoresis coating)
I) Pump Head Cover	- Stainless Steel AISI 316
F) Pump Base Plate	- Cast Iron ASTM 25B (with Cathaphoresis coating)

The pump performance curve shall comply to the tolerance according to ISO 9906 Annex A.

Electric Motors

The electric motor shall be of EFF class IE 4, and CE marking, with totally enclosed fan cooled squirrel cage induction type suitable for operation on a 380V - 415V/3/50Hz voltage supply. The motor shall be design based on 40 deg C ambient temperature and up to a max. of 2900 rpm. The motor shall be of class F insulation and IP55 enclosure with a max. surface temp. of not more than 150 deg C.

The motor shall comply with the requirement of BS4999 or other compatible IEC standard.

Direct on line starting method is required for motor up to 2.2 kW and star delta starting is required from 3 kW onwards.

All motors shall be sized for pumping operation based on non-overloading conditions. The motor shall be suitable for 20 start/stop per hours.

All motor must comply with the followings efficiency ranges for energy conservation:

A) 0.37 kW – 1.1 kW	- 82% and above
B) 1.5 kW – 7.5 kW	- 84% and above

C) 11 kW and above - 90% and above

The terminal box shall be positioned to accept cables, which rise vertically from below or alternatively in such a way as to accept cable from a cable tray without stress being introduced to the cable.

- **Type:** Multistage centrifugal pumps with variable frequency drives (VFD) for energy efficiency.
- **Material:** Stainless steel (SS316) for wetted parts to resist corrosion.
- **Pressure:** Capable of delivering 10–20 bar operating pressure as per membrane system design.
- **Flow Rate:** Designed to handle 20 MLD feed with 20–30% excess capacity for redundancy.
- **Efficiency:** >85% pump efficiency.

	Type	MOC	Quantity	Flow
High pressure pump for RO	Vertical Multi Stage Centrifugal VFD	SS 304	As per design with 100% standby	Min. 150 m3/hr at 100 mwc

2.1.2 Inter stage pressure boosting

- Flux drop of more than 8 LMH between two stages should be managed by using inter stage booster pump of reputed make as mentioned in approved make list.
- All pumps should be tested by manufacturer at duty point and should have required test certificate.

2.2 RO Membrane

	MOC	Flow
RO Module	High pressure pipes in SS 304	Min. 150-180 m3/hr per train

- **Type:** Thin-film composite (TFC), low fouling (LF), Fouling Resistant (FR) spiral-wound configuration standard 8 inch dia.
- **Material:** Polyamide-based, high-rejection, LF, FR, membranes suitable for wastewater applications.
- **Pore Size:** Designed for high rejection of dissolved solids (0.0001–0.001 microns).
- **Module Size:** 8-inch diameter, 40-inch length (standard industrial size).
- **Membrane Life:** Minimum 3–5 years under normal operating conditions.
- **Salt Rejection:** 95–99% for NaCl and other salts.
- **Configuration:** Multiple membrane elements per pressure vessel (e.g. 6 elements per vessel).
- The membrane supplied shall be from fresh lot (manufactured not later than 12 months from date of commissioning) and shall be properly stored and preserved at site in line with OEM guidelines.

2.3 RO permeate tank (As per annexure E2)

	MOC	Quantity	Flow
RO Permeate	RCC	1 No.	1000 m3

2.4 Post – Treatment

2.4.1 Dosing system for chlorine and pH correction

	Type	MOC	Quantity	Flow
Dosing System for RO 1	Electronic diaphragm dosing pump	1000 Liters LDPE 1 tank	As per design	As per design

- **Disinfection:** Chlorination to ensure pathogen-free permeate. With totally automatic chlorine dosing system of reputed make as per approved make list and test certificate.
- **pH Adjustment:** Addition of alkali (e.g., NaOH) to stabilize permeate pH (6.5–7.5).
- **Remineralization:** If required for industrial reuse, addition of calcium/magnesium salts.

2.4.2 Concentrate/Brine Management

- **Volume:** Approximately 4–6 MLD (20–30% of feed) based on 70–80% recovery.
- **Disposal/Treatment:** Discharge to designated water body after treatment as per CPCB norms (TDS within limits 2100 ppm TDS and other parameters to Hasdeo River). The safe drainage and disposal arrangements shall be done by the bidder in the nearby nala which intern meets Hasdeo river

2.5 UF cum RO reject tank

	MOC	Capacity
UF and RO reject water sump	Underground RCC M-30	1000 m3

2.6 Instrumentation and Control

2.6.1 Instruments

- Flow meters: For feed, permeate, and concentrate streams (electromagnetic or ultrasonic type).
- Pressure transducers : For 4 to 20 mA signal to PLC
- Pressure gauges: For monitoring feed, interstage, and concentrate pressures.
- Conductivity meters: To measure TDS in feed and permeate with PLC communication.
- pH meters: For continuous monitoring of feed and permeate pH with PLC communication

- Temperature sensors: To monitor feed water temperature with PLC communication

2.6.2 Control System

- PLC/SCADA-based system for fully automated operation.
- Real-time monitoring of flow, pressure, TDS, and pH.
- Alarms for high pressure, low flow, or high TDS in permeate.
- Data logging and remote access capabilities for performance tracking.

2.6.3 HMI: Touchscreen interface for operator control and monitoring.

2.7 Electrical and Power Requirements

- **Power Supply:** 415V, 50 Hz, 3-phase, with backup power (DG set).
- **Energy Consumption:** Should be declared as per design and conditions.
- **Energy Optimization:** Optimization is essential without compromising membrane operational longevity. Following points may be considered for this
 - VFDs on all high-pressure pumps.
 - Low Energy Membranes.
 - High-efficiency motors (IE3 or better).
- **Control Panel:** Remote operation Weatherproof (IP65), Main panel with MPCB, overload protection, VFD, SCADA and all standard specifications.

2.8 Pressure Vessels/tubes

- Material: Fiberglass-reinforced plastic (FRP) or stainless steel (SS316) for corrosion resistance.
- Pressure Rating: Minimum 300 psi (20 bar) to handle high-pressure RO operation.
- Configuration: Multi-element vessels (6 elements per vessel) arranged in stages parallel and series to achieve desired recovery and flow.
- End Connection: Side port, multiport orientation and multi size configuration type for easy membrane replacement.

2.9 Piping and Valves

- Piping Material:
 - High-pressure side: Stainless steel (SS316) or duplex steel for corrosion resistance.
 - Low-pressure side: UPVC or CPVC for cost-effectiveness and corrosion resistance.
- Valves: Automated control valves (butterfly, globe or gate type) with SS316 or UPVC construction.
- Fittings: Corrosion-resistant, compatible with high-pressure and chemical exposure.

3. Testing & commissioning

3.1 UF System

- The Contractor shall arrange for a Manufacturer's/ its technology provider's Representative be on site fulltime for the following activities:
- Installation supervision;
- Pre-commissioning checks & approvals;
- Functional and performance testing (Dry Tests);
- Start-up & commissioning assistance;
- Operator Training.

3.2 RO System

- Factory Acceptance Test (FAT): Conducted at manufacturer's facility for major components (pumps, membranes, Pressure Tubes). Witness.
- Site Acceptance Test (SAT): Post-installation, to verify system performance against specifications.
- Trial Operation: 3 months continuous operation to demonstrate treated water quality and system reliability.
- Performance Guarantee:
- Achieve specified treated water quality and quantity.
- Energy consumption within specified limits.
- Minimum downtime (<5%) during trial operation.

4. PEB structure for housing all installations of UF/RO with air conditioned Admin / Control / Laboratory room

Proposed UF and RO shed shall be designed and constructed for the flow mentioned under the data sheets provided and as filled in by the bidder.

	MOC	Size
UF and RO PEB shed	PEB	40M x 30M x 6M
Air conditioned Admin / Control / Laboratory room	PEB	40M x 10M x 4M

The entire UF-RO treatment system shall be housed in 40M x 30M x 6M height, PEB structure with a provision of 40M x 10M x 4M Air-conditioned room with a false ceiling.

- Supplying, fabricating, erecting and fixing in position of steel structures at all elevations using fusion welding quality steel E- 350 (Fe490) conforming to IS:2062 - 2006. Rate shall include cost of cutting, welding, splice plates and packing plates, transporting, straightening, cleaning, fabricating and erecting in position welded/bolted Structural steelwork in columns, beams, trusses, purlins, platforms, ladders, monorails, staircases ,supports, strengthening of steel members etc. at site to line and level, supply of approved bolts/nuts/washers etc. complete as per drawings including painting as per G4/G5/G6 before erection and all materials and labour charges etc., complete and including Sand blasting & painted with 1 coats of enamel paint (Berger EPILUX SG – HHI 664002) of 35-50 micron each coat with air less spray gun over a coat of zinc chromate primer - 35-50 micron etc.

- Supplying, fabricating and erecting of Cold Formed Light Gauge structural steel members conforming to IS:801/ IS:811 hot-dip galvanised to IS:4759 - 96 including cutting, welding or bolting, splice plates and packing plates, transporting, straightening, cleaning, fabricating and erecting in position.
- Providing and fixing colour coated zinc alum ® AZ150 (min 150 gms / sq. Mt Total on each side) profiled sheets for roofing The feed material is manufactured out of nominate 0.45 mm base metal thickness (8mt) (0.5 mm TCT) Hi strength steel with m/s 559 Mpa yield strength, metallic hot dip coated with Aluminium zinc alloy (55% aluminium 43.4% zinc 1.6% silicon) with COLOURBOND(R) steel quality super durable polyester paint coat (with inorganic pigment) The plant shall have a total coating thickness of nominal 35 um. Complying of nominate 25 um exterior coat on top surface profile sheet shall have nom. 950- 1050 mm effective cover width and nominal 25-30 mm deep ribs with subtle square fluting in the five pan of nominal 180- 250 mm centre to centre. The end rib shall be designed for anti-capillary groove. And return leg . The feed material should have coll manufactures product details marked at regular interval including fasteners with min. fastened with min 25 um zinc tin alloy coated max head self-drilling screw etc completed (Weight of profile 4.52% sqm) ROOFING AND SIDE CLADDING.
- Supply & Fixing of 0.5 mm thk PPGL roof accessories - Roof Accessories.
- Supplying, fabricating and erecting in position PPGI Eaves Gutter of required size with stop ends, all fixing accessories, drop ends, etc., at all elevations levels & heights including aligning, levelling, providing and fixing bolts, nuts, washers etc., conforming to latest specification including straightening, cutting, welding, bending to shape, bolting etc., complete Roof Gutter (Min. Girth- 600 mm) PPGI 0.5 mm Thk.
- Providing and fixing of the rain water down take pipes of PPGI, the sectional area of rain water down take pipes provided shall be generally at the rate of 1 square cm per 70 to 80 square decimetre of roof area drained. No spout shall be less than 80 mm in diameter. The spacing of spouts shall be arranged to suit the position of openings in the wall including necessary accessories for fixing the pipe and including all materials and labour charges etc., complete as per specifications.
- Flooring should be industrial grade anti-skid tiles.

The roof of the shed shall be equipped with a Ventilation fan / roof air vent.

4.1 Admin / Control / Laboratory room

Provide admin / control and Laboratory inside the PEB structure air conditioned room

Sr. No	Item of work	Work
1.	Personal Computer in PLC/Control Room	1no. of PC of latest configuration with 3nos. of 24" VDU along with 55 inches LCD display
2.	Printer in PLC/Control Room	1 No. of A3 Size Laser Printer of latest version & configuration complete.

3.	Telecommunication Facility	Min. 1 No Android Mobile with activated SIM any company where network is available /Telephone Line with a Broad Band facility with Wi-Fi router. The chargers will be borne by the Bidder up to the O & M Period.
4.	Plant Model	<ul style="list-style-type: none"> 1 No. Wall Mounted Process Model (Electronic Plant Display Model) with Flow Diagram (Minimum size 3 m x 1.5 m) 1 No. 3D Model with display of flow direction and lighting.
5.	Air Conditioner	Adequate nos. of Air conditioners shall be provided as directed by Executive Engineer.
6.	flooring	industrial grade anti-skid tiles
7.	Height of plinth	1.2 m

5. MISCELENEOUS POINTS OF CIVIL WORKS

- All the reinforcement steel to be used for the RCC work for the proposed tertiary sewage treatment plants at all levels, shall be CRS type of Fe 500 Grade confirming to IS:1786 and from the specified vendors/manufacturers only. Test certificates indicating steel confirming to required IS, must accompany before delivery of each & every lot of reinforcement steel to be supplied & used for the proposed work. After delivery of such reinforcement steel at site, testing of steel shall be carried out from any Government approved laboratory as per the relevant IS codes, as per the sampling procedure given in the same.
- All the cement to be used for the proposed work for any civil engineering activity like- PCC, RCC, inside & outside plastering, IPS & flooring etc., shall be Ordinary Portland Cement, confirming to IS: 1489, Part-I (Latest Edition) and of the specified vendors/manufacturers only. After delivery of such cement at site, testing of cement shall be carried out from any Government approved laboratory as per the relevant IS codes, as per the sampling procedure given in the same.
- All the concreting work for the proposed tertiary sewage treatment plant shall be carried out by RMC Plant & concrete mixer installed at the site for the proposed work as per the specifications given in this tender. In case, volumetric batching of concrete ingredients is allowed, then the contractor shall submit mix design duly approved by govt. engineering college / NIT.
- Wherever, grade of RCC is not mentioned, it shall be considered as minimum M-30 grade or more, as per design for water-retaining / water flowing structures / super- structure / foundations / platforms / slabs / stairs etc. of any buildings / units.
- Outside brick wall of any building shall be minimum 230 mm and inside

- partition brick walls shall be 115 mm thick.
- Hydraulic testing of all treatment units shall be carried out by filling water before plastering. Any leakages found shall be repaired by cement slurry pressure grouting before plastering at no extra cost and all units must be water tight.
- Inside plaster/IPS
All the water retaining units of treatment plant shall have inside 20 mm thick water proof smooth cement plaster on vertical/sloping sides and 40 mm thick water proof IPS on bottom as per tender specifications. Inside the tanks, chambers etc. also inside 20 mm thick water proof smooth cement plaster on walls and 40 mm thick water proof IPS on bottom as per tender specifications shall be provided. Inside the buildings, 15 mm thick smooth cement plaster shall be provided on walls and 10 mm thick smooth cement plaster on ceilings / soffits.
- Inside Acid –Alkali Tile Lining
RO feed water tank and Degasser unit shall have acid-alkali tile lining on floor and walls. The slab shall be provided with 406 micron epoxy lining.
- Outside plaster
All the units of tertiary treatment plant shall have outside 20 mm thick double coat sand faced plaster as per tender specifications.
- Inside finishing / painting:
Inside finishing at all levels shall be carried out by three coats of approved synthetic enamel washable distemper paint on a coat of primer. All treatment units three coats of whitewashing shall be applied on inner sides.
- Outside finishing / painting:
All the units and buildings of TTP at all levels (from parapet or top level to minimum 300 mm below ground level) shall have outside finishing by three coats of exterior emulsion / plastic paints of approved make and colour.
- Walkway/platforms
All the units of tertiary sewage treatment plant shall be provided with minimum 2 m. wide (RCC M:30) walkway/platforms throughout their length and these shall be inter- connected at suitable places, for easier movement all around the plant. All the walk- ways/platforms shall be provided with chequered tiles-38 mm thick on their top as per tender specifications. Throughout the length of all walkways/platforms, 1.00 m. high GI Railing shall be provided as per tender specifications.
- Aluminium Railing as per specification provided elsewhere in the tender documents
- If it is required to provide the expansion joint, the same should be provided by separation of two structure. Minimum 25 mm thick. bituminous particle board shall be used throughout the surface of expansion joint. Polysulphide sealant shall also be filled as per standard specifications in the exposed gap of expansion joint.
- Inter connection of all units by providing and constructing adequate size of RCC platform/staircase with GI railing approved by Engineer In Charge.
- From the terrace of pump rooms, arrangement for rain water collection at one point and recharging of the same in the ground by making a bore well of sufficient size shall be provided as per the standard practice adopted by the Korba Municipal Corporation.

- For Foundation Stone Laying and Inauguration, name plate including lettering with golden colour on granite stone (maximum size 1.5 mt. x 0.9 mt.) should be provided and fixed as directed by Engineer-in-charge.
- Providing model using hard board/plywood in scale 1:50 with proper acrylic covering.
- Display of as built drawings, photos, data in laminated form is also included in the scope of works. Moreover, Steel plates showing names & numbers of units, buildings, Rooms, Pumps, etc. in embossed & coloured capital letters of at least eight inches of height in English, shall be provided & fixed at proper places, as directed by engineer-in-charge.
- The Bidder shall have to get approval from factory inspector as per factory act and should submit the certificate of approval to KMC. The required drawings to be submitted to factory inspector shall be supplied by the Bidder and approved drawings shall be handed over to KMC. All necessary drawings/liasons work etc. will be done by the bidder. KMC will assist only in submission of the application forms.
- The bidder shall be required to give test report and submit the same to Electrical Inspector for complete Electrical works done by the Bidder. The approved drawing/test reports shall be handed over to KMC.
- Insurance / responsibility of all the materials / equipments/ plants as well as accident / death of labour shall be the Contractor's account till handing over the plant to Korba Municipal Corporation even if part payment is released.

Note:

- 1) All the interconnecting piping for all the units, bypass piping including fittings and valves for treatment plant, water supply & service water lines shall be provided.
- 2) The reject water treatment shall be carried out as per the norms of CPCB, NGT
- 3) All necessary electrical (power & control) and instrumentation (signal, communication, control & power) cabling for HT, LT power distribution, instrumentation & PLC/SCADA system for entire tertiary sewage treatment plant, etc. shall be provided.

The other units required are:

- a) The TTP premises shall be facilitated with Approach and Internal Roads, Road Kerbs, Storm Water Drains, Plant Pathways, Plinth Protection works and drinking water distribution network. No separate payment shall be made.
- b) Bidder shall consider in his scope to provide lawns, plantation and landscaping within the TTP battery limit (approx. 1000 sq.m. as a minimum or higher as per final approved layout). Plantation shall be provided along the plant roads, plot periphery, open areas and others as directed by engineer in-charge.

The plantation shall be provided with necessary protection (Jali) and the species selected shall be suitable for the site environment and must be shade giving trees. Bidder shall consider to provide saplings such that minimum 100-120 surviving trees are available.

Bidder shall submit the Landscaping Design for approval of KMC during detailed engineering and shall carry out the work as per approval and direction of engineer-in-charge.

The maintenance of these lawns, plantation & landscaping works shall be in the scope of bidder during O&M period.

- c) Earth filling, levelling and dressing around the treatment unit including cutting

of trees, removal of debris, shrubs and solid waste etc. within the premises of treatment plant & filling, to bring the site up to formation level, landscape, tree plantation, shall be included in the scope of work of this contract.

6. TECHNICAL DATA SHEETS

ULTRA FILTRATION(UF) SYSTEM	
UF FEED SUMP	
i. UF FEED SUMP	
No. of units	1 No.
Capacity	4000 m ³
HRT	4 hours
Liquid volume	As per the design requirement
Size of unit provided	As per the Design
Free Board	500 mm Covered with RCC slab
Material of construction	RCC in M:30
Inside finish	20 mm thick Inside waterproof Plaster on Walls and 40 mm Thick IPS on Raft
Outside finish	Three layers of Tarfelt treatment or Liquid Polyurethane Elastomeric Waterproofing Membrane with an 8 mm HDPE dimple board for wall and HDPE self adhesive membrane for raft to be provided
ii. UF FEED PUMP	
No. of units	As per design, with 100% standby
Capacity	As per design by the membrane supplier
Head	As per the design by membrane supplier
Minimum feed pressure required	0.5 bar at the inlet of UF train
Type	Submersible with VFD
MOC	
Casing	1.5% NiCl
Impeller	CF8M
Shaft	SS 410
Sleeves	SS 410
Base Plate	Epoxy Coated MS
Suction Pipe	SS 316
iii. ULTRAFILTRATION (UF) SYSTEM	
Details of UF	
No of trains	As per Design
UF Membrane trains finish	Acid / Alkali tile lining
Total feed flow	As per the design by the membrane supplier
Total Design Required Average feed flow	As per the design by the membrane supplier
Total Average Design permeate flow	As per the design by the membrane supplier
Recovery rate	Min. 90 %
Avg. Filtration Flux at (n-1)	As per design for given Ceramic and PVDF membranes
Avg. Backwash Flux	As per design for given Ceramic and PVDF membranes
Casting material	Noryl with fiberglass reinforced
Operating parameters	
Permissible temperature range	4 - 60 °C
Max. operating pressure	-1 bar during filtration and +1.2 bar during backwash
Transmembrane pressure (TMP)	

Filtration max.	0.65 bar
Standard backwash	0.8-1bar
Burst pressure (membrane)	1.2 bar
Cleaning/disinfection chemicals	
NaOCl (Sodium Hypochlorite 10% Solution)	max. 500 ppm nominal
H ₂ O ₂ (hydrogen peroxide)	max. 500 ppm
Caustic pH	max. 12
Acid pH	min. 2
Inlet Feed Quality	
pH of Feed water	6.5-7.5
Inlet Turbidity	<15 NTU
Inlet TSS	<30 mg/L
Inlet TOC	<2 mg/L
Outlet Filtrate Quality from UF	
pH of Filtrate water	6.5-7.5
Outlet Turbidity	<0.5NTU
Outlet TSS	<3mg/L
SDI	<3
Quality of water required for Backwash/ Cleaning of UF membranes	UF Filtrate Water
iv. UF FEED STRAINERS	
No of units	As per design, with 50% standby
Design Flow	As per design
Type	Punched hole type rotating drum, Automatic
Size	1 mm
Body	SS 316
Screen	SS 316
Backwash valve	SS 316
Backwash arm and internals	SS 316
Seals	Mechanical
v. UF BACKWASH TANK	
No. of units	1 No.
Design flow	As per Design
HRT	30 minutes
Liquid volume	As per Design
Size of unit provided	As per design.
Liquid Volume provided	As per Design
Free Board	500 mm
i. MOC	ii. RCC in M:30
Inside finish	20 mm thick Inside water proof Plaster on Walls and 40 mm Thick IPS on Raft with Acid / Alkali tile lining
Outside finish	Three layers of Tarfelt treatment or Liquid Polyurethane Elastomeric Waterproofing

	Membrane with an 8 mm HDPE dimple board for wall and HDPE self adhesive membrane for raft to be provided
vi. UF BACKWASH PUMPS	
No. of units	2 Nos. (1W+1S)
Back wash pump Flow Rate	As per Design
Back wash Pressure Head	As per Design
Minimum feed pressure required	As per Design
Backwash Flush Frequency	As per Design
Backwash Flush duration	As per Design
Type	Horizontal split casing with VFD
MOC: Casing/Impeller	CF8M
vii. UF CIP TANK	
No. of units	1 No.
Volume	10 m ³
MOC	FRP / GRP
viii. UF CIP PUMPS	
No. of units	2 Nos. (1W+1S)
Capacity	As per design
Head	As per Design
Minimum feed pressure required	As per Design
Type	As per Design
MOC: Casing/Impeller	CF8M
ix. UF & RO SHED (PEB Structure)	
MOC	RCC M: 25 for RCC column, beam, plinth slabs & peripheral wall of brick masonry up to sill level & precast cement jail above sill level up to the roof.
Inside finish	15 mm thick smooth cement plaster on walls & 10 mm thick smooth cement plaster on ceilings / soffits.
Outside finish	20 mm thick double coat sand faced plaster
Roof / Shed	Galvalume/Aluminum sheet of 0.5 mm thickness, MS roof structural member with epoxy painted, and roof of shed with ventilation fan / roof air vent anti corrosive type.
Flooring	40 mm thick water proof IPS
Common walkway passage	Kota stone flooring
UF reject water channel finish	Acid / Alkali tile lining

REVERSE OSMOSIS (RO) SYSTEM (Min. 5-6 trains)

i. RO FEED TANK (UNDERGROUND)	
No. of units	1 No.
Design flow	As per design
HRT	30 minutes
liquid volume	As per design

Size of unit provided	As per design
Liquid Volume provided	As per design
Free Board	500 mm
MOC	RCC in M:30
Inside finish	Acid-alkali tile lining on floor and walls
Outside finish	Three layers of Tarfelt treatment or Liquid Polyurethane Elastomeric Waterproofing Membrane with an 8 mm HDPE dimple board for wall and HDPE self adhesive membrane for raft to be provided
ii. RO FEED PUMPS	
No. of units	As per design with 50% standby
iii. Design Flow rate	As per design
Design Head	As per Design
Type	As per Design with VFD
MOC: Casing / Impeller	CF8M, SS 304
iii. RO MICRON CARTRIDGE FILTER	
No. of units	As per design
Design capacity	As per design
Size	5 µm
Type	Double open-end cartridge
MOC	SS 316
iv. RO TRAINS	
Actual Feed water flow rate to RO Plant	Min. 150-180 m ³ /hr per train
Nos. of RO Skids	5-6
Actual Feed water flow rate/stream	As per design
Overall Recovery from RO (Single Pass)	>80%
RO Permeate /Skid	As per design
Feed Temperature for design of RO Permeate	25 – 30 °C
Type of membranes	Thin film composite polyamide spiral wound low fouling, fouling resistant, 8-inch dia.
No. of Stages/ Pass	Two Stages
Membrane flux rate	16 – 18 LMH
v. RO CIP TANK	
Nos.	1W
Fluid handled	Cleaning chemicals required for cleaning of RO Membranes
Flow Rate Required	As per Design
Capacity of Tank	As per Design
Size of Tank	As per Design
MOC	FRP / GRP / PP
vi. RO CIP PUMPS	

No. of units	As per design with 100% standby
Required Capacity	As per Design
Provided Capacity	As per Design
Head	As per Design
Type	Horizontal split casing
MOC: Casing/Impeller	SS 316
Quality of water required for Cleaning of RO membranes	RO Permeate Water
vii. CIP MICRON CARTRIDGE FILTER	
No. of units	1 No.
Capacity	As per Design
Size	5 μ m
Type	Double open-end cartridge
MOC	SS 316
viii. RO PERMEATE TANK	
No. of units	1 No.
Capacity	Min 1000 m ³
Size of unit	As per Design
Free board	500 mm
Material of construction	RCC in M 30
Inside finish	Industrial grade anti-skid tiles with epoxy gap filing
ix. COMPRESSED AIR SYSTEM – PROCESS	
a) AIR COMPRESSORS (for instrument air)	
Number of units	As per design with 100% standby
Type	Oil and moisture free
Capacity	As per Design
Design Pressure	As per Design
x. HIGH PRESSURE PUMP	

Type	Vertical Multi Stage Centrifugal VFD
MOC	SS 304
Quantity	14 nos or (As per design, with 100% standby)
Capacity	150 m3/hr
Head	100 mwc
xi. PRESSURE VESSELS/ TUBES	
Material	Fiberglass-reinforced plastic (FRP) or stainless steel (SS316) for corrosion resistance.
Pressure Rating	Minimum 300 psi (20 bar) to handle high-pressure RO operation.
Configuration	Multi-element vessels (6 elements per vessel) arranged in stages parallel and series to achieve desired recovery and flow.
End Connection	Side port, multiport orientation and multi size configuration type for easy membrane replacement.
xii. RO DOSING PUMPS	
Capacity	As per design
Type	Open lid type & Electronic diaphragm dosing pump
MOC	PP with level indication and control
Quantity	Min. 7set
Capacity	Min. 100 LPH at 3 kg/cm ²
xiii. DOSING TANK	
No. of units	1 No.
Capacity	Min. 1000 Liters
MOC	LDPE

7. Interconnecting Piping and Valves

All interconnecting Piping, Gates, Valves, Specials and other appurtenances, auxiliaries and accessories required as per Process Design and Scope of Work. In case of Rising Mains, thrust blocks shall be provided wherever required. In case of buried Pipes,

warning tapes shall be provided of the appropriate colours. The material of construction for major interconnecting Piping shall be as follows:

Piping: Guide Line for Velocity

Sr. No.	Service	Design Velocity m/s	Limitations
1.	Gravity Lines for Sewage & Water	0.6-1.2 Designed as pipe line flowing full.	Min. Velocity shall not be less than 0.6 m/sec. Max. Velocity up to 1.2 m/sec is allowable at Peak Flow.
2.	Pressure Lines for Sewage & Water	0.6 – 2.5	Min. Velocity shall not be less than 0.6 m/sec. Max. Velocity up to 2.5 m/sec is allowable at Peak Flow.
3.	Air (Pressurized Lines)	18 – 22	Max. Velocity shall not be more than 25 m/sec in any section.
4.	Chemical Feed Lines	0.6 – 1.5	Irrespective of flow, Diameter shall not less than 20 mm.

Notwithstanding the above, the Bidder shall submit a Pipe Line Schedule with Tag No., Flow, Size, and Type, Material of Construction etc. with detailed P & ID for approval of the Engineer-in-charge prior to any further engineering or procurement/fabrication and installation.

Generally, the Material of Construction shall be selected based on the following guide lines. The Bidder can make suitable selection depending on Service, Type of Flow (i.e. Gravity or Pressurized) and Diameter of Pipe.

Piping: Guide Lines for MOC (Material of Construction)

Sr. No.	Service	Type of Flow	MOC
1	Waste Water	Gravity	RCC NP-3 Class
2	Waste Water	Pressurized	CI Class “LA” / DI K-9
3	Service Water	Gravity / Pressurized	CPVC
4	Air Lines: Headers, Vertical Down-comers	Pressurized	Above Water: MS Sand/Shot Blasted, Epoxy Painted Under Water: SS 304
5	Air Grid Piping: Aeration Zone	Pressurized	UPVC Schedule 40
6	Chemicals	Gravity / Pressurized	SS 304 except Chlorine & FeCl ₃

7	Chlorine & FeCl ₃	Gravity / Pressurized	Schedule 40 UPVC
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7.1 EQUIPMENT SIZING CRITERIA FOR PIPING & FITTINGS

All the piping systems and equipment supplied under this package shall be designed to operate without replacement and with normal maintenance for a plant service life of 30 years and shall withstand the operating parameter fluctuations and cycling which can be normally expected during this period.

For all Low-Pressure piping systems covered under this specification, sizing and system design shall be to the requirements of relevant codes and standard indicated. In addition to this, requirements of any statutory code as applicable shall also be taken into consideration.

Pipeline under gravity flow shall be restricted to a flow velocity of 1 m/sec generally. Channels under gravity flow shall be sized for a maximum flow velocity of 0.6 m/sec.

WILLIAM & HAZEN formula shall be used for calculating the friction loss in piping systems with the following "C" value:

(i)	Carbon steel pipe	100
(ii)	Ductile Iron.	140
(iii)	Rubber lined steel pipe	120
(iv)	Stainless steel pipe	100

For calculating the required pump head for pump selection, at least 10% margin shall be taken over the pipe friction losses and static head shall be calculated from the minimum water level of the tank/ sump/ reservoir from which the pumps draw water.

(b) Compressed Air Application

Compressed air 15.0 m/sec.

The pipes shall be sized for the worst (i.e., maximum flow, temp. and pressure values) operating conditions.

Based on the inside diameter so established, minimum thickness calculation shall be made as per ANSI B OD. Manufacturing allowance shall be added to minimum calculated thickness and next higher standard thickness of pipes shall than be selected as per ANSI B 36.10/IS-1239 Heavy grade/IS-3589/ASTM-A-53/API-5L/ANSI B36.19 as the case may be. Alternatively, manufacturers standard thickness can also be accepted subject to that such thickness shall be equal to or more than the minimum calculated thickness after considering manufacturing allowance. Selected thickness then shall be checked for vacuum loading criterion as per the guidelines given in AWWA-M-11.

Corrosion allowance of 1.6 mm will be added to the calculated thickness being considered (except stainless steel piping).

Bend thinning allowance/manufacturing allowance etc. shall be as per the requirement of the design code provision.

Material of construction for pipes carrying various fluids shall be as specified elsewhere.

Compressed air pipe work shall be adequately drained to prevent internal moisture accumulation and moisture traps shall be provided at strategic locations in the piping systems.

Depending upon the size and system pressure, joints in compressed air pipe work shall be screwed or flanged. The flange shall be welded with the parent pipe at shop and shall be hot dip galvanized before dispatch to site. Alternatively, the flanges on GI pipes may be screwed-on flanges also.

SYSTEM	TYPES OF VALVES					
	Butterfly	Gate	Globe	Check	Ball	Plug
Water	x	x	x	x	x	
Air		x	x	x	x	
Drains & vents		x	x	x		
Fuel oil (if any)		x	x	x	x	x

Recirculation pipes along with valves, breakdown orifices etc. shall be provided for important pumping systems as indicated in respective process and instrumentation diagrams (P&IDs). The recirculation pipe shall be sized for minimum 30% design flow of single pump operation or the recommended flow of the pump manufacturer whichever is higher.

7.2 Ball Valve

For General Design/Construction, bidder to refer sub section, clause no - 2.12.01 of this sub-section. Material of Construction of valve shall be as follows: -

Sl no	Description	Material of Construction
1		
(i)	Body	ASTM A105 / A350
(ii)	Side Piece	ASTM A105 / A350
(iii)	Ball	ASTM A 479 GR SS316
(iv)	STEM & seat ring	PTFE
(v)	Stem	ASTM A 479 Gr SS316
(vi)	Handle	CS
2	Painting	Plz refer sub section A-01, clause no-7.00.00

3.1 Electrical & Instrumentation Works

It shall be the Bidder's responsibility to obtain adequate incoming HT power from State Electricity Authority based on the maximum demand load. The KMC will pay the charges for obtaining the above connection whereas necessary licencing for the same shall be done by the Bidder in consultation with Engineer-in-charge.

Two nos. of Transformers (1W + 1SB) for full load of the plant with 20% overload shall be provided **with Auxiliary transformers**. These shall be step down Transformers suitable for outdoor installation manufactured in accordance with IS 2062/1962 and as modified from time to time. They shall be supplied with all accessories and mounting as per IS 2062 and shall Also, have Dial Thermometer, Bucholz Relay, Rollers and Explosion Vent. Each Transformer shall be provided with off load tap changer for $\pm 2.5\%$. The windings shall be of connections as per vector group DY II. The efficiency of the Transformer at 100%, 75% and 50% loading should Also, be indicated separately. The Transformer should be tested as per I.E. Rules & Regulations. Suitable cable boxes for H.T. and bus ducting for L.T. side be provided.

The entire Plant shall be operated on 415 V, 3-Phase, 50 Hz, 4-Wire system. The Bidder's Scope of Work shall include the following:

- Obtaining incoming HT Power from State Electricity Authority including necessary licensing, documentation etc. complete.
- HT Cable with Termination Kit from "Source" to the Electrical HT Substation located at the Sewage Treatment Plant.
- HT Substation including 4-Pole Structure, Metering Kiosk, HT Panel, Transformers, Power Control Centre etc. complete.
- Motor Control Centres.
- Cabling including Power, Control and Instrumentation Cables.
- Earthing for Electrical equipment as well as Instruments.
- Internal Lighting in Buildings.
- External Lighting.
- Local Push Button Stations near respective Drives.
- Any other item / accessories required for successful completion of the Project.

The Bidder shall design/execute the System as per standard specifications, I.E. Rules and Regulations, requirements of State Electricity Board and other local Authorities and actual site conditions.

Also, the Bidder shall provide adequate automation for fully automatic operation of the entire plant Power source through a one Programmable Logic Centre (PLC) and Supervisory Control and Data Acquisition (SCADA) with Man-Machine Interface (MMI). Provision shall Also, be made to operate each Unit of the Plant manually, if required. Remote monitoring shall also have to be provided on static IP on IoT using cloud tunnel. The annual subscription charges for the cloud gateway shall be borne by the bidder.

Note: The CSPDCL will provide power upto the compound wall / entrance gate. The excavation, laying of HT / LT cables with proper cable trenches, cable makers with danger sign, etc will be in the scope of the bidder. The required letters, fees and deposits will be borne by the ULB. However, all liaisoning pertaining to the approvals from chief electrical safety officer & CSPDCL will be in the scope of the bidder.

3.1.1 Monitoring and Control

- a. The bidder shall provide all instrumentation, monitoring, and control systems for the entire UF System.
- b. The bidder shall provide flowmeter at inlet and outlet of TTP.
- c. All the sensors, instruments, analysers, sample pumps, equipment, systems, and processors provided shall be integrated with the Supervisory Control and Data Acquisition System (SCADA).
- d. The process flow parameters and operating status of all equipment within the UF system shall as a minimum be monitored and displayed at the SCADA. The appropriate action, fault and/or alarm condition shall be automatically raised (to alert the operator) at the SCADA.
- e. Each UF train shall have process performance monitoring and associated instrumentation, including, as a minimum, the following:
 - i. Transmembrane pressure
 - ii. Flux/Permeability/Flow
 - iii. Temperature corrected permeability (specific flux)
 - iv. Total unit run (elapsed) time
 - v. Elapsed Time: since last backwash
 - vi. Filtered Water Volume: since last backwash
 - vii. Elapsed Time: since last membrane chemical cleaning
 - viii. Filtered Water Volume: since last membrane chemical cleaning
 - ix. Elapsed time since last membrane integrity test (MIT)
 - x. Filtrate turbidity – The Contractor shall provide individual turbidity meters for each UF skid.
 - xi. The Operator shall be able to adjust process setpoints from the SCADA operational stations in the Control Room.
 - xii. Adjustable setpoints shall be provided for each of the UF subsystems and shall include, but not be limited to, the following
 - xiii. Number of UF trains on-line and off-line
 - xiv. Membrane process tank levels (if applicable)
 - xv. Filtered Water Storage Tank water level settings
 - xvi. UF feed pumps start and stop based on Filtered Water Storage Tank level, slow start and slow stop operation, adjustable pump/motor pump speed based on UF array flow or process tank level
 - xvii. Control setpoints for the dosing of chemicals
 - xviii. Filtrate water quality limits, such as turbidity, to initiate backwash or alarm on poor water quality

- xix. All setpoints relating to UF backwash initiation, duration, and frequency
- xx. Backwash water flow rates, including slow start and slow stop modes.
- xxi. Feed water or filtrate water flow rate through each train
- xxii. Alarm settings

3.1.2 Computer hardware and software

All programs required for operation of the system must be correspondingly compatible. The corresponding licenses must be supplied for the standard programs. The operating systems must be agreed upon with the Client. Minimum requirements shall meet:

CPU		
1.	CPU	
2.	Processor	Intel i7 or higher
3.	Processor speed	2 GHz or higher
4.	Configuration	Tower
5.	Architecture	32/64 bit
6.	System memory (RAM)	16 GB or higher
7.	Hard disk	1TB or higher
8.	Operating system	Microsoft Windows 10 professional
9.	Communication ports	USB – 4Nos., Ethernet – 3Nos.
10.	Graphic accelerator	4 GB
11.	Power supply	240V, 50Hz, 1Phase
12.	Keyboard	Internet Keyboard (with USB interface)
13.	Mouse	Optical, 3 buttons (Cordless)
Monitor		
14.	Type	Full HD LED colour monitor
15.	Screen size	72” or higher
16.	Resolution	1920 x 1080 4K
17.	Power supply	240V, 50Hz, 1Phase

3.1.3 E & M WORKS (Equipment & Machineries work)

a) GENERAL

All the E&M works shall be carried out as per latest CPWD Electrical Specifications Part – I (Internal) – 1994, Part – II (External)-1995, Part-IV (Sub-Station) – 1982, Part – VI (Fire Alarm System) – 1988 & Air Conditioning - 1997 with up to date corrections slips issued up to the date of submission of bid. In case the CPWD specifications are not found applicable and adequate than the relevant BIS specifications shall be used. Further in case, any of these are not applicable to particular tools, Equipment and machinery, then the manufacturer's specifications or their relevant instructions shall be followed.

b) Lighting System - Drawings and Data

a) The bidder shall furnish relevant descriptive and illustrative literature on lighting fixtures and accessories dimensioned drawings/ data for the respective lighting fixtures with manufacturer's catalogue numbers.

b) It shall be the responsibility of the bidder to work out a detailed layouts in order to provide the level of installations as indicated under Design Criteria and shall be furnished for the approval of the Engineer In-charge before commencement of installation

c) Requirements

The Lighting system includes the following items:

- Lighting fixtures complete with Lamps and accessories
- Lighting system equipment
- Light control switches, receptacle units with control switch units, lighting wires, conduits and other similar items necessary to complete lighting system
- Lighting fixture supports and street lighting poles
- Lighting main distribution board, lighting panels.

c) Multi core cables for street, boundary and flood lighting

d) Provision of automatic on-off road switches through solar system

d) Design Requirements

It shall be responsibility of the bidder to work out a detailed layout for different units/areas in order to provide the levels of illumination as indicated in the design requirement above. The bidder shall be responsible for measuring the levels of illumination after installation and establish compliance with the specification.

The design, manufacture and performance of equipment shall conform to the latest amended Indian standard and following design and general criterion is given in Volume – I, Section – 2.0 Scope of Work above.

Mechanical Equipment:

Ambient Air Temp	:	Max. 45°C	Min. 2°C
Relative humidity	:	Max. 85%	Min. 15%

Electrical Equipment:

Ambient Air Temp	:	Max. 45°C	Min. 2°C
Relative humidity	:	Max. 85%	Min. 15%

Nominal system supply

1.	Incoming power	:	11KV, 3Ø, 3W, 50Hz
2.	Power distribution	:	11KV/ 415V, 3Ø, 4W, 50Hz, AC
3.	Lighting & space heating	:	240V, 1Ø, 2W, 50HzAC
4.	D.C. Controlling	:	30V and 24V D.C

5. A.C. Control : 240V A.C
6. P T Secondary : 110V, 3 Phase, 50 Hz A.C
7. Variation Voltage : $\pm 10\%$,
Frequency : $\pm 5\%$
Combined Voltage and Frequency : $\pm 10\%$,
8. System Earthing:
 - a) 11KV System : Wherever generation is taking place at 11 KV, this will be earth through resistance.
 - b) 415V system : Neutral solidly earthed
 - c) 240V Single Phase : Neutral solidly earthed
 - d) 30V D,C, System : Unearthed

Note: The incoming supply will be 33 KVA. The CSPDCL will provide power upto the compound wall / entrance gate. The secondary side of transformer will be 440V, 3-Phase 50 Hz. Short circuit protection shall be as per IEC, Type-2 Coordination. All instrument power will be 24 VDC and control 4-20 Ma.

e) Inspection, Pre-Dispatch Inspections and Testing by the KMC

- i) Bidder shall note that, all equipment manufactured within India shall be inspected from reputed third party inspection agency such as SGS / Bureau VERITAS. All costs towards inspection of this material shall be borne by the bidder. In case, the equipment are manufactured outside India then inspection shall be carried out by third party inspection agency such as SGS / Bureau VERITAS.

Sl. No	Name of the Equipment	Stages of inspection	
1.	Pumps	1	Review of material test certificate for pump casing, bowls, shaft, impeller bearings, columns pipe etc.
		2	Review of heat treatment certificate if any
		3	Dynamic balancing or rotating parts / impeller
		4	Examination of the shaft
		5	Hydro test of casing.
		6	Performance test at 49Hz and 50Hz frequency including vibration measurement covering following tests
		i)	Capacity in LPM / LPS
		ii)	Delivery Head in mtrs.
		iii)	Efficiency at the specified duty.
		iv)	Power absorbed by the pump at the specified duty.
		v)	N.P.S.H required.
		vi)	Maximum power required by the pump.
		vii)	Shut off Head of the pump.
		viii)	Discharge of the pump when only on pump is operated in the system.
		ix)	Delivery pressure when only on pump is operated in the system.
		x)	Power absorbed by the pump when only one pump is

Sl. No	Name of the Equipment	Stages of inspection	
			operated in the system.
		xi)	Efficiency of the pump when only one pump is operated in the system
		xii)	Visual and dimensional check.
		xiii)	Strip test.
		xiv)	Speed test at 49 Hz and 50 Hz frequency
2.	Motors	1.	Dynamic balancing of rotor and visual examination of rotor assembly.
		2.	Visual inspection and testing of stator assembly
		3.	Review of Test Certificate for conductor, Stator Coils, shaft Bearings etc.
		4.	Routine test no load x load test vibration measurement as per IS
		5.	Verification of type test report.
		6.	Visual and dimensional check.
3.	Switch Gear and Electrical Panels	1.	Visual and dimensional check.
		2.	Verification of bill of materials.
		3.	Functional Test.
		4.	H.V / I.R. Test.
		5.	Verification of type test reports.
		6.	Voltage ratio, burden class, induced high voltage, applied high voltage test for potential transformers
		7.	Current ratio, burden, class of accuracy, test for current transformers.
		8.	Rate symmetrical breaking capacity, rated making capacity, rated short time current, auxiliary voltage for release coils, Impulse with Standard voltage test for Switch Gear panels.
		9.	Test results of Relay provided.
4.	Transformer	Visual inspection, dimensional check and verification of bill of materials. Iron losses and Copper losses test at 90% of the rated voltage, 100% rated voltage and 110% of the rated voltage. Resistance voltage test at HV side and L.V side. Routine tests as per IS:2026. Verification of type results, temperature rise test, Impulse test, Insulating oil test etc.	
5.	Capacitor	All routine and type test as per IS:2834 such as sealing test, test for output / capacitance, Insulation resistance test between terminals. Containers and loss angle measurements, test for efficiency of discharge divide, test for dielectric loss angle, thermal stability test, self-healing test, voltage test between terminals.	
6.	Cables	Visual Inspection and dimensional check. Routine test as per IS: 1554.	

Sl. No	Name of the Equipment	Stages of inspection
		Insulation test, resistance test, current rating test, star reactance test, star capacitance test, short circuit current test, voltage drop test.
7.	Valves	Visual and dimensional check. Review of material test certificate for Valve body and internal parts. Operational smoothness. Hydrostatic test / leakage test as per applicable code.
8.	Pipes & Specials	1. Visual and dimensional check. 2. Review of chemical and physical test certificates as per the relevant Indian Standard specifications. 3. Hydrostatic pressure test as per the relevant Indian Standard specifications. 4. Ultrasonic testing of welded joints for MS pipes 5. Checking the integrity of epoxy lining for MS pipes at joints after laying and jointing pipes.
9.	Penstock Gate	1. Visual and dimensional check. 2. Review of chemical and physical test certificates as per the relevant Indian Standard specifications. 3. Hydrostatic pressure test as per the relevant Indian Standard specifications. 4. Checking the integrity of epoxy lining
14.	EOT Crane	1. Visual and dimensional check. Load test at 25% in excess of rated load. Test for Deflection Test for lifting speed.
15.	Actuators	1. Visual and dimensional check. 2. Speed for actuation 3. All the manufactures test certificates shall be submitted. If the KMC desires any test, bidder shall arrange to perform the same at no extra cost.
16.	Motors and Reduction Gears	Visual and dimensional check-up. Test for speed All the manufactures test certificates shall be submitted. If the KMC desires any test, bidder shall arrange to perform the same at no extra cost.
17.	PLC, Automation, Field equipment	Visual and dimensional check-up. Checking for suitability in terms of connecting, fitting, auxiliary voltage, necessary change over contracts. Test certificate of all equipment and performance of equipment after connecting all controllers at local level and at remote level through controller. Display in terms of appropriate units and satisfactory calibration. Any error shall be removed. Coding and addresses of all inputs and outputs. Graphical representation alarm generation.

In addition to these the bidder shall carry out test of the other equipment in the presence of the KMC engineers and shall submit test certificates for approval.

f) Guarantee

i) The Bidder shall guarantee all plant and machinery and their equipment supplied under the Contract, including erection and commissioning works, to be suitable for the application for which it is designed, and against defects due to manufacture or poor workmanship for a period of 12 months from the date of satisfactory completion of the stipulated trial run period. The Bidder shall be responsible to replace, free of cost, the whole equipment or parts thereof which may be found defective during this period, and to ensure the proper working of the equipment during the guarantee period. In case the Bidder fails to repair or replace any defective Equipment & machinery and equipment or part(s) thereof within 30 days from the date of intimation of any defects by the Engineer In-charge, the same will be done by the KMC/Engineer In-charge at the Bidder's cost.

ii) If it becomes necessary for the Bidder to replace or renew any defective portion of the plant or equipment under this Sub-Clause, the plant and equipment, so replaced and the work so renewed shall be guaranteed for a further period of 6 months from the date of replacement or renewal. Only genuine spare parts are to be used under the supervision and with approval of Engineer-in-Charge.

g) Certificates and Drawings for Electrical Installations

The Bidder shall furnish all the necessary data, drawings, layouts and test certificates, etc., as may be required by the power distribution agency and the Electrical Inspectorate Authorities in respect of all electrical installations and shall obtain any required approvals or clearances. Necessary assistance will be given by the KMC in this respect. It would be obligatory on the part of the Bidder to obtain such sanctions and approval of the electrical load from the concerned authorities

h) Suitability of Equipment for Indian Tropical Conditions

All plant and equipment supplied under the Contract shall be suitable for operation under the climatic and operating conditions prevailing at the Site. All parts, surfaces and sealants which are subject to corrosion shall be made of such materials, and shall be provided with such protective finishes, as are appropriate to protect the installed equipment from deterioration or injury due to the climatic conditions or operating environment. All electrical and auxiliary equipment shall be specially treated for Indian tropical conditions especially in city of Kota.

i) Display Panels

The Bidder shall provide such charts and drawings as are appropriate to clearly illustrate the process, operation and maintenance requirements of the plant and facilities provided under the Contract. Such charts and drawings shall be mounted on a panel, protected with a glass cover, and affixed on to the wall(s) of the plant/pump house/control room, as the case may be, and shall include, as appropriate, the following:

- General arrangement drawings.
- Wiring diagrams and detailed drawings of all electrical and mechanical installations.
- Assembly drawings for electrical and mechanical equipment.
- Charts indicating operations and maintenance details and schedules for electrical and mechanical equipment.
- Lists of commonly used spare parts and tools

j) Installation of Plants & Machineries

In case of all Electrical & Mechanical Equipment, plant & Machinery and fittings etc., the tendered rate shall include the costs of supplying, installation/erection, fixing in position, testing and commissioning etc. at the site of work. No extra charges shall be payable on this account by the KMC. 6 sets of completion drawings, complete set of equipment brochures, dimensional details, approved drawings, installation manuals, pre commissioning tests, commissioning tests required to be carried out, shall be kept & made available at site for inspection of the KMC's officers. These sets will be given to Engineer-in-charge before commencement of supply/erection of equipment.

3.1.4 CIVIL SPECIFICATIONS (applicable to all units in tender)

All the building and structure works shall generally comply with the following Requirements:

- 1) All building works shall be reinforced concrete framework with concrete floors and roofs.
- 2) All internal partition walls except for toilet shall be in 230 mm thick brick masonry built in cement mortar 1:5 with transoms and mullions as in (2) above. Toilet partition walls shall be in 115 mm thick brick masonry built in cement mortar 1:4 and shall have transoms and mullions similar to (2) above and shall form panels not exceeding 1200 mm x 1200 mm in size.
- 3) Toilet floor slab shall be filled with brick bat cobs (broken bricks in lime) and provided with waterproofing as per the specifications of an approved specialist waterproofing company.
- 4) The finished floor level in toilet areas shall be 25 mm below general finished floor level elsewhere in the building.
- 5) The toilet facilities shall be provided in Administration-cum-Laboratory building separately for men and women which include at least:
 - 6) 2 Nos. Toilet (1 no. for men and 1 no. for women) with white porcelain Orissa pan minimum 580 mm long with flushing cistern of 10 liters capacity.
 - 7) ii) 2 Nos. wash basins (1 no. for men and 1 no. for women) of size 510 mm x 400 mm in white porcelain with inlet, outlet and overflow arrangements,
 - 8) iii) 2 Nos. mirrors (1 no. for men and 1 no. for women) of size 400 mm x 600 mm wall mounted type fitted over wash basins.
 - 9) iv) 2 Nos. plastic liquid soap bottles (1 no. for men and 1 no. for women)
- 10) Nos. chromium plated brass towel rails (1 no. for men and 1 no. for women) minimum 750 mm long,
- 11) All stopcocks, valves and pillar cocks shall be heavy-duty chromium plated brass.
- 12) All fittings such as "P" or "S" traps, floor traps, pipes, down take pipes etc.
- 13) The sewage from toilet blocks shall be led to the nearest wet well.
- 14) All staircases shall have 25 mm thick chequered mosaic tiles for treads and 25 mm thick plain mosaic tiles of approved shade for risers set in cement mortar or lime mortar to give an overall thickness of 50 mm.
- 15) All floor cut-outs and cable ducts, etc. shall be covered with pre-cast concrete covers in outdoors areas and mild steel chequered plates of adequate thickness in indoor areas. All uncovered openings shall be protected with **galvanized GI** hand railing.
- 16) All staircases shall be provided with MS galvanized and **GI** hand railing for protection.
- 17) For the entire finished roof surface shall have adequate slope to drain quickly the rainwater to rainwater down take inlet points.

- 18) For roofing drainage, CI rainwater down takes with CI bell mouth and MS grating at top shall be provided. For roof areas up to 40 sq.m. Minimum two nos. 100 mm diameter down take pipes shall be provided. For every additional area of 40 sq.m. Or part thereof, at least one no. 100 mm diameter down take pipe shall be provided.
- 19) 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.
- 20) All doors, windows, rolling shutters shall have lintels above. Chajja protection to lintels on external walls shall be such as to prevent the rainwater splashing into the building. The minimum width of chajja for doors, windows, and rolling shutter shall be 750 mm, 600 mm, and 900 mm respectively.
- 21) All windows and ventilators shall have 25 mm thick Tandoor/Kota stone still bedded in cement mortar (1:3)
- 22) All concrete channels and ducts use for conveying liquid shall have inside width; be less than 500 mm. All open channels shall be provided with hand railings. All such channels, which are more than 1000 mm above finished plot level, shall provide with walkways for access.
- 23) Kerbs to be provided below the hand railing on the catwalks/pathways should be per relevant sections of Factor Act.
- 24) Wherever equipment and machinery are to be moved for inspection, service replacement etc., and suitable movable gantry of minimum capacity of 2 tons or more; required shall be provided with monorail and operating equipment.
- 25) The design of buildings shall reflect the climatic conditions existing on site. Process buildings shall be as far as is possible permit the entry of natural light.
- 26) The Laboratory, Chlorine House and office building shall be provided with two drinking water taps of 20 mm size with adequate inlet and out connections.
- 27) The sidewalls of buildings shall, except those used for storage and handling Chlorine gas comprise at least 15% ventilation areas. Ventilated brickwork louvers shall not be used where the ingress of driven rain could affect plant or stored materials.
- 28) All walkways, staircase, platforms etc., shall be minimum 1200 mm wide and will be provided with hand railing on one or both sides as required.
- 29) The floor shall generally be made of 150 mm thick concrete slab on grade with mm thick rubble soling and polyethylene sheet. The grade slab shall be provided with TOR 8 mm reinforcement Bars at 200 mm c/c both ways.
- 30) All hardware fittings and fixtures for doors, windows and louvers (e.g. Hinges, locks, latches, stay doorstops, door closers, floor springs) shall be heavy matching to the size and weight of the door window/ventilator shutters. These operate easily without hindrance secure properly without jamming; require nominal maintenance durable under prevailing site/weather conditions.
- 31) Suitable steps and/or ramp with overhead RCC Canopy shall be provided as requirement, at the entrances of the buildings.
- 32) 1,000 mm wide Plinth Protection (Apron) shall be provided all around Building/Sheds.

1. Civil Works for TTP

1.1 Survey Work

The Bidder shall carry out detailed survey work and submit both soft and hard copies of contour drawings with spot levels with 10 m x 10 m grid to the KMC. Necessary information such as

reference to the location as proposed for the treatment plant by him with respect to site boundary. The investigations necessary to obtain HFL, Nala section and river section shall be done. The entire structure shall be proposed in such a way that the outlet of the TTPs shall be above the HFL. The detailed survey shall be carried out with GTS bench mark and TBM shall be established in TTPs area for construction purpose.

1.2 Geotechnical Investigation

The Bidder shall carry out Geotechnical Investigation work at the proposed location of treatment plant. The no. of bore holes to be taken, depth of boring etc. shall be decided in consultation with the Engineer In-charge. The Bidder has to provide the hard and soft copies of the test reports. If the bearing capacity of the soil found lower than that is mentioned in the soil report provided with the Tender document, the lower of the two values shall be considered for design.

1.3 Structural Design

The Bidder shall have to do the structural design considering the survey details and geotechnical investigation details like safe bearing capacity, seismic forces, depth of water table and hydraulic flow diagram. Minimum grade of concrete shall be M30 and steel Fe500 TMT for water retaining structures. For building work minimum grade of concrete shall be M25. The bidder has to carry out additional investigations required if any for carrying out the structural design. Rock anchoring shall be carried out if required wherever uplift is considered. The design of plant units and Buildings – if any, shall be submitted by the Bidder in soft and hard copies, with General Arrangements and detail RCC drawings. The design of units shall be finalized in consultation with the Engineer – in – Charge. The design of units shall be as per relevant BIS or other Indian/international standards in absence of BIS or sound engineering practice. The bidder has to comply the queries raised during the scrutiny and if required has to redesign the structure till the structural designs are finally approved. The requirements to be fulfilled by the Bidder are described in detail in the general civil specifications and particular specifications for civil work for sewage treatment plant. Pressure releasing valve to release sub soil water pressure shall be allowed at appropriate locations.

1.4 Construction Works

The Bidder shall construct the civil units of the plant to accommodate the mechanical units to fulfil the requirement of process design. There shall be adequate working space, accessibility considerations like RCC staircase or ladders, walkway with proper width, hand railing, etc. wherever needed. For Buildings, there shall be additional items like ventilation and lighting requirements, flooring and finishing (hard flooring like granite for machine bearing floors) etc. The civil units shall be constructed such that there is proper accessibility for repair or replacement of mechanical equipment. Any concreting shall be done only after approval of Engineer – in – charge. All construction work shall be carried out as per the provision of CPWD specifications unless otherwise mentioned in the document.

The finished GL of the TTPs premises shall be above HFL.

1.5 Equivalency of Standards and Codes

Wherever reference is made in the Contract to specific standards and codes to be met by the goods and materials to be furnished, and work performed or tested, the provisions of the latest current edition or revision of the relevant standards and codes in effect shall apply, unless otherwise stated in the Contract. Where such standards and codes are national or related to a

particular country or region, other authoritative standards which ensure an equal or higher quality than the standards and codes specified will be acceptable subject to the Engineer's prior review and written approval. Differences between standards specified and the proposed alternative standards must be fully described in writing by the Bidder and submitted to the Engineer at least 28 days prior to the date when the Bidder desires the Engineer's approval. In fee event the Engineer determines that such proposed deviations do not ensure equal or higher quality, the Bidder shall comply with the standards specified in the Bid Documents.

1.6 Sign Board

The Bidder at his own cost, shall provide sign boards at approved locations, in English and Hindi at the site of the Works of approved size and design which provides

- (i) The name of the Project,
- (ii) The name and addresses of the KMC, the Bidder and the Consultant.
- (iii) The name and short description of the Project and
- (iv) The starting and completion dates. Bidder shall take care of signboard and re-do it in case of loss, damage, theft etc., as desired by the Engineer In-charge.

1.7 Assurance Programme/Sample Tests

Bidder shall be responsible to develop a quality control program and to all necessary materials, apparatus, instruments, equipment, facilities and qualified staff for sampling, testing and quality control of the materials and the under the Bidder. Without limiting the generality of the foregoing, the actor shall either (i) establish a testing laboratory at the site of Works which be adequately equipped and staffed to carry out all sampling and testing in accordance with the requirement set out in the Tender document specifications provide all field equipment and apparatus as necessary to conduct all in-situ tests and/or any Tests on Completion, or (ii) arrange for routine sampling, testing and reporting, as required, through a certified independent laboratory acceptable to the Engineer In-charge. The Bidder shall obtain the approval of the Engineer In-charge for the quality control programme developed by him and incorporate any modifications suggested by the Engineer In-charge at no extra cost.

All costs of such sampling, testing and reporting of test results will be borne the Bidder, and the Bidder shall include sufficient provisions in his; tendered rates to allow for independent sampling and laboratory testing under the direction of the Engineer In-charge. The Bidder shall furnish certified copies of all test reports to the Engineer In-charge within 3 days of completion of the specified tests.

The Bidder shall, within 14 days after the date of the issue of Letter of Acceptance, submit to the Engineer In-charge for his consent a detailed description of the arrangements for conducting the quality control programme during execution of the Work, including details of his testing laboratory, equipment, staff and general procedures. If following submission, or at any time during the progress of Works, it appears to the Engineer In-charge that the Bidder's quality control programme is not adequate to ensure the quality of the Works, the Bidder shall produce a revised programme, as desired by the! Engineer In-charge, which will be adequate to ensure satisfactory quality control, in case of the Bidder will fail to ensure quality control program the action deem fit will be taken against the Bidder. The KMC shall carry out supervision and quality control and monitoring the progress of works.

1.8 Protection of Utilities

The Bidder is required to carefully examine the location of the Works and their alignments and to make special enquiries with all authorities concerning utility lines such as water supply, sewers, gas pipe, telephone (underground and/or overhead) lines, electric cable (underground and/or overhead) etc., and determine and verify to his own satisfaction the character, sizes, position and lengths of such utilities from authentic records. The Bidder shall be wholly responsible for the protection and/or facilitating relocation of such utilities as may be required and shall not make any claim for extra work or extra time that may be required to protect or facilitate relocating such utilities. If any major shifting realignment of water supply, sewers, gas pipes, electric and telephone lines is necessary due to their interference with the proposed Works, the same may be done by the Bidder. The cost of such relocations will be borne by the Bidder.

1.9 Erection

Bidders have to note that various major items shall be procured / executed under this Contract subject to inspection by the KMC or their authorized representatives at manufacturer's premises. Cost of inspection shall be borne by Bidder

1.10 Testing of Concrete

Testing of Concrete shall be carried out as per IS4926: 1976. The bidders shall send three flexural beams to the laboratory for every ten slabs, or part thereof, for testing flexural strength. The admixture used shall conform to IS 9103-1979 reaffirmed on 1990 or AS1 C-494 of 92.

All taxes/duties etc. will be borne by the bidders and not by the KMC. No extra payment will be made for the use of admixtures.

2. Mechanical Equipment for TTPs

The Bidder shall have to design, supply, erect and commission the mechanical equipment as proposed by him in the treatment train to achieve the required parameters. The design, material of construction and type of various mechanical equipment shall conform to the standards laid in various sections of Tender document.

3. Electrical and Instrumentation / Automation System

The Bidder shall design, shop test, supply, transport, storing at site, erecting, testing and commissioning all electrical equipment and instruments required for the plant as per general specifications, specific specifications for electrical works, typical power distribution scheme and typical control system architecture

4. Disposal of Excavated Stuff

It will be the responsibility of Bidder to dispose all the excavated stuff within the KMC limits or as directed by Engineer In-charge.

5. General Utilities

For the proper functioning of the proposed works of TTP, connection for rising mains, sewage channel, the other general utilities necessary for the proper functioning of the proposed works which shall be included under this Contract are :

- Internal & outdoor lighting, plant water supply and sanitation, waste disposal, etc.
- Electric substations and distribution of power supply to all necessary points

- Street and yard lighting and fire hydrant system for the TTP.

6. Safety Equipment:

Safety Equipment should be provided at TTP as per the recommendation of Inspector of Industries. Bidder shall Also, take care of safety compliance as applicable from time to time as per safety rules/Factory act/Indian Electricity regulations/manuals/manufacture's special instructions.

7. Model of the Project:

A 3D working Model of the Plant shall also be submitted by the Bidder. The size of the Model shall not be less than 1.2 m x 2.0 m. The Model shall be within a wooden Box having glass on its top and kept over a Table for display.

8. Operation and Maintenance Cost

All the cost for Operation and Maintenance of the Plant such as Chemicals and Consumables, Manpower, Spares, Repair and Maintenance of Civil, Mechanical, Electrical, Instrumentation Items including all other major/minor repairs, breakdowns, replacements etc. **excluding Cost of Electricity and Diesel for DG** shall be in the scope of the Bidder. **No extra payment other than whatever has been quoted in Price Schedule will be entertained by the KMC.**

9. Contract Period

The total Contract Period shall be as follows:

Construction Period : 24 Months (including Monsoon & trial run)

Stabilization & Trial & Run Period: 3 Months

O&M Period : 15 Years including 18 months defect liability period

10. Laboratory Equipment

Laboratory equipment shall be provided as mentioned below:

S.No	Item Description	Unit	Qty
A	Laboratory Instruments		
1	Digital Spectrophotometer	No.	1
2	Cuvette 50mm	No.	1
3	Cuvette 10mm	No.	2
4	Digital Nephelometer	No.	1
5	T D S meter	No.	1
6	Magnetic Stirrer	No.	1
7	Hot Plate with regulator	No.	1
8	Autoclave portable	No.	1
9	Digital pH meter	No.	1
10	Distilled water plant	No.	1
11	Vacuum Desiccator	No.	1
12	Vacuum Pump	No.	1
13	Centrifuge	No.	1
14	Microscope	No.	1
15	Digital Colony Counter	No.	1

17	Water Bath Thermostatic	No.	1
18	Digital Muffle Furnace	No.	1
19	Lab. Oven	No.	1
20	Bacteriological Incubator	No.	2
21	B.O.D. Incubator, made by Refrigerator	No.	2
22	Single Pan Balance	No.	1
23	Inoculation Chamber	No.	1
24	Gas stripping Apparatus	No.	1
25	Membrane filter Assembly	No.	1
26	Membrane filter Disc	No.	1
27	Heating Mantle	No.	1
28	Fume Hood	No.	1
29	Thermometer with calibration	No.	1
30	Kjeldahl Distillation Assembly	No.	1
31	Flow Meter	No.	1
32	Reduction Column	No.	1
33	Activated Carbon Column	No.	1
34	ERTL Approved calibration Certificate	No.	10
B	Laboratory Glassware		
1	Amber coloured bottle, 1000ml	No.	4
2	Amber coloured bottle, 500ml	No.	10
3	Amber coloured bottle, 250ml	No.	12
4	Amber coloured bottle, 125ml	No.	6
5	Plain wide mouth bottle, 1000ml	No.	1
6	Plain bottle, 1000ml	No.	4
7	Plain bottle, 500ml	No.	10
8	Plain bottle, 250ml	No.	52
9	Plain bottle, 125ml	No.	6
10	Beaker, 1000ml	No.	2
11	Beaker, 500ml	No.	4
12	Beaker, 250ml	No.	4
13	Beaker, 100ml	No.	4
14	Beaker, 50ml	No.	2
15	Plastic Beaker, 500ml	No.	3
16	Plastic Beaker, 250ml	No.	3
17	Measuring Cylinder, 500ml	No.	3
18	Measuring Cylinder, 250ml	No.	2
19	Measuring Cylinder, 100ml	No.	1
20	Volumetric flask, 500ml	No.	4
21	Volumetric flask, 250ml	No.	4
22	Volumetric flask, 100ml	No.	8
23	Grouch crucible G-4	No.	1
24	Grouch crucible G-3	No.	1
25	Silica dish	No.	1
26	Filter funnel	No.	4
27	Screw capped tube, 50ml	No.	12
28	Screw capped tube, 30ml	No.	12
29	Nessler's Cylinder, 100ml	No.	8

30	Durham's tube	No.	3
31	Test tube, 20ml	No.	60
32	Test tube, 10ml	No.	15
33	Round bottom flask, 500ml	No.	1
34	Round bottom flask, 100ml	No.	3
35	Flat bottom flask, 500ml	No.	1
36	Flat bottom flask, 250ml	No.	3
38	Separating funnel, 500ml	No.	2
39	Separating funnel, 125ml	No.	4
40	Separating funnel, 1000ml with Teflon	No.	1
41	Dropper	No.	4
42	Glass rod	No.	10
43	Graduated pipette, 25ml	No.	3
44	Graduated pipette, 2ml	No.	2
45	Petri plate 4"	No.	60
46	Conical flask, 500ml	No.	3
47	Conical flask, 250ml	No.	3
48	Iodine flask, 250ml	No.	2
49	Condenser	No.	2
50	Burette, 50ml	No.	3
51	Boiling Beads	Kg	0.5
52	Watch Glass	No.	2
53	Cover Slip	No.	2
54	PP Measuring Cylinder, 100ml	No.	2
55	PP Conical flask, 250ml	No.	2
56	PP bottle 250 ml	No.	6
57	Tripod Stand	No.	2
58	Wire gauge	No.	10
59	Watman filter paper No. 1/2	No.	1
60	Watman filter paper No. 40/42	No.	1
61	Test tube stand	No.	1
62	Pipette stand round	No.	1
63	Burette Stand	No.	1
64	Non-absorbent cotton	No.	2
65	SS Spatula	No.	2
66	SS Tong	No.	2
67	Test tine	No.	2
68	Tissue role	No.	2
69	Gas burner	No.	2
C	Laboratory Chemicals		
1	Ammonia buffer soln.	ml	500ml
2	Activated charcoal	gm	500gm
3	Ammonium Dichromate	gm	500gm
4	Ammonium acetate	gm	500gm
5	Ammonium chloride	gm	500gm
6	Ammonium hydroxide	gm	500ml
7	Antimony metal powder	gm	500gm
8	Azomethane H	gm	2gm

9	Acetic acid Glacial	ml	500ml
10	Ammonium oxalate	gm	500gm
11	Aluminium potassium sulphate	gm	500gm
12	Ammonium carbonate	gm	500gm
13	4 - Aminino antipyrine	gm	25gm
14	Acetone	ml	500ml
15	Ascorbic acid L	gm	100gm
16	Buffer tbt 4.0	tbt	10tbt
17	Buffer tbt 7.0	tbt	10tbt
18	Benzene	ml	500ml
19	Boric acid	gm	500gm
20	Barium chloride	gm	500gm
21	Barium hydroxide	gm	500gm
22	Calcium chloride	gm	500gm
23	Cobaltous chloride	gm	100gm
24	Chlorotex Reagent	ml	100ml
25	Citric acid	gm	500gm
26	Cyclohexanone	ml	500ml
27	Calcium hydroxide	gm	500gm
28	Copper metal powder	gm	500gm
29	Chloroform	ml	500ml
30	Cupric sulphate	gm	500gm
31	Chromotropic acid	gm	25gm
32	Dodecyl benzene sulphonic acid	gm	500gm
33	Di ammonium hydrogen orthophosphate	gm	500gm
34	Ethyl acetate	ml	500ml
35	Ethanol	ml	500ml
36	E D T A	gm	100gm
37	Erichrome Cyanine R	gm	5gm
38	Ferric chloride	gm	500gm
39	Ferric citrate	gm	500gm
40	Ferrous ammo sulphate	gm	500gm
41	Formaldehyde	ml	500ml
42	Gelatin powder	gm	500gm
43	Glycerine	ml	500ml
44	Hydrazine sulphate	gm	100gm
45	Hexamethylene tetramine	gm	500gm
46	Hydrochloric acid	ml	500ml
47	Hydrogen peroxide	ltr	1ltr.
48	Hydroxylamine Hydrochloride	gm	100gm
49	Iodine resublimed	gm	100gm
50	Iso Propyl alcohol	ml	500ml
51	Methanol	ml	500ml
52	Mercuric chloride	gm	250gm
53	Neocuprone (2, 9 dimethyl 1, 10 (N1-napthyl) ethylene dihydrochloride	gm	1gm
54	NED dihydrochloride		5gm
55	Nitric acid	ml	500ml

56	N,N dimethyl - P - Phenylene diamine oxalate	gm	5gm
57	Orthophosphoric acid	ml	500ml
58	Potassium chloroplatinate	gm	1 gm
59	Potassium iodine	gm	250gm
60	Perchloric acid	ml	500ml
61	Potassium dichromate	gm	500gm
62	Potassium chromate	gm	500gm
63	Potassium nitrate	gm	500gm
64	Potassium permanganate	gm	500gm
65	Patton &Reeders indicator	gm	5gm
66	Potassium cyanide	gm	5gm
67	Phenol crystal	gm	500gm
68	Potassium bromate	gm	500gm
69	Potassium bromide	gm	500gm
70	Potassium dihydrogen phosphate	gm	500gm
71	Potassium ferricyanide	gm	100gm
72	Potassium chloride	gm	500gm
73	Potassium metaperiodate	gm	100gm
74	1, 10 Phenanthroline	gm	5gm
75	Potassium hydroxide	gm	500gm
76	Rhodamine B	gm	25gm
77	Sodium acetate	gm	500gm
78	Sodium hydroxide	gm	500gm
79	Sodium chloride	gm	500gm
80	Sodium thiosulphate	gm	500gm
81	Sulphuric acid	gm	500ml
82	Sodium hydrogen carbonate	gm	500gm
83	Sodium carbonate	gm	500gm
84	Sodium sulphate	gm	500gm
85	Starch soluble	gm	500gm
86	Silver nitrate	gm	25gm
87	Sodium sulphite anhydrous	gm	500gm
88	Sodium ascorbate	gm	100gm
89	Sulphur dioxide solution	gm	500ml
90	Sodium fluoride	gm	500gm
91	Sodium metabisulphate	gm	500gm
92	Sodium nitrite	gm	500gm
93	Sodium oxalate	gm	500gm
94	Sucrose	gm	500gm
95	Sulphamizide	gm	500gm
96	Tri sodium citrate	gm	500gm
97	Tri ethanol amine	gm	500ml
98	1, 1, 2 trichloro trifluoro ethane	gm	250ml
99	Urea	gm	500gm
100	Zinc dust	gm	500gm
101	Zincon	gm	1 gm
102	Zinc sulphate heptahydrate	gm	500gm
103	Zinc acetate	gm	500gm

D	List of Media		
1	Aspergine praline broth	gm	100gm
2	Andrede peptone water	gm	100gm
3	Brilliant green bile broth 2%	gm	100gm
4	Chloramphenicol yeast glucose agar	gm	100gm
5	Differential reinforced clostridial medium	gm	100gm
6	EMB Agar	gm	100gm
7	Lactose broth	gm	100gm
8	MacConkey's broth	gm	100gm
9	MacConkey's agar	gm	100gm
10	Milk agar with cetrinide (Twin)	gm	100gm
11	MR-VP Medium	gm	100gm
12	Nutrient broth	gm	100gm
13	Nutrient agar No. 2	gm	100gm
14	Peptone water	gm	100gm
15	Plate count agar	gm	100gm
16	Simmon's Citrate agar	gm	100gm
17	Tergitol - 7 agar base	gm	100gm
18	Violet red bile agar	gm	100gm
E	list of Indicators		
1	Brilliant green	gm	25gm
2	Bromocresol purple indicator	ml	125ml
3	Bromocresol green	ml	125ml
4	Crystal violet	ml	125ml
5	Eosin	ml	125ml
6	Methyl orange	ml	125ml
7	Methyl red	ml	125ml
8	Methylene blue	ml	125ml
9	Muraxide (Ammono Purpurte)	gm	5gm
10	Neutral red indicator	ml	125ml
11	Phenol phthalein indicator	ml	125ml
12	Erichrome black T	gm	25gm
13	Universal indicator	ml	125ml
14	Phenol red	ml	125ml
15	Gram iodine stain	ml	125ml
16	Bromothymol blue	ml	125ml
F	Providing Furniture for the Laboratory		Qty.
1	Providing, manufacturing & supplying Working table of approx. size 1200mm X 600mm & 750mm height with 4 Drawers of 300 mm width, in marine plywood finish with inside the drawers including all hardware etc. complete		3 Nos.
2	Providing, manufacturing and supplying Side table of specifications same as working table but along wall.		4 Nos.
3	Providing, manufacturing and supplying Running table of specifications same as side table but along wall and 450 mm deep.		2 Nos.
4	Providing, manufacturing, supplying and fixing Storage unit above the running table in marine plywood of approx.		2 Nos.

	450mm deep and 600mm height with shelves, shutters including all hardware, 1.5mm thick laminate on External face & wax polish internally.	
5	Office Chairs	16 Nos.
6	Steel Almirah	2 Nos.

ANNEXURE – E-II

SPECIFICATIONS FOR GROUND SERVICE RESERVOIR (GSR) CUM UF FEED SUMP OF 4000 CUM CAPACITY

1.1. Details of scope of work for GSR CUM UF FEED SUMP, but not limited to followings:

Provision of UF feed sump (i.e. underground RCC M-30 tank) of 4000 m³ for feeding secondary treated sewage from CCT of STP to UF / RO with necessary electrical / mechanical in capacity instruments, inter connecting pipe, with necessary arrangements of valves, gates and secondary treated sewage pumping arrangement by CI/DI/MS pipeline up to UF system.

	Type	MOC	Quantity	Flow
UF feed sump (Covered with RCC Slab)	Underground	RCC M-30	1	4000 m ³

- (i) Trial Pit-Bidders are advised to carry out their own trial pit sections to get the idea of soil conditions at its own cost before quoting the offers.
- (ii) Geotechnical investigations for determination of SBC
- (iii) Approval of Design and Drawings as per tender document
- (iv) Construction of Levelling course of PCC (1:2:4) for foundation.
- (v) Casting of RCC foundation & Pedestals
- (vi) Casting of RCC complete staging up to bottom slab of container with brace beams..
- (vii) Casting of vertical walls of reservoir/container complete
- (viii) Casting of Top Dome/Slab
- (ix) By-Pass arrangement
- (x) 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.
- (xi) RCC Valve Chambers with RCC Covers. RCC Stair Case from Ground Level to roof of the GSR with gate to be provided.
- (xii) Providing and Fixing of all accessories such as Lightning Arrestor and Earthing Pit, Digital Water Level Indicator, Aluminium Ladder from Roof to inside of Floor Level of Tank, Ventilating Cows/Shaft, Manhole Covers with Frame complete at site including approval by the Third-Party Inspection.
- (xiii) Providing and supplying of three row of 25 mm Dia, G.I. medium class pipe Railing with RCC "L" type column 1000 mm height @ 1.5m C/C OR 50x50x6mm M.S. angle iron post 1m high. The stair case will be closed by a M.S gate with jali as per the direction of Engineer-in-Charge at the ground level.
- (xiv) Backfilling of excavated foundation up to finished ground level from side of GSR.
- (xv) Painting as per Specifications.
- (xvi) Successful water tightness testing of work
- (xvii) Testing and Commissioning
- (xviii) All DI Specials shall conform to IS 9523
- (xix) Others works (if any) to complete the Job.

- (xx) Providing and applying epoxy paint of approved make to concrete surface of RCC
- (xxi) The work of construction of R.C.C. GSR involves specialised workmanship, hence requirement of higher standard than general concrete work is essential. The height of staging will be reckoned from ground level at the site and main road level to the site, i.e., the ground level at the site or road level whichever is higher shall be treated as the base level for determination of staging height. Back Filling with moorum, if necessary as per the site conditions, shall be in the scope of the bidder and nothing extra shall be payable on this account since construction of GSR being a lump sum item. The bidder shall construct proper plinth protection surrounding the GL brace to give finished look after construction.

The Ground service Reservoir should be flat bottom circular in shape supported on circular columns. The foundation, columns, bracings etc. should be so designed so as to have a provision for construction of a single storeyed building between GL bracing & first bracing with RCC roof and the live load of roof slab shall be taken as 300 kg/sq.-m and the dead load of roof slab shall be taken as 375 kg/sq.m.

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.

1.2. By-Pass arrangement

For uninterrupted supply in case of repair. Bidder shall make arrangement for providing By-pass arrangement for GSR and should submit layout drawing of same for approval of KMC.

While erecting DIDF pipes for Inlet, Outlet and Overflow and scour pipe arrangement, By-pass Arrangement shall be made directly connecting the Inlet pipe with Outlet Pipe before Inlet pipe entering the GSR and which shall have a controlling valve which will be closed always except when needed for repairs, O&M of GSR.

SBC of all structures should be done at a minimum depth of 3 meters from natural Ground Level. Bidder to carry out SBC at all sites as per the conditions of NIT and shall submit the test certificate to the department before submitting design. A detailed soil investigation to be done at certain locations/site where soil condition is not good at locations where poorly graded soil is found like backfilled site, along the river/nala, coal dust, pond etc. at such locations the soil testing along with SBC shall be done as directed by engineer in-charge at the Lump sum cost of the project for which no extra claim will be entertained. The SBC shall be calculated based on the shear as well as settlement criteria with detailed soil investigation report. Preferably standard penetration test to be done at such locations for SBC at the cost inclusive in NIT and as directed by engineer in-charge.

The Bidder has to carry out Plate Load Test or other tests through Government Engineering College / IIT /NIT to confirm the Safe Bearing Capacity of soil at stated location, and providing detailed SBC report as per technical specifications including following: -

SBC report shall give clear recommendations of the depth of foundation & type of foundation [raft or independent footings]. Bidder shall carry out Topographic survey within

the boundary area of the service reservoir, including providing benchmarks, at the reservoir location, which is to be maintained during the entire period of construction.

Bidder shall prepare and submit a General Arrangement Drawing of GSR covering items such as provision of **Ladder** within the container, ultrasonic level indicator, lightening arrestor, cage ladder, loc of out let pipe DI Double flanged pipe], plinth protection, **electrically actuated sluice valve**, Railing details with its MOC, sectional elevation of cage ladder& residual chlorine sensors.

Carrying out detailed structural design for the tanks in confirmatory to the technical specifications, including preparation of working / construction drawings.

Providing and installing flanged DI pipes of Class K-9 for inlet, outlet, overflow and SCOUR pipes, and specials (Bends, Tees, Duck-foot bend etc, of Class PN-25) confirming to technical specifications.

Providing & fixing DI sluice valves (compatible for fixing Electrical actuators) to be provided at Inlet, Outlet & washout pipes and as required for providing By-pass arrangement at each location.

In case of tanks whose external faces are exposed such as elevated tanks, the requirements of the tests shall be deemed to be satisfied if the external faces show no signs of leakage and remain apparently dry over the period of observation of seven days after allowing a seven-day period for absorption after filling.

Clause 12.1.2 [IS -3370-Part 1:2009] *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 further seven days and if specified limit is then reached, the structure may be considered as satisfactory.*

Clause 12.1.3[IS 3370 Part 1: 2009] *The roofs of liquid-retaining structures should be water-tight and should be tested on completion by flooding the roof with water to a minimum depth of 25 mm for 24 h or longer. if so specified. Where it is impracticable, because of roof slopes or otherwise, to contain a 25 mm depth of water, the roof should have continuous water applied by a hose or sprinkler system to provide sheet flow of water over the entire area of the roof for not less than 6 h.*

In either case the roof should be considered satisfactory if no leaks or damp patches show on the soffit.

Should the structure not satisfy either of these tests then after the completion of their medial work, it should be retested in accordance with this clause. The roof insulation and covering if any. should be completed as soon as possible after satisfactory testing.

During the Contract period, the bidder has to procure and install informatory board displacing Name of work (and specific details) at the location given by Urban Local Body at his own cost.

Disinfecting and cleaning the reservoir / tank before successful commissioning. Conduct necessary Water Tightness test for the service reservoir for successful commissioning of the system.

Mix Design for Concrete Works- in Mix Design, the proportions of the constituents (i.e., cement, coarse aggregates, fine aggregates, and water) shall be determined by weight. Concrete batching and mixing plant as per IS: 4925-2004. Water cement should be carried out as per design mix.

Preparation of GA, Structural & piping Design & drawings of the GSR.

Bidder shall submit Concrete mix designs to Engineer-in Charge for approval as prepared by Govt Engineering College /NIT Raipur CG, before commencing any work. The bidder shall get the Concrete Design Mix based on trial mixes of Concrete cubes made up of approved sand, coarse aggregate. This Concrete Design mix shall conform to IS-10262 (2009)-Concrete Mix Proportioning-Guidelines & clause 9.2 of IS-456 (2000) clearly specifying with complete details that Target Mean Compressive strength shall be achieved which is equal to Characteristic Compressive strength at 28 days (in N/mm^2) plus 1.65 times the standard Deviation (assumed as given in Table 8 of IS: 456 (2000)).

Acceptance Criteria of concrete cubes taken during construction

Clause 16.0 "Acceptance Criteria of IS: 456 (2000) shall be meticulously followed as regards Concrete cubes casted during execution of RCC work at site.

Compressive strength: Mean strength determined from any group of four consecutive test results shall comply with col 2 table 11 of IS-456. And any individual result shall comply with col 3 of Table 11 of IS-456.

Flexural Strength: Mean strength determined from any group of four consecutive test results shall exceed the specified characteristics strength by at least $0.3 N/mm^2$. Strength determined from any test results shall not be less than the specified characteristics strength by less than $0.3N/mm^2$.

To prepare "As Built" drawings, showing all details and submit the same for necessary approval after the completion of each reservoir as constructed. All codes and standards referred to in these Specifications shall be the latest revision thereof and codes which are not mentioned herewith but relevant to work shall be applicable.

1.3. Specific Requirements

The Bidder shall be responsible for design, supply and procurement, testing and commissioning and providing all materials, equipment and services, specified or otherwise which are required to meet the intent of this specification, ensuring high degree of reliability and ease of operation and maintenance in future. The equipment and system / sub-systems shall conform in all aspects to high standards of engineering and workmanship and shall be capable of performing in continuous operation, in a manner acceptable to the Employer. All codes and standards referred to in these Specifications shall be the latest revision thereof and codes which are not mentioned herewith but relevant to work shall be applicable. Bidder shall submit GA/Structural/plumbing drawings for approval of engineer.

The specifications for this work are as follows including cleaning of GSR Site and making appropriate approach to Site.

1.3.1. Earth work

- a. In all type of soils, boulders, ordinary rock, and hard rock (blasting prohibited) includes refilling and disposal of surplus earth as directed by engineer with all lead and lift, including dewatering by pumping or bailing out the water in watering condition, in foul condition or for any condition.
- b. In case Black cotton soil is encountered at site, the foundation of columns should be underlain with at least 600 mm thick layer of sand.
The bed of foundation should be made firm by ramming it well, on rammed bed a 60 cm thick layer of sand should be spread in layers of 15 cm each. Each layers of either stone or sand should be provided to desired height before placing foundation concrete-bed block upon it.
Additionally, around the mat foundation of columns & wall footing, a trench of 200 mm wide should be dug & soil replaced with sand.
Backfilling after casting of foundation should be carried out with sand only.
- c. In case BC soil extends deeper into the ground at site, the excavations shall be carried out until firm strata are reached to avoid of BC soil. The foundation shall be changed to raft foundation & revised structural drawing of foundation shall be prepared & submitted by the bidder's Structural Expert to KMC for approval.
- d. The Bidder 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 Bidder 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.
- e. 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 Bidder 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.
- f. The excess excavated material shall be carried away from the site of works as specified, failing which, in view of public convenience, the Engineer-in-charge may carry out the work by any other agency at the Bidder's risk and cost.
- g. 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.

1.3.2. Soil investigation

The Bidder 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 structures as per relevant IS codes:

- The soil investigation is necessary for finalization of the type of foundation of the structure and hence all necessary parameters like SBC, N-Value, Settlement, dry density, unit weight of soil, submerged unit weight of soil, water table, cohesion value, angle of internal friction etc. are required to be determined for design purpose.
- Soil sampling as per IS 1892-1979 disturbed and undisturbed soil samples.
- Soil classifications as per IS 1498

- In case of strip foundation, the bearing capacity/allowable bearing pressure calculation shall govern by IS 6403-1981, for shear calculation and IS 1904-1986 & IS 8009 (part-1) 1976 for consideration of settlement.
 - Record of boring shall be done as per appendix D (clause 6.5.1) IS 1892.
 - 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.
- 1.3.3. All plain cement concrete work to be of minimum M15 grade. All reinforced cement concrete work for water retaining portion like slab, beam vertical wall, slant wall and columns, staircase, balcony shall be in minimum M30 grade. **RCC staircase** to be provided. Spiral Staircase shall not be allowed
 - 1.3.4. All type of centring and shuttering of foundation, columns, beams, domes stair case, landings curved slabs etc. complete in all respect.
 - 1.3.5. Providing, supplying and fabricating of Thermo-Mechanically Treated (TMT-500) reinforcement bars of all sizes ISI Marked [duly approved by the Ministry of Steel] conforming to IS-1786 for all the components.
 - 1.3.6. No plaster work is required for the form finished surfaces of the RCC structures.
 - 1.3.7. Ventilator shall be provided with fly-proof wire mesh all around in all respect, as per direction of Engineer in charge.
 - 1.3.8. Painting 2 coats with approved shade of emulsion paint having five years warranty (I.S.I. marked) over primer all over the exposed R.C.C. surface of tanks. Inside the tank 2 coats of cement wash will be provided.
 - 1.3.9. Painting 2 coats with approved quality and shade of paint on G.I. pipe (used for railing) fitting & M.S. angle irons M.S. gate, M.S M.H cover, M.S ladder etc. over a primer coat of red oxide, shall be coated with two coats of approved black Japan Paint with arrow mark flow of water on pipes.
 - 1.3.10. The rates should include supply laying, jointing and fixing of D.I (D/F) pipes class (**K-9**) & valves with valve chamber for inlet, outlet overflow and washout including the supply and fixing of the puddle collars, valves & duck foot bends on proper foundation other jointing material such as rubber packing, nuts bolts, various, clamps, T&P for fixing of pipes and valves on the approval of these material by Engineer in Charge including making of sluice valves chambers.
 - 1.3.11. Required number and size of valves It should be fixed in ground with horizontal pipe with suitable size of valve chamber
 - 1.3.12. A Heavy duty SFRC **MH frames & cover – 2 Nos conforming to IS-12592 [2002]** and swan neck type ventilator shall have to be provided on **top slab of GSR**.
 - 1.3.13. Cleaning of site from garbage or any other unwanted material at site.
 - 1.3.14. Any special protection, if required, for foundation. Plinth protection at the finished ground level, with 100 mm thick cement concrete flooring in M-15mixshall be provided for an area which is 5metres more than the dimensions of tank on all sides.
 - 1.3.15. 1.2 m wide RCC Staircase on columns, with RCC landing from ground level to balcony and 0.75 m RCC stairs form **balcony to top slab** as per standard specifications along with three rows of 25 mm Dia GI Pipe medium class railing on both sides supported with RCC post or 50x50x6mm M.S. angle iron post 1m high. The stair case will be closed by a M.S gate with jali as per the direction of Engineer-in-Charge at the ground level.
 - 1.3.16. Balcony will be 1.2m wide having three rows of 25 mm dia. GI Pipe medium class railing supported with RCC posts or 50x50x6 mm M.S angle iron posts 1m. High at 2m. Interval along the periphery of the balcony and around the top dome.

- 1.3.17. Providing Steel ladder 600 wide consisting of 2 nos each 100 mm x 12 mm thick MS flat sections as stringer and 2nos. of bars of 25 mm of Dia as steps @ 300 mm c/c/ spacing. The bars of 25 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
- 1.3.18. Cleaning and dressing of the site of GSR as per direction of Engineer in Charge after constructions and testing of the tank, pipe and pipe fitting etc.
- 1.3.19. The tank shall be water tight. The testing of the tank will be done at the cost of the bidder. Water for filling, however, will be supplied to him free of cost, if available. The rate should include the cost of specials etc. complete.
- 1.3.20. The overflow pipe of the GSR will be connected to outlet pipe after chamber below ground level.
- 1.3.21. The GSR shall be designed by the bidder and all drawings and specifications of all components shall be got approved by the bidder from the Engineer.

This shall be a Lump Sum Contract comprising of Design and construction. The bidder shall have to make the arrangement for procurement/arrange all the material, tools and plants required for successful completion of work allotted. The main items of the material required shall be cement, bricks, sand, aggregate, steel, bricks, D.I. pipes, pipe fittings, valves, steel poles, cables, wires, light fixtures & fittings and other mechanical, electrical and civil related items for completion of the package. The bidder shall have to arrange standard quality material conforming to IS specifications and as per the requirement of bid document. The bidder shall arrange skilled and unskilled labour as and when required for completion of the work in stipulated time.

1.3.22. Plinth protection works around GSR -

Protection work shall be provided. It shall be circular in shape and 5m in width around the outer edge of wall. It shall have 1:60 slope from center and a drain be constructed all around the tank. The protection work shall be in M-15 grade concrete.

The Specific requirement related to Construction of the new service reservoirs is outlined below:

1.4. Reservoir Type and Structural requirement

The Ground Service Reservoir should be flat bottom circular in shape supported over foundation slab. The difference of level between lowest supply and full supply level of the tank and shall not be greater than 5.0 m.

The RCC stairs of 1.2 m width from ground level to the roof slab level should be provided. 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 out-side the supporting structures.

There shall be suitable arrangement for routing the overflow pipe into the delivery pipe. All pipes (Inlet / Outlet / Wash-out / Overflow) shall be suitably clamped with GI flat hoops/supports.

To avoid any accident at the time of cleaning or maintenance of the tank, the opening of the outlet and wash-out pipes should be covered with aluminium mesh of suitable size. Suitable

provision for flushing and disinfection of water tank shall be considered with the wash-out pipes. The wash-out pipes shall eventually allow easy passage for the water to drain out.

All proposed pipes, shall be Double flanged Ductile Iron (Class K-9) pipes, confirming to IS: 8329.

1.5. Arrangement of Valves

- All the inlet outlet/wash-out pipes shall be provided with Butterfly/slucice valves for running operation including maintenance activities. All valves provided shall be compatible with actuators.
- Pipes of diameter greater than 300mm shall be provided with butterfly valves, whereas pipes of diameter 300mm and less shall be provided with sluice valves. All Valves (Butterfly / Sluice) shall be provided with dismantling joints for ease of replacement. Unless specified otherwise, the pressure rating of the valves shall be 16 Kg/cm² (1.6 MPa).
- All valves shall be suitably enclosed in valve chambers with suitable pre-cast RCC cover.

1.6. Chambers

- All valves, dismantling joints shall be protected within R.C.C chambers.
- The foundation concrete shall be 1:3:6 (1 cement: 3 fine sands: 6 graded stone aggregate 40 mm nominal size) of minimum 150mm thickness and inside plastering with cement mortar 1:3 (1 cement:3 coarse sand) 12 mm thick finished with a floating coat of neat cement complete as per standard design.
- The chambers shall be of adequate dimensions to allow ease of operation and maintenance. The Bidder shall submit drawings for valve chambers for approval of the Engineer-in-charge.

1.7. Ultrasonic Water Level indicator: -Ultrasonic water level indicator shall comprise of electronic sensor system for accurate level marking with mercury level and all allied fittings such as electronic display board & battery backup etc. complete. These will be compatible to IOT BASED SCADA automation, monitoring and control system.

1.8. Painting and Lettering: -The GSR shall be finished with 2 coats of emulsion paint. The colour and shade of the paint shall be got approved by the Engineer. The inside of the tank shall be painted with good grade epoxy paint, acceptable to the Engineer-in-charge.

The name, location and capacity of each of the service reservoirs constructed shall be clearly written on the tank portion of the reservoirs.

The letters and figures shall be to the heights and width as ordered by the Engineer. These shall be stencilled or drawn in pencil and got approved before painting. They shall be of uniform size and finished neatly. The edges shall be straight or in pleasant smooth curves. The thickness of the lettering shall be as approved by the Engineer. Lettering shall be vertical or slanting as required. Two or more coats of paint shall be applied till uniform colour and glossy finish are obtained.

Black Japan paint (conforming to IS: 341) or ready mixed paint as ordered by the Engineer shall be used. The paint shall be of approved brand and manufacture. Ordinary ready mixed paint shall be of the shade required by the Engineer.

1.8.1. Employer's Requirements for Design works

The Bidder must fulfil the following requirements during contract execution stage:

Design for the service reservoir shall be got done from approved Government institute or as mentioned above in Instructions to bidders, acceptable to the Engineer-in-charge.

For each part of the Works, the prior consent of the Employer's Representative shall be obtained as regards the modalities of the design by the designer. However, nothing contained in the Contract shall create any contractual relationship or professional obligations between any designer or a design sub-bidder and the Employer. The Bidder shall carryout and be responsible for the design of the Works.

The Bidder holds himself, his designers and design sub-bidders as having the experience and capability necessary for the design.

The Bidder undertakes that the designers shall be available to attend discussions with the Employer's Representative at all reasonable times during the Contract Period.

The Design Requirements for the proposed service reservoirs shall be as stated below:

1.8.2. Load Combination and Stress

The different load combinations shall be taken as per IS: 875 (Part-V) and other relevant IS Codes.

1.8.2.1. **Dead Loads:** Dead loads shall include the weight of structure complete with finishes, fixtures and partitions and shall be taken as per IS: 875 (Part-I).

1.8.2.2. **Imposed Loads:** Imposed loads in different areas shall include live, erection, operation and maintenance loads. Equipment loads (which constitute all loads of equipment to be supported on the building frame) are not included in the imposed loads furnished below and shall be considered in addition to imposed loads. For consideration of imposed loads on structures, IS: 875 (Part – II) "Code of practice for design loads (other than earthquake) for buildings and structures" shall be followed. The following minimum imposed loads as indicated for some of the important areas shall However, be considered for the design. If actual expected load is more than the specified minimum load, then actual load is to be considered.

1.8.2.3. **Seismic load:** For design of all structures the seismic loads shall be considered and structure designed as per the provisions of IS-1893 (latest draft code) and detailing of reinforcement shall be done as per the provisions of IS-13920 (latest). The various design parameters, as defined in IS: 1893 (Part 1), to be adopted for the project site shall be as follows:

- a) Zone-II (As per IS)
- b) Zone factor = As per table given in IS:1893 (Part 1)
- c) Importance factor = 1.5
- d) Response reduction factor = 3.0
- e) Average response acceleration co-efficient as per site condition and building configuration

1.8.2.4. **Temperature Load:** For temperature loading, the total temperature variation shall be considered as 2/3 of the average maximum annual variation in temperature. The structure shall be designed to withstand stresses due to 50% of the total temperature variation. Suitable expansion joints shall be provided in the longitudinal direction whenever necessary with provision of twin columns. The maximum distance of

expansion joint shall be as per provision of IS: 800 and IS: 456-2000 for steel and concrete structure respectively.

1.8.2.5. Individual members Load: Individual members of the frame shall be designed for the worst combination of forces such as bending moment, axial force, shear force, torsion, etc.

Earth Pressure Co-efficient: Earth pressure for all structures shall be calculated using coefficient of earth pressure at rest, coefficient of active or passive earth pressure whichever is applicable depending upon the structural configuration.

1.8.3. Codal Provision

Tank Proper shall be designed as per:

- a) IS: 3370 Part I, II & IV
- b) IS: 1893 Criteria for EQ. resistant Structure, Zone II
- c) IS: 13920 Ductile detailing of RCC Structures
- d) Concrete Grade M-30 (Minimum)

Supporting Structure

- a) IS: 456 Plain and reinforced concrete code of Foundation practice
- b) IS: 11682 Criteria for design of RCC staging
- c) As per relevant BIS Code for type of foundation proposed
- d) Concrete grade M-30

Dispersion of Load in any direction through soil shall be as per IS: 8009. Dispersion of load through concrete shall be considered at an angle of 45 degree with horizontal from the edge of contact area.

The design and construction of RCC structures shall be carried out as per IS: 456 – 2000. Though limit state method shall be adopted for structural design of all components of the structure, working stress method shall be adopted for the design of water retaining structure.

For reinforcement detailing, IS: 5525 and SP: 34 shall be followed.

The responsibility for the designs, constructions structural stability shall However, rest solely with the bidder and he shall have to make good any damage or loss to the Government due to defects if any in the above mentioned or any other work carried out by him. The bidder shall submit four sets of working drawings immediately after approval of the designs and drawings.

1.9. Construction Requirements

1.9.1. Construction Methodology

The Bidder along with designs shall submit the construction methodology to be adopted for the construction of the reservoirs. From all major concrete works for the reservoirs, concrete shall be brought from Batching Plant / Ready mix concrete. Concrete shall be brought to site in transit truck mixers.

Concrete pouring shall be carried out by either discharging the concrete through concrete pumps of adequate capacity or lifted through diesel powered winch's / lift hoist of suitable capacity.

Manual pouring of concrete shall not be permitted. However, for minor concreting works, manual pouring of concrete may be permitted with specific approval of the Engineer-in-charge.

1.9.2. Formwork and Staging

1.9.2.1. Steel formwork

Steel shuttering shall only be permitted. Steel formwork used for concreting should be sufficiently stiffened. The steel shuttering should also be properly repaired before use and properly cleaned to avoid stains, honey combing; seepage of slurry through joints etc. Shuttering used shall be of sufficient stiffness to avoid excessive deflection and joints shall be tightly butted to avoid leakage of slurry. If required, rubberized lining of material as approved by the Engineer shall be provided in the joints.

Form work shall be properly designed for self-weight, weight of reinforcement, weight of fresh concrete, and in addition, the various live loads likely to be imposed during the construction process (such as workmen, materials and equipment). The formwork shall be robust and strong and the joints shall be leak-proof.

1.9.3. Testing for Water Tightness

All the reservoirs / tanks shall be tested for water tightness as per provisions of IS: 3370 and IS: 6494. In the rare event of the failure to pass the Water Tightness test successfully, the Bidder shall be responsible for ensuring water tightness by adopting requisite measures and no payment shall be made for such additional expenses.

The tank portion of the service reservoirs shall be tested for water tightness at full supply level as per procedure as described in IS: 3370 for Water tightness. In the case of tanks whose external faces are exposed such as elevated tanks, the requirements of the test shall be deemed to be satisfied if the external faces show no signs of leakage and remain apparently dry over the period of observation of seven days after allowing a seven-day period for absorption after filling.

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.

The water container shall be provided with Epoxy based water proofing treatment by an approved Water Proofing Specialist firm/manufacturer.

In the rare event that the water retaining structure fails to pass the water tightness test satisfactorily, the Bidder will have to provide a comprehensive plan to identify the leakage areas and plug it by sealing cracks and joints, corners by injecting epoxy-based compound through guniting shall demonstrate the water tightness test successfully. The entire exercise shall be got done by the Bidder at no extra cost.

The Bidder 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 Bidder for water tightness test.

10% of the amount reserved for each Civil (Water Retaining) Structure shall be retained for failure to comply with water tightness test.

1.9.4. 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 Engineers 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 Bidder and submitted to the Engineer at least 28 days prior to the date when the Bidder desires the Engineers approval. In the event the Engineer determines that such proposed deviations do not ensure substantially equal performance, the Bidder 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).

1.9.5. Quality Control on Works and Materials

The Bidder 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.

i. 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 Bidder 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.

ii. Quality Assurance Plan

The Bidder shall provide Quality Assurance Plan adhered by the manufacturing units for production of items like Pipes, Specials, Valves, electrical equipments like motors, pumps, Actuators, VCB, ACB, MCCB, Transformer, PMCC panels, PH, Turbidity meters, EMF meters, IOT BASED SCADA panels, residual chlorine sensor, ultrasonic level indicator to compatible to IOT BASED SCADA system, etc. as required prior to the procurement. If required Engineer-in-Charge may inspect through self (or designated representative or Third-Party Inspection agency all manufactured items at the vendor's workshop / factory at Bidder's cost. After delivery of materials, the same should be visually inspected at site. The Bidder 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.

iii. **Unacceptable Works**

All defective/ deficient Works are liable to be demolished, rebuilt, and defective materials replaced by the Bidder 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 Bidder. 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.

1.9.6. Safety requirements at site

The Bidder shall be responsible for safety of his staff on Site during the execution and O&M period.

The Bidder'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 Bidder 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 Bidder shall notify the KMC immediately, if any accident occurs, whether on-site or off-site in which the Bidder 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 bidder 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

1.9.7. General Requirements

All flanges of DI fittings shall be of PN-25. DI fittings shall be manufactured and tested in accordance with IS: 9523 and shall include the following types of specials:

- Flanged socket / spigot
- Double socket bends (90^0 , 45^0 , $22\frac{1}{2}^0$, $11\frac{1}{4}^0$)
- double socket branch flanged tee
- All socket tees
- Double socket taper
- All Flanged Tee
- Flanged Socket and Spigot
- Mechanical collar joint
- Duck foot bend

1.9.8. Butterfly Valves

i. Scope

The scope covers manufacture, supply, and installation of Butterfly valves confirming to IS: 13095/ BS: 5155/ DIN: 3354/ AWWA-C-504, suitable for bi-directional flow. The flanges and their dimensions of drilling shall be in accordance with IS: 1538 (part-I to XXII). Valves shall have a nominal pressure rating PN 16 unless otherwise specified.

ii. General Requirements

The valves will operate smoothly and steadily in both the direction, free from flow induced vibration. The valves will be provided with light shut-off closures suitable for frequent operation. The valve disc will rotate 90^0 from full open to full close and is suitable for throttling duty also. The valves will be of double flanged ends and the body will be provided with lifting lugs. The valve disc will be of solid streamlined slab design with no ribs. The seat ring will be replaceable type and will be bolted on the body. The rubber seal on the disc will be easily replaceable type to facilitate removal at site. The seat design shall be of non-jamming and self-cleaning type. The valves shall be manufactured with integral body seats, suitable for open-closed and throttling service. Each valve shall be capable of withstanding the rated pressure from either side.

The valves, where specified shall be electrically (motor) operated. Valves on pump discharge piping and transmission mains shall be furnished with extension spindles. The extension spindle shall be furnished with a universal coupling and intermediate supports.

Electric actuators mounted shall be mounted on floor stands at floor level. Butterfly valves with motor operators shall be mounted with the valve stem facing horizontally. Butterfly Valves to be installed on mains shall be of the metal seated type generally as per BS EN 593. Butterfly Valves to be installed in the discharge piping of pumps shall have seat of elastomer (EPDM rubber) seats as per IS 1309 and AWWA C504 (Resilient Seated Butterfly Valves). Valves shall be suitable for mounting in any position. The valve seat shall be of integrally cast and of replaceable design. When the valve is fully closed, the seal shall seat firmly. The seat surfaces shall be machined smooth to provide a long life for the seal. All fasteners shall be set flush so as to offer the least possible resistance to the flow through the valve. All valves shall be suitable for throttling purpose. All valve spindles and hand wheels shall be positioned to give good access for operational personnel. Valve of diameter 400 mm and above shall be provided with an enclosed gear arrangement for ease of operation. The gearing shall be such that the valve can be opened and closed by one man against an unbalanced head of 1.15 times the specified rating. Valve and gearing shall be such as to permit manual operation in a reasonable time and not exceed a required rim pull of 80 N. All hand wheels shall be arranged to turn in a clockwise direction to close the valve, the direction of rotation for opening and closing being indicated on the hand wheels.

iii. Material of construction

The material for different components parts of valve shall conform to requirements as given below:

Sl. No.	Component	Material Composition
1	Body, Disc, Thrust plate	Body--Ductile Iron (Body -- DI (EN-JS-1030 GGG-50) Disc-- SS: IS 3444(1987)
2	Shaft	Stainless Steel SS, ASTM A276 Type 410 IS 6603 Seat Ring/Seat retaining-- SS, ASTM A276 Type 304 SI: 6603 Bearing: SS, banked PTFE
3	Body Seat Integral	Micro finished Chromium Steel plated / Nickel weld overlay
4	Shaft Bearing Bushes	Phosphor Bronze
5	Disc seal, O Ring	EPDM rubber
6	Internal Fasteners	Stainless Steel AISI 304 External Bolt, Nuts---- Carbon Steel IS: 1363-1967 Internal fastening. SS135:970 Gr 304 Electrically operated of IS 13095 Auxiliary hand wheel to be provided for manual operation clause 16.1 of IS 13095 Gear box shall conform to the provisions of AWWA C504.

iv. Gearboxes for Butterfly Valves

Gearboxes shall be of the self-locking type, with a continuous indicator. Traveling nut and screw type of gearboxes shall not be acceptable

Each gearbox must conform to the provisions of AWWA C504. The rated torque capability of each operator shall be sufficient to seat, unseat and rigidly hold in any intermediate position the valve disc it controls under the operating conditions specified. Operating torque must be as per requirements given in AWWA C504.

The operator shall be of worm and worm wheel design, self-locking type with or without an additional spur gear arrangement to ensure that the effort on the hand wheel is limited to the pull specified.

All valve operators shall be equipped with adjustable mechanical stop-limiting devices to prevent over-travel of the valve disc in the open and closed positions. Either end of the worm shaft must be provided with a needle roller bearing to take the lateral thrust.

The housing for the gearing must be enclosed and sealed in such a way that there is no leakage of oil / grease even after long period of idleness and there shall be no ingress of rainwater. Operator for valves, which are likely to be submerged in water for any period of time, shall be watertight.

Valves for exposed service or in vaults shall be equipped with a hand wheel. The hand wheel maybe provided with an extension for easy grip. The hand wheels must have a provision for locking with a chain and pad lock. All operators when fitted to the valve shaft shall ensure clockwise closing and this shall be indicated on the housing. A mechanical indicator is to be provided to show disc position and end of travel.

v. Coating

Valves shall be coated (inside and outside) with (food grade) epoxy powder of minimum Dry Film Thickness of 250micron.

vi. Marking, Testing and Inspection

The following information shall be cast on each valve body:

- Manufacturers' Name or trade mark
- Nominal pressure of valve
- Size of Valve
- Year of manufacture
- Serial number in punch on top of flanges

Valves shall be tested for Hydro-static test and flaw detection test in accordance with IS: 14846. Inspection shall be carried out at manufacturer's works to test the valves, as per requirement.

The design, construction material, manufacture, inspection, performance and testing shall comply with all applicable Standards and Codes. Nothing in the specification will be construed to relieve the supplier of this responsibility regarding performance of the valves during the contract period.

1.9.9. Sluice Valves

- i. Scope:-** This section covers the requirements for Sluice valve shall be as per IS: 14846 and their latest revision, compatible for buried applications. The pressure rating of the valve shall be as per the specific standard followed taking into account the operating pressure. Wherever specifically mentioned, the valve shall be fitted with extended spindle, head stock along with hand wheel for easy operation from the operating platform. There will be no play in the 'XX' and 'YY' axes of the valve gate within the guide channel of the valve. The valves above and

including 400 DN shall be provided with spur/ bevel gear arrangement for ease in operation and be fitted with by-pass arrangement. Valves shall have two positions marked at the closed end of the scale. The first position corresponding to the position of the gate tangential to the bore of the seating and the second position below the first, corresponding to the position of the gate as it sits on the seat after moving a further distance equal to the depth of the seating. The gate face rings shall be securely pegged over the full circumference of the valve. Valves shall be equipped with electrical (motor) actuators, if so specified or shown on the drawings. Valves in buried service or in vaults shall be furnished with extension spindles. Each extension spindle shall be furnished with a universal coupling and intermediate supports. The following codes are applicable for Sluice valves.

Codes	Description
IS: 14846	Sluice valve for water works purposes
IS: 2906	Specifications for sluice valves for water works purposes

- ii. **Nominal Pressure and Dimensions:** The dimension and mass of the sluice valves shall be in accordance with IS: 14846. The flanges and their dimensions of drilling shall be in accordance with IS: 1538 (part-I to XXII).

iii. **Material of Construction**

The material for different components parts of sluice valve shall conform to requirements as given below:

Sl. No.	Component	Material
1.	Body, bonnet, Wedge, Gland, hand Wheel	Ductile Iron
2.	Seat Ring/ Wedge Seat Ring	SS: AISI: 304
3.	Spindle / Stem	SS: AISI:410
4.	Stem nut	Stainless steel, IS-6603.
5.	Bonnet Gasket	EPDM rubber (Approved for drinking water)
6.	Internal fasteners, Bolts, Nuts	Carbon Steel IS: 1363-1967
7.	Wedge nuts	Aluminium Bronze.
8.	Packing	Carbon Steel IS: 1363-1967
9.	Gasket	Rubber: IS:638-1979, Type-B
10.	Hand Wheel	CI, IS: 210.
11.	Gland Packing	Rubber, IS-638.
12.	Gear	Spheroidal graphite iron, IS-1865, Grade 500.
13.	Gear Housing	CI, IS-210, FG 200.
14.	Pinion Shaft	SS 420
15.	Power drive etc.	Power drive [Electric] as per clause A-1.1.7 of IS-14846[2000] ---Gearing arrangement—as per clause

Sl. No.	Component	Material
		A-1.1.2 of IS-14846[2000].

The valves should be with replaceable stem nut and replaceable sliding shoes. Valve stems shall be of single piece thread rolled. Valve shall have 3 “O” rings of NBR for stem sealing.

iv. Coating

Valves shall be coated (inside and outside) with (food grade) epoxy powder of minimum Dry Film Thickness of 250micron.

v. Marking, Testing and Inspection

The following information shall be cast on each valve body:

- Manufacturers’ Name or trade mark
- Nominal pressure of valve (PN 1.6)
- Size of Valve
- Year of manufacture
- Serial number in punch on top of flanges

Valves shall be tested for Seat leakage test, Body hydrostatic test, Valve operation and flaw detection test in accordance with IS: 14846. Inspection shall be carried out at manufacturer’s works to test the valves, as per requirement.

The design, construction material, manufacture, inspection, performance and testing shall comply with all applicable Standards and Codes.

vi. Installation of Valves

Valves shall be installed between flanges according to the instructions of the manufacturer and the Engineer in Charge. Valves shall be placed on a support of concrete so that no shear stress is in the flanges. In case of axial thrust due to closure of a valve against pressure the valve shall be anchored in the support in a suitable manner to transfer the thrust into the floor slab of the chamber.

vii. Steel & reinforcement for GSR

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.

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

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.

- 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.
- Vertical steel in columns : 0.8% of cross sectional area actually required and 0.3% where larger section than actually required is provided.
- Horizontal link in column : Not less than 8 mm dia at 200mm c/c or 10 mm dia not more than 300 mm 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.
- Steel in tank : As per provision of IS 3370 subject to minimum as set out in (b) above.

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.

- 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.

ANNEXURE – E-III

SPECIFICATIONS FOR TERTIARY TREATED WATER PUMPING MACHINERY FROM SUMP TO NTPC PREMISES

1 Submersible Pumps

The bidder shall supply, install and successfully commission following pumps with all ancillary and required accessories at the locations mentioned below

Sr. No.	Location	Ratings
1	TTP	Pumping machinery Q=1000000 LPH and Head 26 m. at sump

The Bidder shall provide manufacturer's published pump curves, system curves and the necessary hydraulic calculations to justify the sizes of any pumps selected. The Bidder shall provide the following shop drawings:

- Impeller diameter
- Maximum impeller diameter
- Minimum impeller diameter
- Velocity of liquid in pump suction at duty point
- Velocity of liquid in pump delivery at duty point
- Velocity of liquid in the pump casing or impeller eye at duty point
- Net positive suction head (dry well submersibles only)
- The materials of construction shall be specified in detail and itemized against a sectional drawing of the pump proposed.

After approval of the pump types the Bidder shall submit the test data as required under factory inspection and testing

The Bidder shall submit Operation and Maintenance Manuals and Instructions which shall include all the documentation provided as above and as required in the Specification.

1.1 Pump Requirements

Pumps and drives shall be rated for continuous duty and shall be capable of pumping the flow range specified in the Specification without surging, cavitations, or excessive vibration to the limits specified. All pumps and drives shall be from approved manufacturers.

The pumps shall meet maximum allowable shut-off head.

The pumps shall not overload the motors for any point on the maximum pump speed performance characteristic curve and the pump operating range, within the limits of stable pump operation, as recommended by the manufacturer, to prevent surging, cavitations, and vibration.

To ensure vibration-free operation, all rotative components of each pumping unit shall be statically and dynamically balanced to BS 6861 and the following requirements shall be met:

- The mass of the unit and its distribution shall be such that resonance at normal operating speeds is within acceptable limits
- In any case, the amplitude of vibration as measured - at any point on the pumping unit shall not exceed the below limits
- At any operating speed, the ratio of rotational speed to the - critical speed of a unit, or components thereof, shall be less than 0.8 or more than 1.3.

Vibration levels shall not exceed the levels given in BS 4675 for Class 11 machines, quality bands A and B.

The completed units, when assembled and operating, shall be free of cavitations, vibration, noise, and oil or water leaks over the range of operation.

All units shall be so constructed that dismantling and repairing can be accomplished without difficulty.

The Bidder shall be responsible for proper operation of the complete pumping system, which includes the pump, motor, variable speed drive unit (if designated), and associated controls furnished with the pump.

The Bidder shall ensure that the controls and starting equipment are suitable for use with the pump motor, taking into account all requirements including starting currents and number of starts per hour.

For the performance curve of the selected pump impeller, the head shall continuously rise as flow decreases throughout the entire curve from run out to shutoff head.

The Bidder shall ensure that drive motors, variable speed drive systems (if specified) and pumps shall be supplied and tested together by the pump manufacturer, who shall supply full certification for the proper function of the entire pumping system.

If variable speed drive systems are specified, motor and drive system shall be fully compatible, and shall be of sufficient power and torque, and be capable of sufficient heat transfer for starting, accelerating and continuously operating over the entire range of head/capacity conditions, from minimum to maximum pump operating speed, as designated. The motor shall be de-rated to take into consideration the reduced cooling effect when running at the lowest speed with the variable speed drive.

1.2 Design Conditions

Pumps shall be single stage mono-block type with non-clog design. It should pump all kinds of water/sewage in particular unscreened sewage containing long fibres, solid admixes, liquid containing trapped air and gas etc, long fibres, polythene covers, and capable of dealing with sewage of specific gravity 1.05

Profile gasket should be provided in pump casing so as to avoid metal to metal contact between pump and the special designed duck foot bend/ flanged elbow, automatic coupling to ensure leak proof joint with delivery pipe. The profile of pump side flange shall be matched with pump claw so as to automatically lock by virtue of its own weight or an automatic coupling device for easy installation and easy removal.

Pumps shall be designed and constructed to satisfactorily operate and perform within the designated design conditions and the requirements specified herein. They shall be designed for a life of 100,000 hours with service intervals at 20,000 hours.

Castings, fabrications, machined parts and drives shall conform to the industry standards for strength and durability and shall be rated for continuous duty over the entire operating range.

Bearings shall be of the anti-friction type designed for an L10 life in accordance with BS 5512. The maximum operating speed shall not exceed 1450 / 585 rpm and shall be supplied as per BOQ.

Pumps shall be of non-clog design, capable of passing spheres of a minimum diameter unless other diameters are specified. The pump set shall be supplied along with special duck foot bend / flanged elbow, lifting chain, guide wire / guide pipe.

Suitable RCC slab / ISMB (with necessary anti-corrosive painting) to be erected over suction well to fix guide wire / guide pipe holding bracket.

The pump, motor and associated electrical equipment shall be rated for a minimum 15 starts per hour, unless otherwise specified.

The Bidder shall ensure that the pump manufacturer provides certification which guarantees the following:

- Flow rate
- Total head
- Power input
- Efficiency

1.3 Materials

Pumps shall be manufactured of the following materials as a minimum:

Type of pumps : Submersible type non-clog design

Solid passage size through pumps : 100 mm max.

Insulation : Class F

Protection : IP-68

Liquid : Raw Sewage

Temperature : Min. 20° C

Efficiency : more than 70%

Installation : Fixed.

Casing : Cast Iron IS 210 Gr. FG 260

Impeller : CF8M

Shaft : As per AISI 410

Cable gland : Cast Iron IS 210 Gr. FG 260

Motor Body : Cast Iron IS 210 Gr. FG 260

Seal cover : Cast Iron IS 210 Gr. FG 260

Automatic Coupling : CI

Duck foot bend : CI

Guide Pipe : SS-304

Lifting chain : SS-304

Fasteners : MS with GI coating

1.4 Fabrication

General. Pumps shall be fabricated in accordance with the following requirements:

- Pumps shall be capable of handling raw, unscreened sewage.
- Pumps should be able to withstand reverse rotation of impeller.
- In the case of submersible installations no portion of the pump shall bear directly on the floor of the wet well.
- Pumps shall utilise a guide system to permit easy removal and reinstallation without dewatering the pump sump discharge connections shall be made automatically with a simple downward motion without rotation when the pump is lowered into operating position. The pump shall be capable of being removed without disconnecting any fasteners
- An appropriate length of chain shall be connected to the motor eyebolts to permit raising and lowering of the pump.
- Impellers shall be fabricated according to the rated motor size as follows:
- Non-clog type statically and dynamically balanced, keyed to the shaft
- Provided with pump-out vanes to prevent material from getting behind the impeller and into mechanical seal area
- Impellers shall not be trimmed unless approved by the Engineer. Provision for adjustment of clearance between impeller and casing for restoring the pump efficiency, without dismantling the pump will be an added advantage.

Impellers shall be fabricated according to the rated motor size as follows :

- Non-clog type statically and dynamically balanced, keyed to the shaft
- Provided with pump-out vanes to prevent material from getting behind the impeller and into mechanical seal area.
- Pumps must be equipped with a method of restoring impeller to casing clearance in the axial direction, to restore the pump efficiency, at site, without the need for dismantling of pump and machining for replacement of wear rings.
- Impeller clearance adjustment shall not be done unless approved by the Engineer
- Impellers shall be of closed, Multi vane (three to four sweeping vanes) type.
- Single/multi vane or vortex type, with a cutter impeller in the case of small flows.

Discharge Connection and Guide Rails shall be fabricated as follows:

Sliding guide bracket and discharge connections shall be provided which, when bolted to the floor of the sump and to the discharge line, will receive the pump discharge connecting flange without need of adjustment, fasteners, clamp, or similar devices.

The guide rails shall not support any portion of the weight of the pump.

The pump discharge connections shall incorporate a sealing face and connection yoke to allow for automatic coupling to fixed discharge connection pipe work.

Pump Shafts shall be fabricated as follows:

- Pump shafts shall be of such diameter that they will not deflect more than 0.05 mm measured at the mechanical seal, whilst operating at full driver output
- The shaft shall be turned, round and polished
- The shaft shall be key-seated for securing the impeller.

Shaft Seals shall be fabricated as follows :

- The drive motor and pump/motor bearings shall be sealed along the shaft with tandem mechanical seals operating in an oil filled chamber. The seals shall require neither routine maintenance nor adjustment, but shall be capable of being easily inspected and replaced.
- Two back to back mechanical seals shall seal the motor off from the pump.
- The upper seal shall be oil lubricated with a carbon rotating component and fixed tungsten carbide component.
- The lower seal shall have both parts in tungsten carbide.
- A detector shall indicate when moisture is leaking past the first seal.

Bearings shall be fabricated as follows :

- Bearings shall be capable of taking the static weight of the rotating parts and any thrust generated by the operation of the pump
- The upper bearing(s) shall be of the grease lubricated sealed for life type; the lower bearing(s) shall be lubricated by the internal oil supply
- The bottom bearing(s) shall be of the angular contact ball bearing type in combinations with roller bearing(s)
- If required in the project specification, remote indication shall be provided for bearing high temperature-, using a thermistor at the lower bearing, to provide a signal at 95 °C.

Motors shall be fabricated as follows :

- Motors shall be 415 V, phase, 50 Hz, rated at 20 % above the maximum power requirement

- Motors shall be squirrel cage, induction, air filled, totally sealed to IP 68, suitable for the maximum immersion depth to be encountered, rated with group 1 gases, to BS 5345
- Motor insulation shall be Class F, limited to a Class F temperature rise.
- Motor temperature shall be monitored using a thermistor, in each phase of the winding, set to stop the motor when the monitored absolute temperature reaches 130°C
- A watertight cable junction box sealed from the motor shall be provided for the motor power and control cables shall be EPR insulated, Niplas sheathed flexible 450/750 volts grade, oil and grease resistant, with tinned annealed copper conductors in accordance with BS 6007. The cable shall be brought directly out of the submersible motor without joints, and shall be of sufficient length, minimum 20 m to be terminated in an IP67 junction box outside adjacent to the wet well. They shall be sized in accordance with the electricity utility regulations and BS 7671. The cable must be leak tight in respect of liquids and firmly attached to the terminal box. The should be laid in a suitable PVC encasing pipe from control panel upto suction well .
- Motors shall be capable of start up and operation in the event of a completely flooded wet well. Motors shall be selected to meet the maximum power required for the selected impeller at all operating conditions
- Motor cooling shall either be by means of the pumped medium or by oil. The use of external cooling water is not acceptable.
- Motors shall be derated for dry well and/or variable speed operation
- All parts of the pump and motor shall be 100% holiday free fusion bonded epoxy coated to a minimum thickness of 300 microns.

1.5 Control Panel

The control panel shall be made of 14/16 SWG sheet steel for the front side for bottom and other sides with powder coating for long life. It should have suitable starter. The control panel consists of multi section unit containing one pump and one incomer/control. The sections are interfaced, via, cable way/marshalling section. All wires and links are of electric grade copper conductor. The control of the pumps viz., Mercury/magnet activated/ any other float switch with auto for duty pump.

Power circuit is operating at 3 phase, 415 Volts, 50 Hz supply and for control circuit it is single phase 230 V, 50 Hz supply.

Type of starter shall be as under:

Up to 10 HP - DOL

From 12 Hp to 40 HP - Star - Delta.

50 HP and above – Auto Transformer Starter / Soft Starter

The following protections should be provided in the panel: short circuit protection, over load protection, over temperature protection for motors, single phasing preventor, reverse rotation protection, dry run failure protections to be made. Suitable range ammeter, voltmeter, selector switch, auto-manual switch, pump running lamp, pump fault lamp, fault reset push button, phase indicating lamps, indication of high level in the well, hours run counter should also be provided.

The control panel wiring circuit should be furnished in triplicate.

The pump should be controlled by the magnetic/mercury float switches while the pumps run in auto. The floats with switches should be available in the wet wells and the connections from float should be made to the individual control panel through the cable duct. Necessary control sensor wiring should be made to convert the signals of mercury/magnet float switches while the level is high/low so that the pump starts/stops on auto mode.

The necessary push button stations with control wiring should be made on the wells for each pump set each stations as per std. rules.

The control panel, pump set and accessories for pumps should be manufactured by same manufacturer. The pump and motor shall be accordance with the relevant standards.

1.6 Automatic Control

The automatic level control shall be arranged such that when level rises in the well the pumps starts successively at the different pre-determined levels. When the level drops the pump sets stop in the same order as that in which they have started. The different start and stop levels for several pumps/single pump have to be chosen according to the sewerage and as desired by the Engineer. Magnetic/mercury float switches have to be used for this purpose.

The tenderer should also furnish the list of authorised dealers for the supply of spares for submersible pumps and list of authorized workshop to carry out repairs to the submersible pumps along with the address while tendering.

Labels. Each pump shall have a stainless steel label permanently fixed to the pump and an identical label fixed to the pump starter compartment.

1.7 Factory Inspection and Testing

The Bidder shall secure from the pump manufacturer certification that the following inspections and tests have been conducted on each pump at the factory, and submit to the Engineer prior to shipment:

- The pump casing has been tested hydrostatically to 1.5 times the maximum closed valve pressure
- Impeller, motor rating and electrical connections checked for compliance with the Specifications
- Motor and cable insulation tested for moisture content or insulation defects
- Prior to submergence, the pump has been run dry to establish correct rotation and mechanical integrity
- The pump has been run for 30 minutes submerged under a minimum of 2 m water after the operational test and the insulation tests above and after the performance test below

Each pump shall tested at the factory for performance according to BS 5316 Part 1, including:

- Flow
- Motor power
- Efficiency

The Bidder shall secure from the pump manufacturer the following certification and submit to the Engineer prior to shipment:

- Certified copies of the pump characteristic curves and reports generated by the tests described above
- Foundry composition certificates for all major castings (pump case, impeller, motor housing) showing exact material composition and tests conducted to ensure compliance with the pump manufacturer's material specifications.

1.8 Site Inspection and Testing

The equipment delivered to the Site shall be examined by the Bidder to determine that it is in good condition and in conformance with the approved working drawings and certifications. All

equipment shall be installed in strict conformance with the Specification and the manufacturer's instructions.

The Bidder shall provide the services of the pump manufacturer's representative to supervise the installation, commissioning and start-up of the pumping equipment.

The commissioning tests shall be performance and reliability trials, mainly for the purpose of satisfying the Engineer that the pump sets have been correctly assembled and installed and that their performance matches that obtained during the manufacturer's works tests. In the event of an unwarranted change in the pump performance characteristics or power consumption, all necessary steps shall be taken as soon as possible to establish the cause and remove the fault. Similar action shall be taken for an undue increase in bearing or gland temperature, increased gland leakage rates, unsatisfactory vibration levels or any other fault or defect in the operation of the pump set.

The site reliability trials shall include the following:

- A record of bearing and coupling clearance and alignments shall be tabulated to show the "as-built" condition of each pump
- A record of all overload, timing relay and oil pressure relays shall be tabulated to show the "as-built" condition of each motor starter
- All cables shall be 'megger' tested to confirm the integrity of the insulation. A tabulated record of results shall be made
- The control panel shall be statically tested with motors disconnected to confirm the correct sequence of operation
- Each pump shall be operated individually over the range from closed valve to maximum emergency top water level, on a recirculation basis, using fresh water, and for a minimum of four hours continuously. During this test the following parameters will be recorded
 - Motor phase currents
 - Pump output
 - Motor/pump casing temperature (dry well submersible only)
 - Power consumed
 - Power factor
 - Vibration (dry well submersible only)

The commissioning trials shall extend until each pump unit has run 'continuously' for at least 3 days under all operating conditions. The term 'continuously' shall include running at various speeds or on a start/stop basis as determined by the control system

The Bidder's supervisory staff, and the pump manufacturers representative shall be present during the period of the tests and trials. The Bidder shall be responsible for any failure of the whole equipment or any part thereof, whether such failure shall be determined by the methods detailed herein or otherwise. If the Bidder interrupts the pump test or trial, or through negligence on the part of the Bidders staff, it shall be completely repeated for the pump set concerned.

1.9 Motors

All motors shall be suitable for operation on a 415v, 50 Hz, 3 phase, AC supply.

Motors shall be capable of giving rated output without reduction in the expected life span when operated continuously under the following supply conditions.

- | | | |
|----|---|-----------|
| i | Variation of supply voltage from the rated motor voltage: | + / - 10% |
| ii | Variation of supply frequency from the rated frequency : | +/- - 5% |

- iii Combined voltage and frequency variations + / - 10%
:

All motors shall be capable of starting 6 times per hour. Starting current of motor shall not exceed 200% of the rated full load current for star - Delta starting and 600% of rated full load current for DOL Starting under any circumstances.

Motor shall be capable of starting and accelerating the load with the applicable method of starting without exceeding the acceptable winding temperatures, when the supply voltage is in the range of 10% above of the rated motor voltage.

Motor shall be designed to withstand 120% of the rated speed for two minutes without any mechanical damage in either direction or rotation.

The insulation class of motor winding shall conform to class - F and the maximum temperature rise shall not exceed 95°C, when measured by winding resistance method and 85°C, when measured by thermometer method for an ambient temperature of 45°C.

Motor shall be offered for routine and type tests in accordance with IS: 4029 and IS: 325 at the manufacturer's works. Test certificates shall be endorsed to the effect that they are properly balanced and free from vibration. In addition, a test shall be required to establish the maximum transient starting current.

Pump motors shall be of the squirrel cage submersible type, protected to IP. 58 and rated at 10 per cent above the calculated maximum power required on site.

The motor shaft shall be of large diameter, lightly stressed to ensure rigidity, with impeller and bearing location shoulders and a keyway for location of the impeller.

The motor windings shall be protected with a waterproof material and shall incorporate a thermistor in each phase to safeguard against high winding temperatures. The thermistor shall be connected into the control circuit of the starter and arranged for hand reset only.

The motor shall incorporate a cut-out device to detect the presence of any liquid in the motor enclosure.

The motor frame shall incorporate lifting points and shall be fitted with a galvanised lifting chain, reaching to, and secured at the access point.

The terminal connections for the power and protective circuits shall be housed in a completely sealed and waterproof junction box, complete with all external corrosion resistant cable glands.

The pump units shall be provided with power and protection circuit cables of sufficient length to reach from the motor junction box to the local isolator, located at the access level.

The power cable shall be 600/1000V grade flexible stranded copper wire, insulated and overall sheathed with under-water grade compound flexible insulation. The cable shall be rated to take the full motor current under the prevailing liquid and ambient temperature conditions.

1.10 Characteristic Curves

Characteristic and system curves for the pumps shall be supplied to a reasonably large scale which shall show the capacity of the pumps under single and multi pump operation at the duty point.

When tested through their complete range of workable heads at the maker's works, all the pumps shall give results which conform to the curves submitted with the Tender. Curves showing pump efficiency and kW. loading shall also be included.

1.11 Performance Test

Each pump shall be tested at the manufacturer's premises for the full operating range of the pump. Pump performance shall be within the tolerance limits specified in the relevant standards. The bidder shall furnish the guaranteed values of discharge and efficiency for the total head at duty point for each pump.

Discharge Connection and Guide Rails shall be fabricated as follows :

- Sliding guide bracket and discharge connections shall be provided which, when bolted to the floor of the sump and to the discharge line, will receive the pump discharge connecting flange without need of adjustment, fasteners, clamp, or similar devices.
- The guide rails shall not support any portion of the weight of the pump.
- The final connection between the pump discharge flange and discharge elbow (duck foot bend) shall ensure zero leakage by means of a Neoprene seal,(no profile gaskets) fixed on to the pump discharge flange, thereby avoiding a metal to metal contact.
- The pumps shall be provided with proprietary monitoring and control units for inclusion in the motor controls. Analog inputs shall include the following:
 - Winding temperature
 - Bearing temperature
 - Digital inputs shall include the following :
 - High winding temperature
 - High bearing temperature (upper & lower)
 - Seal Monitoring
 - Over temperature
- Motors shall be capable of start up and operation in the event of a completely flooded wet well. Motors shall be selected to meet the maximum power required for the selected impeller at all operating conditions.
- Motor cooling must be achieved by a cooling jacket, using the pumped media to cool the motor. The pump impeller must be equipped with a system to ensure a pumped flow of liquid through the cooling jacket and also incorporate a device to prevent the liquid channels from blocking with hair and foreign material.

Coatings and Protection shall be provided as follows

- All parts of the pump and motor shall be 100% holiday free fusion bonded epoxy coated to a minimum thickness of 300 microns.

1.12 Control Panel for Sewage/Drainage pumps:

Design, fabrication, assembling, wiring, supply, installation, testing and commissioning of control panel fabricated out of 14 gauge CRCA sheet steel in with reinforcement of suitable size angle iron, channel 'T' sections irons and/or flats wherever necessary. Cable gland plates shall be provided on top as well as at the bottom of the panels. Panels shall be treated with all anticorrosive process before painting as per specifications with 2 coats of red oxide primer and final approved shade of powder coated paint. 2 Nos. earthing terminals shall be provided for 3 phase, 4 wire, 50 Hz supply system. Lifting hooks shall also be provided in case of large panels. Approval shall be taken for each panel before fabrication. Cadmium Plated hardware shall be used in fabrication of panels.

Panel should have the following features/components as minimum:

1. Auto – Manual selection of the pumps. In case of Auto mode pumps shall run on the basis of float level switches. Each pump will have its own float level switch.

2. Single-phase preventer.
 3. Changeover of pumps to ensure equal wear and tear of all the pumps.
 4. 0-500 volts square digital or analog voltmeter with selector switch protected by 2 amps TP MCB- 1 Set
 5. 0-300 amps square digital or analog ammeter with selector switch and 300/5 amps 10 VA CL: 1 CTs. –1 Set
 6. Phase indicating lamps protected by 2 amp SP MCB - 3 Sets
 7. Starters with overload relays, MCB's etc as per the rating and quantity of the selected pumps.
 8. Push buttons for manual start of the pumps. Quantity should be as per the BOQ/number of pumps.
 9. Indicating lamps for phase, start/stop/trip and high-level indication.
 10. Potential free contacts for start, stop and trip of the pumps through BMS (in Manual mode).
 11. Necessary internal wiring, interlocking, earthing for all equipment shall also included
- Panel should be complete in all respect.

ANNEXURE – E-IV

Specifications of Electric Substation for TTP

1. TRANSFORMER

GENERAL REQUIREMENT

Sub-station shall be provided with (as mentioned in table beneath) double copper wound outdoor type transformer. The transformer of sub-station shall be installed, under RCC and brick work room with rolling shutter. 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.

Transformer Ratings	
For TTP	Min. 1500 KVA / 33/ 3.3 KV

Voltage ratio : 33/ 440 V
 Vector group : Dyn-II and all the transformers shall be filled with mineral oil and ONAN cooling type suitable for out-door 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 variation : 10%
- ❖ 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.
- ❖ Bidder shall have to give the complete electrical plant load and get it approved by the ULB / PMC and based on the approved plant load (with 20% margin) the transformer sizing (kVA) is to be installed.

❖ The source supply shall be 33KVA/11KVA as per CSPDCL norms.

CONSTRUCTIONAL FEATURES

2. TANK

- (i) 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 shock during transportation and (ii) all filling by vacuum.
- (ii) The tank cover shall be bolted on to the tank with weather proof, but oil resistant, resilient gasket in between for complete 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.
- (iii) Oil sampling taps shall be provided with valve at top and bottom to collect sample of oil from the tank for testing.
- (iv) To facilitate the oil filtration by streamline filter suitable inlet and outlet taps with valve at 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.
- (v) Thermometer pocket for top oil temperature measurement by mercury thermometer shall be provided.
- (vi) The transformer tank shall be fitted with a double diaphragm type of explosion relief vent at the top having equalizer pipe connection from conservator

3. 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 accure during movement of transformer or under short circuit stresses.

4. 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.

5. 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.

6. TEMPERATURE INDICATOR

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

7. 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 closed connections.

8. 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.

9. 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.
Silica gel breather with connecting pipe and oil seal.
Explosion relief vent with double diaphragm and equalizer pipe connection to conservator airspace.
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.

10. 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-1**

11. 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:

2. 1 Nos. Incoming feeder each incoming feeder comprising of:
 - (a) 1 Nos. Three pole MCCB of amperes rating as specified in **annexure E-1** with in-built magnetic thermal release, under voltage release and shunt trip release. **PCC/PMCC shall be configured with two incomers and one bus coupler**
 - (b) 1 Nos. suitable CTs for protection & metering.
 - (c) **Single / Double front, Aluminium Bus bar, intelligent and draw out type panels for all Low Voltage Switchgear/MCC panels shall have to be provided.**

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.

12. 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.

13. 33 KV DROP OUT FUSE

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

14. 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, confirming to IS:9921 (Part I to V) 1981.

15. ACRS CONDUCTOR

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

16. 33 KV PIN INSULATOR.

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

17. 33 KV DISC INSULATOR

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

18. 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.

19. 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.

20. 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 equipment.

21. G.I. PIPES

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

22. HARDWARE FOR EARTHING

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

23. MAIN HOLE COVER

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

24. D.P. STRUCTURE for each substation

- 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.

25. FENCING

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

26. 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.

27. 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

28. 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.

29. 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.

30. 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.

31. CIVIL WORK FOR ERECTION AND COMMISSIONING OF ENTIRE JOB

Transformer platform made of CC M-25 Mix, Foundation work and other mechanical mixed CC M-25 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.

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.

Work of erection (as per IE rules) of entire substation equipment and allied works.

Work of drawing preparation, commissioning along with obtain of charging permission from electrical inspector as per IE rules. Drawing preparation and approval from authority, inspection charges of electrical inspector/ authority shall be in scope of agency.

1500 KVA DG SET FOR TTP

Work also includes providing 1500 KVA DG set for TTP of reputed make including all cabling panelling etc complete including required connection, commissioning etc complete.

SPECIFICATIONS FOR PROVIDING INSTALLING COMMISSIONING 1500 KVA DG SET FOR TTP

14.8.1 GENERAL

1. It will be complete responsibility of successful agency to carry out following Work without any extra cost. If any minor Work other than the considered items in required being carried out without any extra cost, which may please be noted.
2. The successful agency will be responsible to operate the D.G. Set after testing and commissioning for the period of two year including defects liability period of one years from the date of completion of Work. The agency is to deploy one operator and one helper with required minor materials and tools round the clock and should take care of the required operation and maintenance of D.G. set during power failures in co-ordination with regular maintenance and repair agency or as specified by Engineer-in-charge.
3. The agency is required to provide Diesel for the D.G. Set as per the requirements. The diesel tank should be full/90% capacity at all times. No laps on any accounts shall be tolerated. The payment of the same will be paid as per actual after producing required documents such as diesel consumption/cash memo etc.
4. The manual operation required for the D.G. Set is Also, included in this scope. The successful agency will have to operate the D.G. Set in coordination with the KMC's other Electrical departments and existing electrical M&R agency Chhattisgarh Electricity Department supply is to be used as a standby supply during that period.
5. The agency is to bring adequate diesel required for the DG Set. They should operate the D.G. Set at least 10 minutes in a day and keep the D.G. set in full working condition at all times.
6. The D.G. Set provided is fully automatically operative condition. However, in case of any emergency, if the D.G. Set is not operating in its automatic mode, then the operator should be in a position to operate the D.G. Set in manual mode.
7. The agency should provide the manpower during the three shifts or as specified by Engineer-in-charge from time to time.
8. It will be the responsibility of the successful agency to obtain the necessary approval/sanctions from concerned authorities like Chhattisgarh Electricity Department, Electrical Inspector, PWD, Pollution Control Board etc. before

- commissioning of the D.G. Set and same shall be submitted to Engineer-in-charge within the stipulated Contract period.
9. Successful agency will also be responsible for carrying out comprehensive maintenance of total installation under Contract in addition to operation for a period of Five year including defect liability period of three year. This Also, included the replacement/ repairs of any defective parts and fuel and oil required, so as to ensure the required operation schedule.
 10. In case if any breakdown/ power failure is notice due to negligence in operating the D.G. set during the emergency/during the required period, 2% of the total deposited amount against operation of D.G. set for the period of one year will be deducted as penalty for every incident.
 11. Before quoting the Tenderer should inspect the present location where the D.G. set is to be kept and Also, visit the site to collect the data for Work.
 12. The successfully agency will have to design the scheme matching with existing system and Work will be started only after due approval to the scheme from Engineer-in- change.

14.8.2 SPECIAL REQUIREMENT

1.0 GENERAL

- 1.1 The entire electrical Work shall be carried out in accordance with specification without any extra cost. The Work shall conform to relevant Indian standard, Indian Electrical Acts and requirements of local electricity board.
- 1.2 For supervision, Bidder must depute qualified electrical engineer with sufficient experience for similar type of Work.
- 1.3 The Bidder shall employ only experience and licensed electrical / wiremen for the Work. Only licensed electrical Bidder is allowed to Work.
- 1.4 When the electrical installation is complete, the same shall be tested as per I.S. code, i.e.. Regulations in front of Engineer-in-Charge and result are to be submitted in four sets.
- 1.5 The Bidder shall carry out all minor civil works connected with electrical Work. The Bidder shall repair and make good damage caused to the civil structure while carrying out the electrical works.
- 1.6 The foundation for panel board grouting of frames in wall etc. is required to be carried out by the agency.

2.0 SCOPE

- 2.1 Supply, installation, testing and commissioning of D.G. set of desired rating, Auto transfer panel and power and control cabling Work and sound proof Enclosure (Acoustic canopy). DG set shall be provided for critical process requirement only i.e.. to for load requirement of SBR air blowers, plant lighting & raw sewage transfer pumps.
- 2.2 The scope of Work Also, including the operation and maintenance of the D.G. set for the period of five year including the defect liability period of three year. It Also, including and breakdown maintenance / replacement of defective parts and providing require manpower for daily operation of same round the clock or completely as per the requirement of Engineer-in-charge.

2.3 DRAWING & SPECIFICATION

Drawing and specification shall be followed and if any deviation from the same is necessary to make the Work conform to the requirement, the same shall be called to the attention of the Engineer. If any discrepancy between specification, Drawing and BOQ is

noticed the same shall be informed to the Engineer-in-charge before execution of the Work and higher standard amount the three will take precedence.

3.0 SHOP DRAWINGS

3.1 The Bidder prepares detailed shop drawing and submits for the approval of the Engineer before commencing the Work. The shop drawings showing all setting out details and physical dimensions of all complements in the system like conduits and cable, routes, location if HT & LT panel's, D.G. sets AMF panels, sound proof canopy and fixing details. Works shall not be comments without the approval from the Engineer for each working drawing. The drawing should include circuit diagram of the AMF panel.

4.0 BROCHURE AND DATA

4.1 The Bidder shall submit to the Engineer four copies of all brochures, Manufacturer description data and similar literature. One copy will be returned to the Bidder after approval.

5.0 SCALE

5.1 Electrical layout plans shall be drawn to scale as established on drawings and shall indicate the size and location of all equipment and accessories herein. The Bidder shall obtain all dimensions preferably at the building and check those plans for interference with the building structure and other plans for interference with the building structure and other equipment.

6.0 APPROVAL

6.1 The engineer's approval of such drawings, schedule, brochures, etc. will be an approval of general details and arrangements only and shall not relive the Bidder from responsibility for deviation from drawings or specifications unless he had, in writing, called the Engineer attention to such deviations at the time of submission, nor shall it relieve the Bidder from responsibility for errors or commissions of any kind in the shop drawings when approved.

7.0 STORAGE

7.1 All materials and requirements shall be stored properly to the satisfaction of the Engineer so that physical handling and climatic conditions do not affect the equipment.

8.0 CUTTING & PATCHING

8.1 Cutting, patching and reading shall be kept to the minimum. Whenever this is required, advance approval of the Engineer shall be obtained before cutting and patching Work is taken up during the installation of Work. Those shall be subsequently finished properly to the satisfaction of the Engineer. Care shall be taken to prevent spreading of dust and debris and for protection of equipment and finishes.

9.0 PROTECTION

9.1 All Work equipment and material shall be protected at all times to prevent obstruction, damage or breakage. All equipment shall be covered and protected against water, dust and sand as well as chemical and/or mechanical damage. At the completion of the Work, all equipment shall be thoroughly cleaned and delivered in a perfect unblemished and working condition.

10.0 TESTING & COMMISSIONING

Testing and commissioning of complete electrical, accessories/equipment/ installations shall be carried out in the presence of Engineer-in-charge/ Chhattisgarh Electricity Department officials as per the required norms/ directives at Manufacturers place and at site.

11.0 The Bidder shall furnish all labour and materials called for in this specification and accompanying drawings and shall install the system complete in every respect. Only license approved electrical Bidder/Sub Bidder are permitted to execute the Work.

12.0 GUARANTEE

The Bidder shall furnish one-year guarantee on all equipment and appliances. This shall include guarantee against defects in workmanship or material in any part or accessory. If any higher period is implied elsewhere in this Contract, the same shall hold a Govern. If any defects are found during the guarantee period, the Bidder at no additional cost shall replace the defective part or Work.

13.0 HANDING OVER OF INSTALLATION:

13.1 The Bidder shall handover the complete installations to the Corporation in a clean, brand new and perfect working condition. Any area in which the Bidder has worked, shall be thoroughly cleaned of all debris and unwanted materials cleaned and handed over in a perfectly finished, ready to use condition.

14.0 DEVIATION & ORDERING MATERIAL

14.1 The Bidder must quote exactly as per specification bill of quantities and drawing.

14.2 The bill of quantities shall not be used as a basis for ordering materials and the Bidder shall be responsible for assessing the quantities of material to be ordered.

15.0 AS BUILT DRAWINGS

15.1 On completion of Work, the Bidder shall submit to the Engineer, a reproducible and five copies of "As Built" drawing showing:

- 1) LT Cable layout wherever required.
- 2) Single line diagram and complete electrical layout.

15.2 Bidder shall prepare operation and maintenance manual for the complete electric system under this Contract and submit the same in four sets.

16.0 MANUFACTURE TEST

The Bidder shall specifically perform all test such as routine test, type test on all equipment in the presence of KMC &Chhattisgarh Electricity Department officials. All cost incidental to such test shall be deemed to have been included in the specific items of that equipment and no extra charge will be payable.

1.8.3 GENERAL SPECIFICATION

1. INTENT OF SPECIFICATION

This specification is intended to cover the design engineering manufacturing, fabrication. Assembly, testing at Manufacturer Work/delivery properly packed for transport, transportation up to site, erection, testing and commissioning at site suitable design capacity of D.G. Set. The D.G. Set shall run with HSD oil and shall be supplied complete with all the accessories described below for safe and trouble free commercial operation, in manner accepted to KMC.

2. CODES & STANDARD

The design, manufacture, shop testing, erection and commissioning of compression ignition diesel Engines and accessories shall conform to the following particular standard and codes, with latest revisions in addition to the relevant standards and manufactures own standards.

3. SCOPE OF WORK

The scope of Work includes design, manufacture, supply, transport to project site, handing erection testing and commissioning of Diesel Engine driven Generating sets in conformity with the specification given herein and the schedule of quantities.

The scope of Work covers the design, Manufacturer; testing supply of suitable capacity D.G. set which including the following:

- a) Alternator along with its excitation system auxiliaries, circuits, control panel, metering and protection circuits.
- b) Diesel engine along with its accessories and starting system.
- c) Flexible / semi flexible couplings.
- d) Common heavy-duty channel for base frame supported by anti-vibration damper at bottom.
- e) Cooling arrangements etc.
- f) Exhaust piping with heavy-duty residential type silencer, insulation of exhaust piping and etc. height of piping as per pollution control regulation.
- g) Starting lead Acid batteries with battery charger having trickle and boost charging arrangements complete with Ammeter with switch and voltmeter with fuse and switch to read battery voltage, starting motor, fuel oil, service tank, fuel oil piping etc.
- h) All control and power wiring between D.G. set, control panel batteries, safety controls, pumps and AMF panel etc.
- i) First fill of fuel oil, lubricating oil; etc. including cleaning and flushing out of the system after the test at manufacture facility.
- j) Fuel and oil for testing, trials runs and up to commissioning
- k) Obtaining all licenses, approval from local authorities including but not limited to any or all of the following:
 - 1) Electric Supply Utility, with source supply of 440 V as per CSPDCL norms
 - 2) Electrical Inspector of Govt. of Chhattisgarh.
 - 3) Pollution Control Board.
 - 4) Fire Department of the local Fire Brigade.
 - 5) Traffic Advisory Committee.

6) Municipal Corporation.

Installation and commissioning of the above D.G. Set is Also, including in the scope.

All requirement offered shall be provide design and reliable in operation. Diesel Generator set capacity specified is at site condition.

Generator shall be rated for critical process requirement only. The excitation system shall be designed to maintain the rated voltage constant even if a load of 150% of rated load is imposed on the Generator for duration of 15 Sec. Tendered to indicate power consumed by auxiliaries along with quotation.

The Tenderer shall specify in detail all equipment offered including auxiliaries, associated piping, cabling based on typical layout

PAINTING, PACKING AND TRANSPORT

All metal surfaces shall be thoroughly cleaned of scale, rust and grease, etc. prior to painting. Cleaned Surface shall be given two coats of primer and prepared for final painting. Final finish shall be free from all sorts of blemishes.

The equipment shall be shipped to site suitably packed to present any damage. Each package shall have labels to show purchaser name, purchase order and equipment number, suitable lifting lugs, etc. shall be provided and lifting points shall be clearly marked on the package. Packing shall be suitable for storage at site for a minimum period.

TEST AND INSPECTION

The owner or his authorized representative may visit the works during manufacture or equipment to assess the progress of Work as well as to ascertain that only quality raw materials are used for the same. He shall be given all assistance to carry out the inspection.

Detailed test procedure along with the facilities available at Bidder works shall be furnished as and when called for. Owner representative shall be given minimum four-week advance notice for witnessing the final testing. The Bidder shall furnish test certificate including test records and performances curves, etc.

The Bidder shall prepare and submit detailed shop drawing depicting the general arrangement of D.G. Sets, connected accessories, fuel tank, fuel oil piping, pumps, control panels, single line electrical diagrams for power and controls, exhaust piping, chimney, foundation details, etc. within 10 days of award of Work.

LOCAL REGULATION, BYELAWS, I.E.R. ETC

The D.G. Set installation will be generally governed by the following Regulations:

- i) Indian Electricity Rules (1956 and latest revisions).
- ii) Local regulations.
- iii) Pollution Control Rules (State/Union Govt. Rules)
- iv) Electrical Utility Co.
- v) Fire Brigade.
- vi) Electrical Inspector Approval.

vii) Tariff Advisory Committee.

OPERATION & MAINTENANCE MANUALS SPARE PARTS, TOOLS ETC.

The Bidder shall furnish operation and maintenance manuals in triplicate after installation of the D.G. Set. One set of special tools required shall be supplied at the time of handing over of the set to the Corporation. The price of these special tool set is deemed to be included in the rates quoted by the Tenderer. The bid letter shall list out such tools that will be handed over to the Corporation.

OPERATION OF THE SET AFTER INSTALLATION

The Bidder shall arrange to depute, free of charge, a Senior Operator to the site of works to operate the D.G. Set for a minimum period of four weeks after successful installation and approval of the installation by the local authorities. The operator shall impart training to the owners' operator/technicians in proper up-keep of the DG set.

COMPLETION DRAWING

On successful completion of the installation and before issuance of the certificate of virtual completion, the Bidder shall prepare and submit to the owner "as built completion". Drawings of the entire installation.

The completion drawings shall include:

Layout of D.G. St and accessories.

- b) Exhaust piping arrangement.
- c) Fuel oil tank and piping.
- d) Electrical single line diagram, control wiring single line diagram, cable layout, panel GA drawings, etc.
- e) Location of earth pits and Earth conductor with sizes.

TESTING

1. The following test shall be conducted on each alternator and D.G. Set.
2. Factory Test

- i) Routine Tests.
- ii) High Voltage Test.
- iii) Short circuit Current Test.
- iv) Instantaneous short-circuit withstand test.
- v) Insulation resistance test.

These tests shall be conducted as per the requirements of the original test certificates shall be furnished to the KMC.

3. Site Tests

After the erection and wiring and earthing for DG set, the following tests shall be conducted:

Insulation resistance of the generator.

Speed, no load voltage and full load voltage regulation.

Frequency at no load, half load and full load.

The readings shall be observed with calibrated meters. Only one meter shall be used for the tests. The reading shall properly tabulated and submitted in triplicate to the Engineer-in-charge.

4. Testing of Controls

All the safety controls and protective devices of the DG set shall be tested for correct calibration and operation. The result of the tests shall be tabulated and submitted in triplicate.

OPERATION

DG set with individual Auto Transfer starting facilities is required to provide electric power to the essential loads in the events of failure of normal power supply or when normal supply is switched off under abnormal conditions like fire. When normal power fails or is tripped manually, the D.G. set should start automatically and restore electrical supply for essential loads. It should have provision to start all the equipments one by one so as to reduce higher starting current. The DG set shall Also, run continuously to supply power to the loads till restoration of normal power supply.

A potential free Contact (NO) closing on under voltage will be made available by means of a suitable control cable at the Auto Transfer control panel to indicate failure or absence of normal supply. The DG set shall start on receipt of this signal with an adjustable time delay of 0.5 secs, the time shall be of self - reset type.

The starting time of each of the DG set should be as less as possible, but not exceeding 15 sec. to come on load. In case the first starting operation is not successful, two more attempts with preset time intervals should be attempts; the particular set should be locked out. When an engine speeds up and alternator develops desired voltage in frequency, generator circuit breakers will be switched on.

INSTALLATION

The Bidder shall carry out the installation of the DG sets including but not limited to the following:

- a) Installation of the DG Set, testing, commissioning, alignment, mounting along with AVM pads on ready floor, foundation to be made by the Bidder and the cost shall be included in the rate for supply and installation of the D.G. set.
- b) Installation of fuel oil system complete with day tank and Lube oil system with necessary piping, valves, fittings, supports, etc.
- c) Installation of air intake system, exhaust gas system completes with residential type silencer, expansion bellows, etc. and necessary piping, valve, fitting. Supports etc.
- d) Installation of Auto Transfer Switch and any other electrical panel.
- e) The Bidder to supply and install the required 8" Dia MS exhaust pipe up to the required height (as stipulated by Pollution Control Board Authorities) above the building in which the D.G. set are housed. The scope Also, includes providing insulation.
- f) Installation and charging of battery along with leads, battery stand, etc.

CAPACITIES

The capacity of each of the D.G. set shall be suitable as per design of TTPs. Generator shall be rated for critical process requirement only. The excitation system shall be designed to maintain the rated voltage constant even if a load of 150% of rated load is imposed on to the Generator for duration of 15 secs. Tenderer shall indicate power consumed by auxiliaries along with the Tender document.

DIESEL ENGINE

The engine shall be suitable for continuous operation to develop design capacity of dg set at site conditions as mentioned above.

The diesel engine shall be indoors type, multi cylinder, totally enclosed, continuous duty, direct fuel injection, series Turbo charged compression ignition, complete with its self-contained lubricating system. The lube oil system shall be provided with Engine Driven Lube Oil Pump only.

Following accessories shall be supplied with the engine and the quoted rate for supply and installation of DG set shall be deemed to have included for the accessories described below:

- a) Air filter Air restriction gauge.
- b) Lube oil filter.
- c) Fuel oil filter.
- d) Coupling.
- e) Day service Tank.
- f) Fly wheel with Guard.
- g) Corrosion Resister.
- h) Scroll type fuel injection system.
- i) Residential type silencer.
- j) Electronic governor.
- k) Starter motor.
- l) Instrument panel.
- m) Laid Acid Battery.
- n) Exhaust Bellows.
- o) First fill of lube oil

DAY FUEL TANK

The fuel oil day tank shall be provided with gauge glass, filling, drainage and vent connections with valves. Fuel Transformer pump between Engine & Day tank should be engine driven only.

LUBRICATING OIL SYSTEM

The Lubricating oil for engine lubrication shall be collected in the oil pan located at the bottom of the cylinder block. From oil pan, the lubricating oil shall be let off to a separate lube oil sump, if required. From the oil pan or from the oil sump the lubricating oil shall be drawn by engine driven lubricating oil pump through foot strainer (in the oil sump) and then Through oil filter of suitable capacity . The lube oil pump shall be of Gear type and Engine driven only and the entire assembly should be filter inside the sump. All the inter connecting oil piping together with valves, fittings, hangers, supports, etc. shall be provided by Bidder.

AIR / EXHAUST SYSTEM

Exhaust gas Driven Turbocharger shall be fitted to each bank and each turbocharger shall have its own self-contained lubricating oil system. Air shall be normally supplied and ducted to the turbo-charger of low & high pressure one. Air from the Turbocharger compressor passes to the after cooler and then to the engine manifolds. The cooler shall be of Tabular constructed with aluminium bronze MS and cat-Iron water Boxes. An Engine Drive water ump shall cool it.

The engine turbo charging system including exhaust and intake Manifolds, valve timing and arrangement of the cylinder Head shall be designed for optimum performance at High boost pressure with subsequent high specific Engine Power output.

GOVERNING SYSTEM

Electronic governing system shall be provided with the necessary sensors. The governor shall be suitable for operating without external power supply and shall be provided with adequate speed control system.

FLYWHEEL

The Bidder shall be responsible for determining and providing the necessary flywheel effect. The flywheel shall be both statically and dynamically balanced and capable of rotating at 125% of rated speed without injury. Flywheel guards shall be furnished.

ENGINE COOLING SYSTEM

Radiator shall be offered by the Bidder to cool the water received from the engine or any other cooling system as specified by Engineer-in-charge.

ENGINE STARTING SYSTEM

Manual Electrical starting arrangements of the engine in case of power failure shall be provided. The system will consist of DC starter motor mounted on turning gear will receive power from the set of 24V DC Batteries.

FUEL OIL SYSTEM

The fuel used for the DG set shall be High-speed diesel (HSD) only. The day tank shall be filled manually by operating Hand pump. In order to transfer fuel from day tank to engine has to be done through fuel transfer pump which should be engine driven only.

ALTERNATOR

The generator shall be driven by the diesel engine as described in this specification and shall match the same in all respects. The generator shall Also, conform to 15 4722 or equivalent.

TESTS

1. Equipment shall be tested to conform to the appropriate standard and the following tests shall be conducted in the presence of purchasers.
2. Functional tests, continuity tests and high voltage test on control panel to establish the performance called for in the specification.

3. Power frequency voltage test on switchgear and mechanical / electrical operation check.
4. Routine test for alternator as per IS 4722.
5. Over speed test (1.2 times the rated speed for 2 minutes)
6. Transient response tests for sudden application and rejection of loads of 25%/0/ 50%, 75%, and 100% of rated capacity.
7. Wave from test (type test result are acceptable).
8. Please sequence test.
9. Vibration test.
10. Noise level test
11. Dimensional and alignment.

DG AUTO TRANSFER SWITCH CONTROL PANEL

DG set shall be supplied with automatic transfer switch control panel. This panel shall be floor mounting, free standing, dust tight, vermin proof/ sheet metal enclosed, cubicle type. Cable entry to the ATS control panel shall be from the top or bottom (depending upon site condition) for power and control cable, outgoing cable, of auxiliary equipment and outgoing cable to power centre.

1. The panel shall be free standing, fabrication from 14/16SWG CRCA sheet metal enclosed, dust and vermin proof type with a hinged door and having a degree of protection IP 52 as per IS 2147 unless otherwise specified. The panel shall be powder coated with Siemens Graycolor shade after completing 7-tank pre-treatment process. Curing shall be by baking. Finish shall be structural finish (70-80 microns). Power and control equipment shall be segregated inside the Panel as far as practicable. The maximum height of the operation handle / switches shall not exceed 1000 mm and the minimum height shall not below 300 mm. All hardware shall be made corrosion resistant and bolts, nuts and washer shall be made of galvanized zinc passivated cadmium plated high quality steel. Unless otherwise specified the panel shall be suitable for bottom cable entry. Necessary glands shall be provided with panel.

All auxiliary devices for control, indication, measurement and alarm such as push buttons control/selector switches, indicating lamps, metering instruments, annunciation, etc. shall be mounted on the front door of the panel. Adequate number of potential free contact shall be provided in the control panel for any remote control, monitoring of the generator set.

2. All switches shall be load-break, heavy-duty type. All fuses shall be non-deteriorating HRC cartridge pressure filtered, link type. The Bidder shall be air brake type having AO3 duty rating. Thermal overload relays shall be three elements, positive acting, ambient temperature compensated type with adjustable setting range and built in protection feature against single phasing. All control/selector switches shall be rotary back connected type having cam operated contact mechanism with knob type handle 'STOP' push buttons shall be stay put type.

3. Wiring for power, control and signalling circuits shall be done with PVC insulated copper conductors having 1100V grade insulation. Minimum size of control wires shall be 2.5 mm. "ELEMEX" type terminals shall be acceptable for wires up to 10 sq. mm size and for conductors larger than 10 sq. mm bolted type terminals with crimping lugs shall be provided. A minimum of 10% spare terminals shall be provided on each terminal block.

4. An adequately sized earth bus shall be provided in the panel for connection to the main earth grid. All non-current carrying metallic parts of the mounted equipment's shall be earthed. Doors and movable parts shall be earthed using flexible copper connections.

5. Engraved nameplates shall be provided for all devices mounted on the front of the panel. Nameplate or polyester adhesive stickers shall be provided for each equipment mounted inside the panel.

AUTO MAINS FAILURE CONTROL PANEL:

The AMF control panel shall be provided with, but not limited to the following devices:

The AMF Panel shall have provision such that on switching over to DG supply; it shall not put all the drives into operation on load at a time. But the same shall be put into operation one by one with suitable time lag. The panel shall be Cubical type, floor mounted, dust and vermin proof control panel with hinged doors, CAM type doorknob, undrilled bottom gland plate, load manager each fitted with:

- > Suitable rating Amps 4 phase 36KA MCCB - Similar to MD's make Cat No.25606 with frame size of DPX 630, S-I, electronic type - 2 NOS.
 - > Shunt Release 220V A.C coil similar to MDs make, Cat No.26164 & frame size of DPX-630 - 2 Nos.
 - > Remote control front operated; motor operated similar to MDs make - Cat No.26144 & frame size of DPX-630 - 2 Nos.
 - > Auxiliary contacts similar to MDs make Cat No.26160 & frame size of DPX-630 - 2 Nos.
 - > Spreader lines similar to MDs make Cat No.625008 & frame size of DPX-630 - 4 Sets.
 - > Electronic control unit automatic supply inverter similar to MDs make of Cat No.26196 & frame size DPX-630 - 1 No.
 - > Automatic transfer switch fixed version supply inverter mounting phase suitable for suitable rating Amps similar to MDS make, Cat No.26509 & frame size DPX- 630 - 1 No.
 - > Digital Ammeter of adequate rating with selector switch & CTs - 1 No.
 - > 0 - 500V digital voltmeter with selector switch & CTs. - 1 Set
 - > RYB indicating lamp - 2 sets.
 - > MCCB ON/OFF indicating lamp - 2 sets.
 - > 2 No. + NC Auxiliary contactor 220V ac - 2 Nos.
 - > Frequency meter.
 - > Digital hourly running meter.
 - > KW meter, Digital.
 - > KWH meter, Digital.
 - > Current transformers of suitable ratio of class 1 for metering.
 - > 3 Nos. current transformers of suitable ratio of Class-I for metering.
 - > 4 Pole ALB Microprocessor based EDO type contact operated by charging motor and incorporated with shutter Assembly, shunt release etc.
 - > Micro switch for service position, Test service, 3 indicators for DG ON/OFF/TRIP.
 - > CT for above ACB's
 - > Copper Bus Bar (TPN) of adequate rating.
- Mains supply Monitor to identify low voltage/complete failure and initiate necessary single for operation of automatic control gear.
- > 1 Set Window Annunciation's with audio visual alarm & Trips for:
 - i) High Water Temp.
 - ii) Low lube Oil pressure.

- iii) Over speed stop
- iv) Set fails to start.
- > 1 No. Electronic Hooter.
- > 1 Set push button hooter accept/fault clear.
- > 1 No. Control switch (ON/OFF - for DG Manual control)
- > 1 No. Mode Selector Switch (AUTO/MANUAL/aEST/OFF)
- > 1 Set Indicating Lamps for s Load on Set', ' Load on Mains' etc.
- > 1 No. Battery Charger consisting of:
 - Transformer
 - Rectifier
 - D.C. ammeter
 - D.C. voltmeter
 - Charger selector switch (TRICKLE/BOOST/OFF)
 - Lamp for battery charging indication.
- > 1 Set Instrument fuses.
- > 1 Set Bus bars of adequate capacity.
- > 1 No. of Automatic Transfer Switch fixed version (750 Amps).

CABLES

1. The specification covers the design, manufacture, performance, inspection at the Manufacturer's works and delivery to site of 1100V grade cables.
2. The design, manufacture of performance of the cable should confirm to the latest applicable standards of Bureau of Indian Standards.
3. All cable shall be XLPE and shall comply with the following requirements:
 - a) Annealed copper conductor, class 2 as per 15:8130 or aluminium.
 - b) Colour coding shall be provided.
 - c) Inner sheath shall be extruded type and shall be compatible with the insulation for the cables. The inner sheath shall be with PVC compound type 'A'.
 - d) Armouring for all the cables shall comprise G.I. strips/wires.
 - e) The outer sheath shall be of an extruded layer of type ST-1 compatible with the specified ambient and operating temperature of the cables. The sheath shall be resistant to water, ultra violet radiation, fungus, termite and rodent attacks. The outer sheath shall be of black colour.
 - f) Cables shall be subjected to routine and acceptance tests in accordance with 15:1554 and other relevant standards.
4. General Conditions
 - a) The quantities given in the schedule are subject to change to suit site conditions.
 - b) The Manufacturer should have in house testing facilities as per IS.
5. Specifications for Installing LT cables and Control Cables
The method of installing cable shall be broadly classified into four main categories:

Laid in prepared trenches/Hume pipes

All cables laid inside the substation building shall be laid in prepared trenches. For easy identification all cables laid shall have cable marker tied to it by means of steel wire and showing the size and name of panels embossed on it.

Laid Underground

The procedure stated in technical specification shall be followed. However,, before laying all precautionary procedure shall be adopted by the Bidder. Layer of sand then cables and then layer of sand again with half round RCC pipe shall be laid.

Fixed on walls etc.

If cables are to be fixed on walls, etc. then the same shall be done by using MS galvanized spacers and GI saddles using screws, etc.

Laid on cable trays

Generally, cables laid on trays shall be fixed on the rungs of the trays using nylon lockable cable ties of approved make of **MOC of Steel (Hot Dip Galvanized)**. As far as possible, cables shall not cross each other unnecessarily on tray, so that a neat and easily identifiable cable system is achieved.

Note: All external cables shall be directly buried with proper cable trench and cables (outside) within buildings shall be laid on cable trays. However, the cables inside the rooms / office / building shall be concealed.

INSPECTION

All cables shall be inspected by the Bidder upon receipt at site and checked for any damage during transit.

JOINT IN CABLE

The Bidder shall take care to see all the cables received at site are apportioned to various location in such a manner as to ensure maximum utilization and avoidance of jointing cables. The apportioning shall be got approved by the owner before the cables are cut to length. Straight joints are prohibited unless specifically allowed in the schedule of quantities.

EXCAVATION AND BACKFILL

All excavation and backfill including timbering, shoring and pumping required for the installation of the cables shall be carried out by the Bidder in accordance with the drawings and requirements laid down elsewhere. Trenches shall be dug true to line and grades. Backfill for trenches shall be filled in layer not exceeding 150 mm. Each layer shall be properly rammed and consolidated before laying the next layer. The Bidder shall restore all surface, roadways, sidewalks, curbs walls or other works by excavation to their original condition, satisfactory to the KMC. Back filling shall be done with soft earth only.

TERMINATION OF CABLES & JOINTS

a) For termination of cables of size 16 sq.mm. and above, suitable copper cable sockets of appropriate size and capacity shall be provided at terminal ends. This condition is applicable to single PVC insulated wires of 16 sq. mm. and above Also.

- b) Generally, reducer/spade type sockets shall be used where grub screw/clamp type fixing arrangement is available at the terminating end. Tubular sockets shall be used where bolt and nut arrangement is available at terminating end.
- c) The cable socket shall generally be fixed to the cable cores by crimping process.
- d) Irrespective of the size of the cable and the method of termination, the core end shall be cleaned and immediately covered with an oxide inhibiting/corrosion inhibiting compound before termination.
- e) The tail end wire shall be finished in an appropriate colour by using PVC insulating tape.

14.8.4 TESTING, MANUFACTURER TESTS, PRE-COMMISSIONING TESTS AND COMPLETE COMMISSIONING

The general intent of this specification is to mention the relevant tests to be done and furnished to the client by the Bidder. These are guidelines. However, the Bidder shall carry out all such tests and complete all formalities as per relevant Indian Standard Specifications, Tariff Advisory Committee's rules and fire Insurance Requirements and or Electricity Rules and Regulations as per Govt. Gazette and Publications.

Testing of Equipment

All equipment before installing on the site Work shall be tested and at such results produced to the Engineer in charge nothing shall absolve the Bidder from re-performing any tests that the Bidder may be called upon specifically by the consultant/KMC or supply company or electrical inspector. All equipment shall be tested jointly with the Consultants/KMC as required by various sections of the specifications and test data shall be furnished as required at Manufacturers Work before dispatch of material at site.

Pre Commissioning Test

All rules, regulations and requirements of Chhattisgarh Electricity Department, Govt. and local authorities and of Indian Standard specifications and/or Rules and regulations stated in Indian Electricity Act shall be strictly complied.

On completion of erection the Bidder shall clean all the equipment thoroughly and inspect the entire installation for correctness and shall furnish a report of completion to the consultants, pre-commissioning tests shall commence only on approval of this report by the consultants.

All tests and the certification thereof shall only be carried out by those authorized. Skilled, experienced and certified permit holders of the supervisor category of state government Industries and Labour Department. No unauthorized personnel shall ever carry out any such tests as stated herein under.

- 1) Phantom load tests for protective relays.
- 2) Insulation tests at the following points by 1000 Volts and or 500 Volts megger.
- 3) Mechanical operation tests for all movable parts of switchgears breakers tripping devices, etc.
- 4) Phase sequence test at all the relevant points for connecting correct R, Y and B as per the supply authorities positions.
- 5) All panels to be tested for interlocks, control tripping and breakers to be tested for sequential tripping.
- 6) Capacitors banks shall be tested for all residual voltages on the terminal of the units and it should not exceed 50V after one minute.
- 7) Continuity tests shall be done for noting any short circuits and or earthing of phases.

Commissioning

- a) Prior to commencement of installation Work the Bidder shall obtain the approval of the substation drawings, if any and electrical layout prepared by him from the electrical inspector. The time involved in this is included in the overall completion period of the Contract.
- b) The Bidder shall obtain the written permission and sanction of commissioning the equipment and substation from electrical inspector and from KMC.
- c) All costs incidental to obtaining such sanctions shall be to the Bidder account.
- d) Bidder shall furnish all the necessary tests and test reports to the Electrical supply authorities and complete all formalities required to comply as per the Rules and regulations laid down for release of Electric supply. If called on, the Bidder shall carry out all such tests and prove the results to the entire satisfaction of the local and electric supply authorities.

All costs and expenses incidental to the release of electric supply shall be to the Bidder account and no demand whatsoever shall be to the KMC, except for any security deposits that the supply authorities would deem necessary for charging of the line, except as may be provided for in the schedule of quantities.

All such documents forwarded and or letter and or correspondence exchanged in this regard shall be made available for inspecting and the Bidder shall furnish 3 sets of documents and drawings for the KMC records.

After release of electric supply to KMC premises, the Bidder shall furnish six sets of all tests declared to the supply Co. authorities and shall furnish all such documents, officially exchanged.

Bidder shall also, obtain and furnish the relevant completion certificate from the Electrical Inspector, Fire Officer and/or any other Authority thereof whichever may be applicable.

14.8.5 TECHNICAL SPECIFICATION:

ENGINE

Engine shall be water cooled tube charger with water cooler, under NTP condition of BS: 5514 with at overload capacity of 10% for one hour in any 12 continuous hrs Operation.

The engine shall complete with following accessories:

- a) Radiator with blower fan or Heat Exchanger.
 - b) Corrosion inhibitor coolant.
 - c) Paper element filter-fuel, lube oil and by-pass.
 - d) Flywheel housing and flywheel to suit double bearing alternator.
 - e) Spider flexible coupling.
 - f) Dry type air cleaners and vacuum indicators.
 - g) Residential Silencers.
 - h) Stainless Steel exhausts flexible bellow.
 - i) Motor driven priming pump.
 - j) Electric Starter.
- Battery charging alternator.
- i) Solid-state potentiometer.

ELECTRONIC CONTROL PANEL (Displaying the following)

- > Battery voltage
- > Coolant water temperature.

- > Lubricating oil pressure.
- > Engine speed.
- > Safety Control: High water temperature (HWT)
- > (Trip & Indication): Low lube oil pressure (LLOP)
- > Over speed stop.

ALTERNATOR

Approved make, standard design alternator, suitably rated at 600 W/ required rating at 0.8 p.f.(lag), 415, 3 phase, 4 wire, 50 cycles/ sec. 1500 RPM, self-excited and self-regulated with brush less excitation, bank of voltage regulation + 2.5% of rated voltage, from no load to full load. Insulation class "H". the alternator generally conforms to BS: 5000/15:4722.

BASE FRAME

Sturdy, fabricated, welded construction, channel iron base frame for mounting the Engine and Alternator.

FUEL TANK

Fuel tank of suitable storage capacity sufficient to run the DG Set for minimum 8 hours, with mounting brackets, complete with level indicator fuel inlet and outlet air vent, drain plug, inlet arrangement for direct filling with pumping arrangement of suitable rating and capacity and set of 5 fit or as per the requirement of site long fuel hoses.

BATTERY SET

Set of Batteries: 12 Volts, 27 plates, dry, uncharged batteries with leads and / terminals.

CABLING WORKS

All cables from D.G. Set to AMF panel and from AMF panel to existing control panel and transformers of suitable rating as per the D.G. Set rating should be provided. The Tenderer should inspect the site before quoting the offer.

AUTO MAINS FAILURE CONTROL PANEL

Floor mounting, cubicle type, Automatic Mains failure panel, comprising of:

TPN motorized Air Circuit Breaker for Mains for 2 Nos. of transformers and Nos. outgoing to control panel.

TPN 4 Pole motorized Microprocessor based Air Circuit Breaker.

TPN 4 pole motorized Air Circuit Breaker for Alternator.

Natural Bidders for Main & Alternator.

Voltmeter with selector switches for MAINS & ALTERNATOR.

Ammeter with selector switch.

Current transformer.

Frequency meter.

KWH Meter.

KW Meter.

Battery charger consisting of Transformer/Rectifier with surge protection.

Selector switch for current adjust.

Mains supply failure monitor (voltage sensing).

Supply failure timer.

Restoration timer.

Control unit incorporating 3 impulse Automatic Engine Start/ Stop and "Failure to Start" lockout.

Impulse counter with locking and reset facility.

OFF/manual/Auto Test Selector switch.

Control circuit ON/OFF switch.

LAMP INDICATION & TRIP ANNUNCIATION SCHEME

Mains ON	Yes	-
Generator ON	Yes	-
Load on MAINS	Yes	-
Load on Generator	Yes	
Low Lube Oil Pressure	Yes	Yes
High water temperature	Yes	Yes
Set/Fails to Start (with Alarm)	Yes	
Mains ON	Yes	-

Push Buttons/Switches for :

- > Engine Start/Stop
- > Alternator breaker ON/OFF
- > MAINS Breaker OFF
- > AMF Test

WORKING OF THE PANEL

a) Auto Mode

When the mains supply fail, the "Mains supply failure Monitor" operates after a preset time of approx. 10 Sec. This actuates the "3 impulse Engine Start" control. We do not recommend plug type relays. The control unit gives three starting impulses with an interval of 1-5 sec. If the engine starts at the first impulse, the unit shuts off. If not, it gives further two impulses, during which time, if the engine, does not start, the unit shuts off, activating the audio-visual alarm for "Set fails to Start".

b) Test Mode

By operating the "AMF Test" Push Button, the conditions of Mains Failure are stimulated as explained in Auto Model above, without disturbing the supply through Mains switchgear.

ENGINE INSTRUMENT PANEL

- a) Starting switch with key.
- b) Lube oil pressure gauge.
- c) Battery charging ammeter.
- d) Charge regulator.
- e) Set of documents comprising spare's part book maintenance.

Mains supply monitor to identify low voltage/complete failure and initiate necessary single for operation of automatic control gear.

1 set window Annunciation's with audio visual alarm and trips for:

- a) High Water Temp.
 - b) Low Lube oil pressure.
 - c) Over speed stop.
 - d) Set fails to Start.
-
- ii) 1 No. Electronic Hooter.
 - ii) 1 Set Push Button - Hooter Accept/Fault Clear.
 - iii) 1 No. control switch (ON/OFF for DG manual Control)
 - iv) 1 No. mode selector switch (Auto/Manual/Test Off)
 - v) 1 Set indicating lamps for load on set, load on mains, etc.
 - vi) 1 No. battery charger cossetting of:
 - a) Transformer
 - b) Rectifier
 - c) D.C. ammeter
 - d) D.C. Voltmeter
 - e) Charge range selector switch (Trickle/Boost/off)
 - f) Lamp for battery charging indication
 - vii) 1 Set instrument fuses.
 - viii) 1 Set bus bar of adequate capacity.

SOUND PROOF ENCLOSURE

Sound proof enclosure of DG set shall be fabricated out of M.S. 16 gauge sheet steel and special type of sandwich material shall be used for sound absorption. DG set can be operated without any duration.

The DG set shall be suitable for direct mounting inside MS fabricated container with proper clamping, mounting and supporting arrangement. M.S. sheet metal enclosure with hinged/sliding type doors shall be provided for protection from sound, dust and rain.

The Salient features of outdoor D.G. Set Canopies (for noise control) are as under:

- > Enough space to house DG Set panel and fuel tank outside canopy.
- > Provision of Air-Intake and Air-Exhaust Silencer(S) for preventing leakage of sound.
- > Openable Doors for easy access to virtually every part of DG set for comfortable.
- > Maintenance Doors are double wall all steel insulated SOUND REDUCTIN DOORS.
- > Provision of additional screen and hoods for multi medium noise suppression.
- > Two layers of sound - suppressing elements:
 - a) Non-Ferrous sheet sound barrier.
 - b) Rock-Wool 48 Kg/cu. M. 100 thick.
 - c) Total thickness of panel - 100 mm.
- > High performance most comfortable sound - reduction level to 70 db. at a distance of 3 meters.
- > Provision for forced ventilating hot air coming out of engine.
- > It can be dismantled completely & engine is accessible from all the sides.

SPECIFICATION OF ACCOUSTIC ENCLOSURE CANOPY

The D.G. Set is mounted on anti-mounts and placed on firm ground. A specially designed transportable acoustic chamber encloses the generator set. The acoustic chamber attenuates the noise of the generator set. The weather proof acoustic chamber is designed to reduce the noise level to an average of 70 ± 5 db. (A) at three meter away from the enclosure as measured in free field condition. The enclosure shall be designed to the following requirement:

- a) Modular type weather proof design so that this can be installed in open space (No engine room is required).
- b) Sufficient space around the genset to meet the day to day maintenance of engine, alternator, batteries etc.
- c) Suitable grills for air suction for engine cooling/aspiration, outlets for hot exhaust gases, air for ventilation, air inlet and outlet without affecting the engine performance etc.
- d) Frame Work made out of heavy gauge steel sections and suitably reinforced.
- e) Proper forced ventilation arrangement to maintain enclosure temperature within permissible limits.
- f) Electric points, illumination lights, blower fans etc, inside the chamber.

The external surface of the enclosure is clad with CRCA steel sheets and treated with anticorrosive paints. The interior is lined with fire proof, vermin proof sound absorbing material suitably retained in position using perforated sheets/galvanized wire mesh.

The acoustic enclosure is designed and fabricated to meet the specification and shall Work at the optimum condition and maximum efficiency with proper fresh air blowers.

Adequate number of doors with lockable arrangements are provided for easy access. All the doors are provided with rubber gaskets for weather and sound proofing. The bolted structure of the enclosure facilitates it easy shifting from one place to another if required. The acoustic chamber shall be painted as per the customer colour choice.

MATERIAL USED FOR CONSTRUCTION

- A) The outer cover for the acoustic enclosure shall be made out of ribbed type 1.6 thick CRCA steel sheet. Size of the rib shall be 80 mm x 20 mm.
- B) All perforated sheets used shall 1 mm thick galvanized iron sheets with 3 mm hole Dia and 5 mm diagonal pitch.
- C) The sound absorbing acoustic materials used shall be resin bonded mineral wool/rock wool. It will have a density not less than 65 Kg./Cu.m.

14.8.6 SCOPE OF INSTALLATION & COMMISSIONING

For erection of the equipment in the power house, following Work shall be undertaken.

1. DG Room layouts, preparation of detailed engineering drawings for foundation, electrical panels and other accessories etc.
2. Supply and installation of exhaust pipes from the engine, with necessary supports as per our layout and lagging of pipes. To a maximum of 6 mtr. additional length will be charged extra.
3. Supply and installation of fuel piping from the engine to fuel tank & return.
4. Supply and laying of power cables between alternator & DG panel.
5. Necessary control cabling between DG set and DG panel.
6. Training of your personnel at site.
7. Unloading and positioning of the DG set.

8. The scope of works Also, includes all types of works to complete the erection and successful commissioning of DG set at site such as:
- a) All civil works including mounting on MS frame etc. as per the directives of Engineer-in-charge.
 - b) Earthing along with earth pits.
 - c) Outgoing power cables.
 - d) Obtaining approval from concerned authorities.

14.8.7 ESSENCE OF WORK

Following given points are the essential works of Contract for the subject Work and successful agency will be responsible for completing the same without any extra cost within stipulated Contract period.

1. Even though the technical specification and other details are specified in the Tender document for carrying out the subject Work, the successful agency will be supposed to design the scheme in detail for carrying out the subject Work, matching with the existing system and the scheme prepared should be got approved before starting the execution of Work, the agency should visit the site before quoting the offer to guess the exact quantum of Work.
2. ~~After finalization of the scheme the agency should obtain the required approvals to the various makes of material to be supplied under the Contract before procurement.~~ The D.G. Set and other material to be supplied under this Contract should be got tested at Manufacturers unit in presence of Engineer-in-charge or his representative.
3. The agency should submit the Bar Chart within a period of one week after issue of Work order.
4. It will be the responsibility of the successful agency to complete the statutory requirements from concern authorities for carrying out the subject Work completely as per the requirement of Engineer-in-charge without any extra cost.
5. Proposed D.G. Set under the present Contract shall be installed at TTPs. For erection of the same, successful agency will be responsible for carrying out the required foundation work and other connected civil Work Also. This foundation work and civil work should be carried out in consultation with concern civil authority completely as per the requirement of Engineer-in-charge.
6. Successful agency will be responsible to provide required connecting cables of appropriate size and length to be connected between transformer, AMF panel and D.G. Set etc. completely as per the scheme approved by Engineer-in-charge. This Work will be included in the total scope and no extra payments will be made against this Work.
7. After completion of erection and commissioning Work of proposed rated designed D.G. set, successful agency will be responsible for operating and maintaining the installation for a period of Fifteen years (including defects liability period of two year).
8. The agency shall carry out the Work as per ISO 9001-2000 procedure and maintain necessary records completely as per the directives of Engineer-in-charge.

Annexure – E-V

**Providing, lowering, laying, jointing successfully testing and commissioning. 500 mm dia
DI K-9 Pumping main from STP sump to NTPC premises**

	Scope of work and technical Specification for Spigot and socket centrifugally cast (spun) ductile iron pipe class K-9 class withinside cement mortar lining 500 mm dia and 1300 m length treated water pumping main.
1.	SCOPE OF WORK: The scope of work shall be as below:
2.	ISI mark socket and spigot centrifugally cast (spun) Ductile Iron Pressure pipes class K -9 withinside 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.
3.	Excavation in trenches in all types of strata for laying & jointing of above pipe line with required depth and width as per specification.

4.	Providing and fixing D.I. D.F. sluice valve including testing & jointing with cost of nut, bolts, rubber insertion duly inspected by SGS/RITES
5.	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
6.	Providing, laying & jointing D.I./ MJ fittings conforming to IS 9523:2000
7.	Construction of 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.
8.	Back filling of trench as per IS:12288-1987.
1.6	Providing and making all interconnections as required to charge the laid pipe lines under scope of work.
1.7	In case, the shifting of any existing, water pipe line/sewage line /power cables, ofc cables or any other utilities is considered necessary by the department such service lines will have to be shifted by the bidder for which the payment shall be made for the actual work done as per approved rate of this contract.
1.8	The firms/bidders are directed to submit the details plan and elevation of all the pipelines showing the dimensions of all components and other details. All the valves and electromechanical fittings shall be IOT BASED SCADA & compatible with actuators for implementation of IOT BASED SCADA. The bidder has to procure and install informatory board's displaying Name of work at the location given by CMO.

2.0 D.I. PIPES

2.1	Manufacture: -All the pipes shall be ISI Mark and confirming to IS: 8329:2000. The pipes should be duly inspected by SGS/RITES before supply.
2.2	Hydrostatic test:- Hydrostatic test of Pipes shall be carried out as per relevant IS codes and guidelines.
2.3	Tolerances:- The tolerance shall be permissible as per IS:8329-2000.
2.4	Coating :- 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	<p>Marking:-Each pipe shall have cast, stamped or indelibly painted on it the following appropriate marks :</p> <ul style="list-style-type: none"> a) Indication of the source of manufacture. b) The nominal diameter. c) Class reference d) The last two digits of the year of manufacture. <p>Marking may be done:</p> <ul style="list-style-type: none"> 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.

	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 mortar (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 200 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. The cost of above works is deemed to be included in the Lump sum offer of bidder, nothing extra shall be paid in this regard. In case bidder fails to comply with the directions department will be at liberty to execute the above works and deduct, the amount incurred plus a penalty of

	10% of amount incurred, from bidder's RA/Final bills.
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 pipeline 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 bidder 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 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	<p>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.</p> <p>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.</p>
5.2	<p>Pipe Line Anchorage -</p> <p>This shall be provided as per relevant BIS 5330:1984 with up-to-date amendments.</p>
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 take 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	<p>After a new pipe line is laid and jointed, testing shall be done for:</p> <ol style="list-style-type: none"> Mechanical soundness and leak tightness of pipes and fittings Leak tightness of joints Soundness of any construction work, in particulars that of the anchorages All other tests as per the direction of Engineer in Charge

7.2	<p>The completed pipe line shall be tested for a pressure given in IS 8329:2000, Hydro static test pressure in field shall be carried out as per clause 11.3.5 and 11.10.3.3 Testing of pressure pipes of Manual of Water Supply and Treatment of CPHEEO.</p> <p>3% amount withheld for hydro static Testing of Pipeline work shall be released after successful hydro static testing of that particular section of pipeline.</p>
8.0	<p>Flushing and disinfection of mains before commissioning:</p> <p>The pumping main & distribution mains shall be disinfected before commissioning as per provisions given in CPHEEO manual and IS 5822:1970.</p>
9.0	<p>Removal, Restoration and Maintenance of paved footpaths etc. (after laying of pipe) :</p>
9.1	<p>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.</p>
9.2	<p>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</p>
9.3	<p>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.</p>
10.0	<p>APPURTENANCES:</p> <p>The following appurtenances shall be suitable designed and fixed on the suitable points on the conveyance main.</p>
10.1	<p>SLUICE VALVES:</p> <p>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 \ conforming to IS 14846:2000. Ductile iron double flanged sluice valves as per I.S.:14846-2000 fitted with cap including jointing & testing with cost of jointing material such as bolts, nuts, rubber insertions etc. all complete shall be provided.</p>
10.2	<p>DI/DF AIR VALVES:</p>

	<p>The bidder shall provide ductile iron single chamber triple function temper proof air valves, small orifice with screwed end as per IS : 14845-2000 including jointing & testing with cost of jointing material and rubber insertion all complete as per IS :13095-1991. All valves shall be supplied and fixed in position by the bidder from desired inside level of the tank to duck foot bend one metre below G.L. and further providing and fixing all Pipes and specials from duck foot bend on ward up to minimum 5.0 m outside the supporting structure of the tank. 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 as per I.S. Specifications.</p> <p>Further D.F. pipes should be provided up to minimum 2.0 m away from the supporting structure of the tank.</p> <p>All these duck foot bends shall be fixed with sluice valves class PN 1.6 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.</p> <p>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.</p>
10.3	<p>BRANCH CONNECTIONS:</p> <p>“T” outlet with manually operated sluice valves shall be provided in the distribution pressure Main for Branch connections.</p>
10.4	<p>The appurtenances shall be located in such a way that these are clearly and easily accessible for operation and maintenance.</p>
11.0	<p>CONSTRUCTION OF CHAMBERS FOR APPURTENANCES:</p>
11.1	<p>CHAMBER FOR APPURTENANCES:</p> <p>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.</p>
11.2	<p>CIVIL WORKS:</p> <p>All the allied civil works necessary for laying and jointing of pipeline shall be a part of this contract; therefore, the bidder 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 bidder.</p>
12.0	<p>Testing, Commissioning of pipe line, trial run and defect liability period:</p> <p>After completing the job of laying and jointing of pipe line the bidder will do testing, commissioning and operation & maintenance for a period of fifteen-year including training of personnel. The repairing of bursting and leakage of pipeline</p>

	during this period shall be done by the bidder at his cost including cost of all materials. The defect liability period shall be 18 months concurrent with O&M.
13.0	Inspection of Pipes, valves & fittings Inspection of the pipes, valves & fittings will be done by the 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.

17.0 DISINFECTION OF PIPE LINE BEFORE COMMISSIONING

Pipeline carrying potable water shall be suitably disinfected before commissioning as per guidelines given in CPHEEO Manual & relevant IS codes.

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

- 18.1 **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.

- 18.2 **Casting:** The pipes will be centrifugally cast (spun) Ductile Iron pipes for Water, confirming 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.
- 18.3 **Surface coating:-**The pipes shall be coated with Metallic Zink 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.
- 18.4 **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, confirming to the IS: 5382. Any change in the stipulated lengths will be approved by the Engineer – in charge.
- 18.5 **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 bidder to see that the manufacturer of the pipes gets them manufactured from a suitable manufacturer under its own supervision and have it tested at his/sub bidder's premises as per the contract. The pipe manufacturer will However, be responsible for the compatibility and quality of the products.
- 18.6 **Flanged joints:-**The flanged joints will confirm to the Clause 6.2 of IS 8329. The pipe supply will also include one rubber gaskets for each flange.
- 18.7 **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.
- 18.8 **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 bidder shall submit the test certificate issued by the manufacturer with the pipe supply, without which payment for pipe supply shall not be released.
- 18.9 **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 at the bidder's cost. 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 bidder to the inspecting agency.

18.10 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.

18.11 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

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

19.0 SPECIFICATIONS FOR DUCTILE IRON FITTINGS (SPECIALS)

19.1 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.

19.2 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 (90^0 , 45^0 , $22\frac{1}{2}^0$, $11\frac{1}{4}^0$)
- double socket branch flanged tee
- all socket tee
- double socket taper
- All the fittings shall be of PN 1.6 pressure rating

19.3 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.

19.4 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 bidder 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 bidders' premises as per the contract. The pipe manufacturer will However, be responsible for the compatibility and quality of the products.

19.5 Lubricant for ductile iron pipes and specials

19.5.1 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.

19.5.2 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

19.5.3 Acceptance tests:-They shall be conducted in line with the provisions of the IS 9523

19.6 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.

19.7 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 end 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.

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 1.00 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 bidder, 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 bidder 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 bidder 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 bidder, 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.

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 street 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.

19.8 MS Pipes and specials underground, outer coating:

Coating:-All underground buried mild steel piping shall be protected by the application of hot coal tar enamel and fibre glass wrapping. The coating shall consist of one coal tar primer coat, one coal tar 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 mill scale, 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 coal tar 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 powerm.

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.

20.0 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.

20.1 Description

Electromagnetic full bore meter with RS485 Interface /Ethernet 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: Micro- processor based, modular design display 2 line back lit LCD for indication of actual flow rate, forward, reverse, sum totalizer, Perfection category : IP 65 Output : One current output (4-20 mA) one scalable pulse output.

20.2 Technical specifications

Media: Liquids (Conductive)

Basic Application: Water

Conductivity : 0.5 to 3 $\mu\text{S}/\text{cm}$ min

Viscosity : 200 cp max

Recommended flow rate : Min./max full scale value(v ~ 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 digits for Flow Rate & 8 digit for

Totalised Flow

Calibration Range : As per requirement or (Factory Standard Calibration)

Accuracy : $\pm 0.5\%$ F. S

Linearity : $\pm 0.5\%$

Repeatability : $\pm 1\%$

Process Temperature : Rubber: 85 $^{\circ}\text{C}$ Max & PTFE: 100 $^{\circ}\text{C}$ 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 m Sec

Temperature Coefficient : $\pm 0.1\%$ per $^{\circ}\text{C}$

Remote Electronics : IP- 68, 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 $^{\circ}\text{C}$ / Humidity 5 to 95% non-condensing

21.0 Specification - Pilot-operated, hydraulic water-level and Flow control valve

21.1 Flow with Attitude/Level control valve;

The Weir/Globe pattern Control valve will maintain a maximum water level in the tank, 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.

21.2 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 ANSI/FCI-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 IOT BASED SCADA or RTU local is required, digital communication port RS 232/485 fibre optics having connectivity as per industry standard protocol should be provided (RTU shall be provided by bidder and bidder shall also comply with the capability requirements).
- g. Provision of battery-operated option should be there in case of power failure

21.3 Plunger Type Flow Control/Pressure Reducing Valve:

In addition to above-

- a. Plunger valves shall be provided with electrical actuators having the control facility for intermediate valve positioning by connecting external signal.
- b. 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.
- c. 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.
- d. 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.

- e. 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. Handwheel shall be positioned to give good access for operational personnel.
- f. Hand wheel shall be provided with integral locking device to prevent operation by unauthorised persons.
- g. A selector switch shall be provided on the actuator for remote/local/hand operation of the valve.

21.3.1 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)

21.4 Diaphragm Type Flow Control /Pressure Reducing Valves

In addition to above

- a. 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.
- b. Commands/electric signals for positioning of the control valve (for IOT BASED SCADA compatibility) will be from RTU.
- c. The diaphragm must with stand a Mullens Brust Test of a minimum of 25 bar per layer of nylon fabric and shall be cycle tested 100000 times to insure longevity.
- d. The internal valve component shall be assessable removable and repairable and repairable without removing the valve body from pipeline.
- e. These valves should be of self-regulating type when power supply is not available

21.4.1 **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 ekastimer-Buma-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)

22.0 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.

ANNEXURE – E-VI

CONSTRUCTION OF 600 M LONG COMPOUND WALL AND MS GATES

Specifications (Refer detailed Drawing)

1	RCC	Min M20 grade
2	Steel	TMT Fe 500
3	Type of Foundation	Column Foundation
4	Gate	As per tender drawings
5	Column Spacing	3 m c/c
6	Expansion Joint Column Spacing	15 m c/c
7	Height of Compound wall	1.8 m

Specifications for RCC, brick masonry, plastering are as per general specifications mentioned in NIT.

Main gate shall be 10 Sqm area and wicket gate shall be 2.4 Sqm area. MS Gate (Main Gate and Wicket Gate) shall be as per approved design. Weight shall not be less than 30 Kg/Sqm. Gate shall be provided with aldrop, locking arrangement, handle, hinges and other requisite fixture. Gates shall be painted with one coat of primer and two coats of synthetic enamel paint.

1.9.10. SPECIFICATIONS FOR GENERAL CIVIL WORKS

1.9.10.1. General

The Technical requirement for Civil Works outlines the details of materials, equipment, workmanship, and quality control guidelines for the major items contained in the Bill of Quantities (BOQ) for the works. The “Central Public Works Department (CPWD) Specifications: issued by CPWD shall also be referred to along with this General Civil Works, wherever appropriate.

The Technical requirements and Bill of Quantities (BOQ) shall be read in conjunction with the other Contract Documents. All the documents and drawings are to be regarded as mutually explanatory. In the event of any discrepancy or assumed discrepancy being found between them, the Bidder shall immediately inform the Engineer of the matter in writing and the Engineer will issue his instructions in the matter in accordance with the Conditions of Contract/Special conditions of Contract.

In general, other than CPWD Specifications, provisions of the Indian Standard Codes, Indian Roads Congress Codes, and MoRTH Specifications for Roads and Bridge Works, and other national standards have been followed. These Specifications are not intended to cover the minute details. The work shall be executed in accordance with best modern practices. All codes and standards referred to in these Specifications shall be the latest revision thereof.

1.9.10.2. Materials for Civil Structures

Materials to be used in the work shall conform to the Specifications mentioned in the document, the requirements laid down in this section and Specifications for relevant items of work covered under the Specifications.

If any material, not covered in these specifications, is required to be used in the work, it shall conform to relevant Indian Standards or International Standards (in the absence of Indian standards) or to the requirements specified by the Engineer.

1.9.10.3. Sources of Materials

The Bidder shall notify the Engineer of his proposed sources of materials prior to delivery. If it is found after trial that sources of supply previously approved do not produce uniform and satisfactory products, or if the product from any other source proves unacceptable at any time, the Bidder shall furnish acceptable material from other sources at his own expense.

1.9.10.4. Bricks

Burnt clay bricks/Fly ash bricks shall be hand or machine moulded conform to the requirement of IS: 1077/ Bureau of Indian Standards (BIS), except that the minimum compressive strength when tested flat shall not be less than 75 kg/cm² for average of 5 specimens and individual brick strength not less than 70 Kg/cm². They shall be free from cracks and flaws and nodules of free lime. Frog shall be 1 to 2 cm in depth. The brick shall have smooth rectangular faces with sharp corners and emit a clear ringing sound when struck. The tolerance of $\pm 8\%$ shall be permitted over the average size of the bricks specified by the Engineer for the work. The bricks shall not absorb more than 20% of water by weight when immersed in water for 24 hours.

Mandatory tests as required shall be done. All Bricks brought to site, shall be stacked and shall be got checked through visual inspection and subsequent testing in the laboratory by the Engineer before commencement of work.

1.9.10.5. Cement

The cement required for the work will be arranged by the bidder at his own cost. Cement to be used in the works shall be Ordinary Portland Cement (OPC) conforming to IS:12269 OR Portland Slag Cement (PSC), conforming to IS: 455.

These shall have to be procured from reputed ISO: 9000/ 14000 organizations. 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 bidder from approved testing laboratory

1.9.10.6. Coarse Aggregates

For plain and reinforced cement concrete (PCC and RCC) works, coarse aggregate shall consist of clean, hard, strong, dense, non-porous and durable pieces of crushed stone, crushed gravel, natural gravel or a suitable combination thereof or other approved inert material. They shall not consist of disintegrated stones, soft, flaky, elongated particles, salt, alkali, vegetable matter or other deleterious materials in such quantities as to reduce the strength and durability of the concrete, or to attack the steel reinforcement.

Coarse aggregate having positive alkali silica reaction shall not be used. All coarse aggregates shall conform to IS: 383 and tests for conformity shall be carried out as per IS: 2386 Parts I to VIII.

The maximum value for flakiness index for coarse aggregate shall not exceed 35 percent. The coarse aggregate shall satisfy the following requirements of grading:

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

1.9.10.7. Fine Aggregates

For plain and reinforced cement concrete (PCC and RCC) works, fine aggregate shall consist of clean, hard, strong, and durable pieces of crushed stone, crushed gravel, or a suitable combination of natural sand, crushed stone or gravel. They shall not contain dust, lumps, soft or flaky, materials, mica, or other deleterious materials in such quantities as to reduce the strength and durability of the concrete, or to attack the embedded steel. Motorized sand washing machines should be used to remove impurities from sand. Fine aggregate having positive alkali-silica reaction shall not be used. 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 Bidder shall submit to the Engineer the entire information indicated in Appendix A of IS: 383. The fineness modulus of fine aggregate shall neither be less than 2.0 nor greater than 3.5. Not more than 10% shall be retained on 4.75 mm IS Sieve. The sum of the percentage of all deleterious materials shall not exceed 5%. It shall not contain harmful organic impurities in such form or quantities as to affect adversely the strength and durability of concrete or mortar. It shall not contain any acidic material, which is likely to attack steel reinforcement.

The fineness modulus of sand to be used in plaster shall be between 1.0 and 1.5. The fineness modulus of sand to be used in concrete and for mortar required for masonry shall be between 2.0 and 3.1. The maximum quantity of silt shall not exceed 8%. Quantity passing through 150 microns IS Sieve shall not be more than 10%. Tests as required under the section 5 "Mandatory Tests" shall be carried out. For masonry work, sand shall conform to the requirements of IS: 2116. Sand/fine aggregate for structural concrete shall conform to the following grading requirements:

IS Sieve Size	Percent by Weight Passing the Sieve		
	Zone I	Zone II	Zone III
10 mm	100	100	100
4.75 mm	90-100	90-100	90-100
2.36 mm	60-95	75-100	85-100
1.18 mm	30-70	55-90	75-100
600 microns	15-34	35-59	60-79
300 microns	5-20	8-10	12-40
150 microns	0-10	0-10	0-10

1.9.10.8. Water

Water used for mixing mortars and concrete shall be clean and reasonably free from injurious quantities of deleterious materials such as oils, acids, alkalis, salts and vegetable growth. Generally potable water shall be used. Where water can be shown to contain any sugar or an excess of acid, alkali or salt, the Engineer may refuse to permit its use. As a guide, the following concentrations may be taken to represent the maximum permissible limits of deleterious materials in water.

- (a) Limits of acidity: - To neutralize 200 ml sample of water, it should not require more than 2 ml of 0.1 N caustic soda solutions.
- (b) Limits of Alkalinity: - To neutralize 200 ml sample of water it should not require more than 0.1 ml of 0.1 N hydrochloric acid.
- (c) Percentage of solids should not exceed: -
 - Organic 200 ppm (0.02%)
 - Inorganic 3000 ppm (0.30%)
 - Sulphates 500 ppm (0.05%)
 - Alkali chlorides 1000 ppm (0.1%)

Water found satisfactory for mixing is suitable for curing concrete. However, the water used for curing should not produce any objectionable stain or deposit on the concrete surface. The pH value shall not be less than 6.5.

1.9.10.9. Steel Reinforcement

For reinforced cement concrete (RCC) works, the reinforcement/ un-tensioned steel as the case may be shall consist of the following grades of reinforcing bars:

Grade designation	Bar type conforming to governing IS specification	Yield strength (f_y) (MPa)	Elastic modulus (GPa)
S 240	IS:432 Part I – Mild steel bar	240	200
TMT500	IS:1786 – High yield strength deformed bars	500	200

Other grades of bars conforming to IS:432 and IS:1786 shall not be permitted.

All steel shall be procured from original producers, or their authorized re-rollers.

Only new steel shall be delivered to the site. Every bar shall be inspected before assembling on the work and defective, brittle or burnt bar shall be discarded. Cracked ends of bars shall also be discarded.

Whenever specified, either in drawings or BOQ, reinforcement steel i.e., high yield strength deformed bars shall be coated with fusion bonded epoxy coating conforming to IS: 13620. The coating shall be applied to the abrasive blast cleaned heated rod as an electrostatically charged dry powder sprayed on to the grounded steel bar. The coating thickness shall be varying between 0.1 to 0.3 mm after curing. Damaged areas shall be patched up with epoxy patching material as per IS: 13620. Mandrel bending machines shall be used for bending end. Utmost

care should be taken for not damaging the coated surface during fabrication and placement of bars. Utmost care shall be taken so that bars are not damaged during handling and transportation.

1.9.10.10. Structural Steel

All structural steel shall before fabrication comply with the requirement of the following Indian Standards:

Code No.:	Title / Specification
IS:808	Dimensions for hot rolled steel beam, column, channel and angle sections
IS:1148	Hot rolled rivet bars (up to 40 mm dia) for structural purposes
IS:1149	High tensile steel rivet bars for structural purposes
IS:1161	Steel tubes for structural purposes – Specification
IS:1239	Steel tubes, tubulars and other wrought steel fittings – Specification
IS:1730	Dimensions for steel plates, sheet strips and flats for general engineering purposes
IS:1732	Dimensions for round and square steel bars for structural and general engineering purposes
IS:1852	Rolling and cutting tolerances for hot rolled steel products
IS:2062	Hot rolled low, medium and high tensile structural steel
IS:4923	Hollow steel sections for structural use
IS:11587	Structural weather resistant steels

1.9.10.11. Stainless Steel

Stainless steel shall be austenitic chromium-nickel steel, possessing rust, acid and heat resistant properties conforming to IS: 6603 and IS:6911. Mechanical properties/ grade for such stainless steel shall be as specified by the accepting authority, but in no case be inferior to mild steel. Generally, stainless steel is available as per AISI grades. AISI 304 which is equivalent to grade 04Cr18Ni110 of IS: 6911 satisfies the requirements of mechanical properties of structural steel. Other grades of stainless steel for specific purposes may be provided as per specific requirements. For application in adverse/ corrosive environment, stainless steel shall conform to AISI 316 or equivalent.

1.9.10.12. Concrete Admixture

Concrete admixtures are proprietary items of manufacture and shall be obtained only from established manufacturers with proven track record, quality assurance and full-fledged laboratory facilities for the manufacture and testing of concrete. The manufacturer should be ISO: 9000/ 14000 certified.

The Bidder shall provide the following information concerning each admixture after obtaining the same from the manufacturer:

- (a) Normal dosage and detrimental effects, if any, of under dosage and over dosage
- (b) The chemical names of the main ingredients in the admixtures
- (c) The chloride content, if any, expressed as a percentage by weight of the admixture
- (d) Values of dry material content, ash content and relative density of the admixture which can be used for uniformity tests
- (e) Whether or not the admixture leads to the entrainment of air when used as per the manufacturer's recommended dosage and if so to what extent
- (f) Where two or more admixtures are proposed to be used in any one mix, confirmation as to their compatibility
- (g) There should be no increase in risk of corrosion of the reinforcement or other embedment as a result of using the admixture.

Admixtures shall conform to the requirements of IS:9103. In addition, the following conditions shall be satisfied:

- 1) 'Plasticisers' and 'Super-plasticisers' shall meet the requirements indicated for 'water reducing admixture'.
- 2) Except where resistance to freezing and thawing and to disruptive action of deicing salts is necessary, the air content of freshly mixed concrete in accordance with the pressure method given in IS:1199 shall not be more than 2 per cent higher than that of the corresponding control mix and in any case not more than 3 per cent of the test mix.
- 3) The chloride content of the admixture shall not exceed 0.2 per cent when tested in accordance with IS:6925.
- 4) Uniformity tests on the admixtures are essential to compare qualitatively the composition of different samples taken from batch to batch or from the same batch at different times. The tests that shall be performed along with permissible variations in the same are indicated below:
 - Dry material content: to be within 3 per cent and 5 per cent of liquid and solid admixtures respectively of the value stated by the manufacturer.
 - Ash content: to be within 1 per cent of the value stated by the manufacturer.
 - Relative density (for liquid admixtures): to be within 2 percent of the value stated by the manufacturer.
- 5) All tests relating to the concrete admixtures shall be conducted periodically at an independent laboratory and compared with the data given by the manufacturer.

1.9.10.13. Plain Cement Concrete

a. Scope

The works consists of providing and placing Plain cement concrete as levelling course in base of foundations, footings, of civil structures (Like buildings, pump houses, in trenches for filling of pockets and depressions, for flooring, as screed concrete / damp proof courses on top of brick walls, concrete blocks, cradles and or on top of slabs as base courses and all miscellaneous works) as shown in drawings and or as directed by the Engineer. Concrete shall be prepared by mixing graded stone aggregate or gravel of normal size as specified with fine aggregate and cement in specified proportions with required quantity of water.

The specific scope includes Providing and placing cement concrete in base / footing / foundation of Valve chambers, Pipe pedestals, Thrust Blocks, Anchor Blocks, Concrete cradles or similar appurtenances structures for laying of pipes as shown in the Drawings and or as per site conditions and or as directed by the Engineer. All Cement Concrete works shall be as per IS: 456.

b. Proportioning

Unless mentioned otherwise, Proportioning shall be done by volume. Boxes of suitable size shall be used for measuring fly ash, sand and aggregate. The internal dimensions of the boxes shall be generally 35x25x40 cm. deep or as otherwise approved by the Engineer. The unit of measurement of cement shall be a bag of 50 kg and this shall be taken as 0.035 cum. While measuring the aggregate, shaking, ramming, or heaping shall not be done. The proportioning of sand shall be on the basis of its dry volume and in case of damp sand; allowances for bulkage shall be made as given in the chapter for mortar.

c. Placing and Compaction

The concrete shall be deposited as nearly as practicable in its final position to avoid re-handling. It shall be laid gently (not thrown) and shall be thoroughly vibrated and compacted before setting commences and should not be subsequently disturbed. Method of placing shall be such as to preclude segregation. Care shall be taken to avoid displacement of reinforcement or movement of form work and damage due to rains. As a general guidance, the maximum free fall of concrete may be taken as 1.5 metre.

Concrete shall be thoroughly compacted and fully worked around embedded fixtures and into corners of the form work. Compaction shall be done by mechanical vibrator of appropriate type till a dense concrete is obtained. To prevent segregation, over vibration shall be avoided. Compaction shall be completed before the initial setting starts.

For leveling course, the Engineer may permit compaction by manual compaction by tamping. After compaction the top surface shall be finished even and smooth with wooden trowel before the concrete begins to set.

1.9.10.14. Reinforced Cement Concrete

Reinforced cement concrete work may be cast-in-situ or Precast as may be directed by Engineer according to the nature of work and shall consist of providing and placing cement concrete in foundations, footings, columns, pillars, beams, slabs and other miscellaneous structures as shown in the Drawings and or as directed by the Engineer.

The specific scope of the work shall include providing and placing concrete in Civil Structure (Like Service reservoirs, Buildings, Valve chambers, Raft, slab etc), Thrust Blocks, Pipe Pedestal etc. and other ancillary structures as shown in the Drawings and or as directed by the Engineer.

Concrete Grade with Mix proportion lower than, 1:2:4 shall not be used in Reinforced Concrete Works. All Reinforced Concrete works shall be as per IS: 456.

1.9.10.15. Design Mix Concrete

Design Mix Concrete is proposed to be used in construction of reservoirs (Foundations, Walls, and Domes etc). Since the structures are proposed to be water retaining structures, the concrete mix should further confirm to requirements of IS: 3370.

The minimum quantity of cement in the Design mix shall be not less than 330 kg/ m³ in reinforced concrete work. The maximum quantity of cement in the concrete mix shall preferably not exceed 530 kg/m³ of concrete.

Thus, the design of the mix shall be such that the resultant concrete is sufficiently impervious. The mix obtained in accordance with the above, if fully compacted, will generally give a degree of impermeability adequate for all ordinary purposes. In special circumstances, the engineer-in-charge should satisfy himself that an adequate permeability is obtained by percolation tests.

It is necessary that concrete should for that concrete in which the design of mix, i.e., determination of proportions of cement, aggregate, & water is arrived as to have target mean strength for specified grade of concrete. **Minimum mix shall be used as per IS:3370, IS:10262 for water retaining structures.**

1.9.10.16. Concrete Mix Design

Mix design shall be done by an expert or a concrete technologist. Mix proportions shall be designed to ensure that the workability of fresh concrete is suitable for conditions of handling and placing, so that after compaction it surrounds all reinforcements and completely fills the formwork. When concrete is hardened, it shall have the stipulated strength, durability, and impermeability.

Determination of the proportions by weight of cement, aggregates, and water shall be based on design of the mix. As a trial the manufacturer of concrete may prepare a preliminary mix according to provisions of SP: 23-1982. Reference may also be made to ACI 211.1-77 for guidance. Mix design shall be tried and the mix proportions checked on the basis of tests conducted at a recognized laboratory approved by the Engineer. All concrete proportions for various grades of concrete shall be designed separately and the mix proportions established keeping in view the workability for various structural elements, methods of placing and compacting

The producer/manufacturer/bidder of concrete shall submit details of each trial mix of each grade of concrete designed for various workability conditions to the Engineer for his comments and approval. Concrete of any particular design mix and grade shall be produced / manufactured for works only on obtaining written approval of the Engineer.

For any change in quality/quantity in the ingredients of a particular concrete, for which mix has been designed earlier and approved by the Engineer-in-Charge, the mix has to be redesigned and approval obtained again. Mix design shall be got approved by Govt. Engineering College in Chhattisgarh/NIT Durg at the cost of bidder approved by engineer-in-charge.

1.9.10.17. Machine Mixing

Concreting for the tank proper and major concreting works (Raft Foundation, Column, Bracing etc) shall be prepared using Batching Plant.

1.9.10.18. Placing

The concrete shall be deposited through concrete pumps in its final position to avoid rehandling. Care shall be taken to avoid displacement of reinforcement or movement of form work and damage due to rains.

Concreting shall commence only after Engineer has inspected the centering, shuttering and reinforcement as placed and passed the same. Shuttering shall be clean and free from all shavings, saw dust, pieces of wood, or other foreign material.

The concrete shall be deposited in its final position in a manner to preclude segregation of ingredients. In deep trenches and footings concrete shall be placed through chutes or as directed by the Engineer. In case of columns, Pillars, walls, the shuttering shall be so adjusted that the vertical drop of concrete is not more than 1.5 metres at a time.

1.9.10.19. Compaction

Concrete shall be compacted into dense mass immediately after placing by means of mechanical vibrators designed for continuous operations. Concrete shall be thoroughly compacted and fully worked around embedded fixtures and into corners of the form work. To prevent segregation, over vibration shall be avoided. Compaction shall be completed before the initial setting starts.

For levelling course, the Engineer may permit compaction by manual compaction by tamping. After compaction the top surface shall be finished even and smooth with wooden trowel before the concrete begins to set.

The Engineer may However, relax this condition at his discretion for certain items depending on the thickness of the members and feasibility of vibrating the same and permit hand compaction instead.

The layers of concrete shall be so placed that the bottom layer does not finally set before the top layer is placed. The vibrators shall maintain the whole of concrete under treatment in an adequate state of agitation; such that de-aeration and effective compaction is attained at a rate commensurate with the supply of concrete from the mixers. The vibration shall continue during the whole period occupied by placing of concrete, the vibrators being adjusted so that the centre of vibrations approximates to the centre of the mass being compacted at the time of placing.

Concrete shall be judged to be properly compacted, when the mortar fills the spaces between the coarse aggregate and begins to cream up to form an even surface. When this condition has been attained, the vibrator shall be stopped in case of vibrating tables and external vibrators. Needle vibrators shall be withdrawn slowly so as to prevent formation of loose pockets in case of internal vibration. In case both internal and external vibrators are being used, the internal vibrator shall be first withdrawn slowly after which the external vibrators shall be stopped so that no loose pocket is left in the body of the concrete. The specific instructions of the makers of the particular type of vibrator used shall be strictly complied with. Shaking of reinforcement for the purpose of compaction should be avoided. Compaction shall be completed before the initial setting starts, i.e., with 30 minutes of addition of water to the dry mixture.

1.9.10.20. Curing

Green work shall be protected from rain by suitable covering. The work should also be protected from damage and rain during construction. After the concrete has begun to harden i.e., about 1 to 2 hours after its laying, it shall be protected with moist gunny bags, sand or any other material approved by the Engineer against quick drying. After 24 hours of laying of concrete, the surface shall be cured by flooding with water of minimum 25mm depth, or by covering with wet absorbent materials. The curing shall be done for a minimum period of 14 days. In special cases, curing may have to be done for a greater number of days as required by the Engineer.

Over the foundation concrete, the masonry work may be started after 48 hours of its laying, but the curing of cement concrete shall be continued along with the masonry work for minimum period of 14 days. Where cement concrete is used as sub-grade for flooring, the flooring may be commenced before the curing period of sub-grade is over but the curing of sub-grade shall be continued along with the top layer of flooring for a minimum period of 14 days. The water used

for curing shall not produce any objectionable stains or unsightly deposit on concrete surface. In special circumstances and locations curing by other means such as sealing material insulating blankets etc. may be adopted with the specific prior approval of the Engineer.

1.9.10.21. Testing of Concrete Cubes

Number of sample cubes cast shall be as specified in IS: 456. A minimum of 6 sample cubes shall be cast, three cubes shall be tested at seven (7) days, and three cubes shall be tested at twenty-eight (28) days. Proper detail record of pour card and testing result should be maintained.

1.9.10.22. Formwork

i. Scope

Form work shall include all temporary or permanent forms or moulds required for forming the concrete (Plain cement Concrete or Reinforced Cement Concrete) which is cast-in-situ, together with all temporary construction required for their support.

The specific scope shall include providing all temporary and permanent forms for casting of concrete in position for Civil structures, pipe pedestals, thrust blocks, Anchor Blocks, valve chambers, drains, coping concrete, and all miscellaneous appurtenant structures as shown in the drawings and or as per site requirement and or as directed by the Engineer.

ii. General Requirements

It shall be strong enough to withstand the dead and live loads and forces caused by ramming and vibrations of concrete and other incidental loads, imposed upon it during and after casting of concrete. It shall be made sufficiently rigid by using adequate number of ties and braces, screw jacks or hard board wedges where required shall be provided to make up any settlement in the form work either before or during the placing of concrete.

Form shall be so constructed as to be removable in sections in the desired sequence, without damaging the surface of concrete or disturbing other sections, care shall be taken to see that no piece is keyed into the concrete.

The formwork shall consist of shores, bracings, sides of walls, beams, bottom of slabs; domes etc. including ties, anchors, hangers, inserts and shall be properly designed and planned for the proposed reservoirs and brake pressure tank. False work shall be so constructed that vertical adjustments can be made to compensate for take up and settlements. Wedges may be used at the top or bottom of timber shores, but not at both ends, to facilitate vertical adjustment or dismantling of the formwork.

iii. Materials of Formwork

Propping and Centering – All propping and centering should be either of steel tubes with extension pieces or built-up sections of rolled steel.

Shuttering - Shuttering used shall be of sufficient stiffness to avoid excessive deflection and joints shall be tightly butted to avoid leakage of slurry. If required, rubberized lining of material as approved by the Engineer shall be provided in the joints.

Normally Steel Shuttering shall be used. Steel shuttering used for concreting should be sufficiently stiffened. The steel shuttering should also be properly repaired before use and properly cleaned to avoid stains, honey combing; seepage of slurry through joints etc. of the required size shall be used

For, very small works 12 mm thick water proofing ply of approved quality may be used with approval of the Engineer. For special finishes the formwork may be lined with plywood, steel sheets, oil tempered hard board, etc. Sliding forms and slip forms may be used with the approval of Engineer.

Form work shall be properly designed for self-weight, weight of reinforcement, weight of fresh concrete, and in addition, the various live loads likely to be imposed during the construction process (such as workmen, materials and equipment).

iv. Camber

Suitable camber shall be provided in horizontal members of structure, especially in cantilever spans to counteract the effect of deflection. The formwork shall be so assembled as to provide for camber. The camber for beams and slabs shall be 4 mm per metre (1 to 25) or as directed by the Engineer, so as to offset the subsequent deflection. For cantilevers the camber at free end shall be 1/50th of the projected length or as directed by the Engineer.

v. Removal of Formwork

Bidder shall record on the Drawing or on a special register the date upon which the concrete is placed in each part of the work and the date on which the shuttering is removed there from.

In no circumstances shall forms be struck until the concrete reaches strength of at least twice the stress due to self-weight and any construction / erection loading to which the concrete may be subjected at time of striking formwork.

Informal circumstances (generally where temperatures are above 20°C) forms may be struck after expiry of the following periods:

Type of Formwork	Minimum Period before Striking Formwork
Vertical Formwork to Columns, Walls and Beams	16 – 24 Hours
Soffit Formwork to slabs (Propose to be re-fixed immediately after removal of Formwork)	3 days
Soffit Formwork to Beams (Props to be re-fixed immediately after removal of Formwork)	7 days
Removal of props to slabs: - Spanning up to 4.5 m - Spanning over 4.5 m	7 days 14 days
Removal of props to beams & arches: - Spanning up to 6 m. - Spanning over 6 m.	14 days 21 days

Striking shall be done slowly with utmost care to avoid damage to arise and projections and without shock or vibration, by gently easing the wedges. If after removing the formwork, it is found that timber has been embedded in the concrete, it shall be removed and made good as specified earlier. Reinforced temporary openings shall be provided, as directed by Engineer, to facilitate removal of formwork which otherwise may be inaccessible.

Tie rods, clamps, form bolts, etc. which must be entirely removed from walls or similar structures shall be loosened neither sooner than 24 hours nor later than 40 hours after the concrete has been deposited. Ties, except those required to hold forms in place, may be removed at the same time. Ties, withdrawn from walls and grade beams shall be pulled toward the inside face. Cutting ties back from the faces of walls and grade beams will not be permitted.

1.9.10.23. Brick Masonry

i. Scope

This work shall consist of construction of general load bearing structures with brick jointed together by cement mortar as specified in accordance with the details shown on the Drawings, Specifications or as directed by the Engineer. The grade or class of bricks should be as per material specification.

The specific scope includes construction of various civil structures (like pump house, office building etc) including pipeline appurtenant structures (viz., chambers, pipe supports, road-side drains, etc) of class designation as shown in the Drawings / BoQ and or as directed by the Engineer.

The following Standard Codes, unless otherwise specified herein, shall be applicable. In all cases, the latest revision of the codes shall be referred to:

Codes	Description
IS – 1077/BIS	Specifications for common burnt clay building bricks/Fly Ash Bricks
IS – 1200	Measurements for Building works
IS – 1905	Code of practice for structural safety of buildings: Masonry walls.
IS – 2116	Sand for masonry mortars
IS – 2212	Code of practice for brick work
IS – 3466	Specification for masonry cement

Others IS Codes not specifically mentioned here but pertaining to the use of bricks for structural purposes form part of these Specifications.

ii. Soaking of Bricks

Bricks shall be soaked in water before use for a period for the water to just penetrate the whole depth of the bricks. Alternatively, bricks may be adequately soaked in stacks by profusely spraying with clean water at regular intervals for a period not less than six hours. When the bricks are soaked, they shall be removed from the tank sufficiently early so that at the time of laying they are skin-dry. Such soaked bricks shall be stacked on a clean place where they are not again spoiled by dirt earth etc.

iii. Cement mortar for Brickwork

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 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 re-tempered 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.

iv. Joints

The thickness of joints shall not exceed 10 mm. All joints on exposed faces shall be tooled to give concave finish. All face joints shall be raked to a minimum depth of 15mm by raking tool during the progress of work when the mortar is still green so as to provide proper key for the plaster or pointing to be done. Where, plastering or pointing is not required to be done the joints shall be struck flush and finished at the time of laying.

v. 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-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.

vi. 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.

vii. Finishing of Surfaces

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. 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.

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.

1.9.10.24. Cement Plaster

i. Scope

The work shall constitute of providing Cement plaster over exposed concrete or brick surfaces (of thickness 6mm, 12 mm, 15 mm or 20 mm) and or as per the required mix proportion stated as specified in the item, drawing and or directed by the Engineer.

The specific scope includes providing cement plaster over exposed brick surfaces of buildings (for Office Building, Pump house, valve chambers or chamber for flow-meters etc) and other appurtenant structures as shown in the drawings and or as directed by the Engineer.

ii. Preparation of Surfaces

For, brick surfaces, 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, 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 retarder is left on the surface. The joints of masonry shall be raked out properly so that the plaster is well keyed with the masonry.

iii. Mortar

The mortar of the specified mix described in the item shall be used. For external work and under coat work, the fine aggregate shall conform to grading IV. For finishing coat work the fine aggregate conforming to grading zone V shall be used.

iv. Scaffolding

For all brick 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/column 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.

v. Application of Plaster

Plaster on top (ceiling) shall be completed before commencement of plaster on sides (walls). Plastering shall be started from the top and worked down towards the bottom (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 thorough 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 trowelling 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, arises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Rounding or chamfering corners, arises, 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 arises. It shall not be closed on the body of the features such as plasters, bands and cornices, nor at the corners of arises. 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.

vi. Finish and Thickness

The plaster shall be finished to a true and plumb surface and to the proper degree of smoothness as required. The work shall be tested frequently as the work proceeds with a true straight edge not less than 2.5 m long and with plumb bobs. All horizontal lines and surfaces shall be tested with a level and all jambs and corners with a plumb bob as the work proceeds.

The thickness of the plaster specified shall be measured exclusive of the thickness of key i.e., grooves or open joints in brick work. Average thickness of plaster shall not be less than the specified thickness of 12mm. The minimum thickness over any portion of the surface shall not be less than specified thickness by more than 3 mm. The average thickness should be regulated at the time of plastering by keeping suitable thickness of the gauges. Extra thickness required in dubbing behind rounding of corners at junctions of wall or in plastering of masonry cornices etc., will be ignored. Thickness of plaster greater than 12mm shall be done in two layers.

vii. Curing

Curing shall be started as soon as the plaster has hardened sufficiently not to be damaged when watered. The same may be started 24 hours after finishing the plaster. The plaster shall be kept wet for a period of seven days. During this period, it shall be suitably protected from all damages at the Bidder's expense by such means as the Engineer may approve. The dates on which the plastering is done shall be legibly marked on the various sections plastered so that curing for the specified period thereafter can be watched.

viii. 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, the plastering of walls and beam/column in one vertical plane junction should be carried out in one go.

1.9.10.25. Minimum Requirements given in offer tenders:

- | | | |
|--|---|-----------------|
| i. Minimum size of Columns | - | 400 mm circular |
| ii. Minimum size of Beams | - | 300x200 mm |
| iii. Minimum grade of concrete to be used | | |
| For, foundation, columns, beams, slab, container, etc. | - | M-30 |
| Minimum grade of conc. For PCC under foundation | - | M-15 |
| iv. INTZ type tank | - | Not Allowed |

v.	Minimum steel in Column	-	0.8% of concrete
vi.	Minimum thickness of wall	-	250 mm
vii.	Minimum Thickness of Roof Slab	-	150 mm
viii.	Minimum thickness of the Bottom slab of Tank	-	300 mm
ix.	Minimum depth of footing at any cross section	-	250 mm
x.	Minimum depth of Chhajja at Balcony	-	125 mm

ANNEXURE – E-VII

Operation and Maintenance of Tertiary Treatment Plant and all components of Scheme for the period of 15 years

The successful bidder shall enter into a separate agreement for O & M of 15 Years after the issue of certificate of completion of trial run period of 3 Three months. The security deposit of the capital works shall only be released as stated in the conditions of contract, after successful completion of 15 years of O & M period. The performance security of 5% of the amount of the bidder's price for B (O&M offer for 15 years B in financial offer) has to be submitted by the bidder within 15 days of the written notice by the KMC.

1. Operations

The Operator shall carry out all Facility operation and Tertiary sewage treatment operation indicated below, in accordance with Good Operating Practices, as set out in this Contract. The Facility operation and Tertiary treatment operation shall include, but not be limited to the following:

- 2) Pumping main from sump at TTP to Sump at NTPC.
- 3) GSR and sump well overall maintenance.
- 4) Operation of pump at TTP for pumping tertiary treated water to NTPC.
- 5) Cleaned Debris should be disposed as directed by engineer in charge within 10 Km radius.
- 6) Operation and Maintenance of 20 MLD Tertiary Sewage Treatment plant.
 - Operator shall maintain the operation and maintenance TTP constructed as per Detailed Scope of Work attached in tender.
 - Operating Tertiary Sewage Treatment Plant to maintain the quality of treated sewage within the standards prescribed mention in tender.
 - Carrying out continuous flow measurement of treated water and recording the same online.
 - Collecting samples of influent and effluent and analysing them daily to determine the quality of sewage and performance of the treatment using existing laboratory.
 - Carrying out preventive, routine & breakdown maintenance operations as indicated in Appendix-1.
 - Replacement of mechanical & electrical equipments which becomes beyond repairs.

- Providing security for facilities and system at all times.
- Operation and Maintaining diesel generator including fuel and operator for round a clock duty in all seasons at Tertiary Treatment Plant at Korba of following capacity.

As per specification given:

Location	Capacity
Korba TTP (Pump House)	1500 KVA

Capacity diesel generator with necessary acoustic hood arrangement with less noise level.(
Salient power with necessary cable and change over switch to HT panel)

- Third Party testing of parameters BOD, COD, TSS, PH, TDS and coliforms from inlet and outlet of Tertiary Sewage Treatment Plant shall be carried out from NABL Lab once in every month during the entire O&M period.

2. Contingency plan

Development and implementing contingency plan in respect of responses to natural disasters, period of power failure, storm water inflow into sewers, pump house during monsoon, de-silting of wet well, basins, fails to operate electromechanical equipments such as pumps, motors, blowers starters etc or it is in non-working condition which leads to overflow or blockage of sewerage distribution system and other units of treatment plants constraint operation's or other similar emergencies to maintain the quality of treated sewage.

3. Service 1-Energy Audit

3.1.1 The Operator shall take all necessary measures to minimize the power consumption in carrying out its Operations. The energy audit Operations shall include, but not be limited to the following:

- a) Reducing electricity consumption by regulating pumping, through suitable modifications to the operating schedules;
- b) Periodically perform pump efficiency tests to identify maintenance requirements.
- c) Avoid periodic motor testing during peak hours.
- d) Install high efficiency lighting systems.
- e) Maintaining power factor and demand to avoid penalty; Install capacitors to reduce power factor charges.
- f) Repairing / Replacing old and worn out pipes; and Blowers, compressors Minimizing energy use may be accomplished by:
 - Closing the valve on the inlet side if a centrifugal blower must be throttled.
 - Monitoring pressure and cleaning filters regularly.
 - Operating centrifugal blowers at more than 50% of their rated capacity.
 - Monitoring daily loads with watt-hour meters.
 - Maintaining blower operation within manufacturer's recommended speeds.

4. Service 2-Repairs and Maintenance

4.1 The Operator shall carry out preventive, routine maintenance and break down maintenance Operations as indicated in Appendix 1, and in accordance Operating Practices. The following items shall be included in such maintenance.

- a) Wet well & Pumping Station

- De-silting of wet well at least once a year and disposing silt;
- Replacing damaged pipes, fittings and valves.
- Replacing damaged bearing, mechanical seal, o ring, gaskets.
- Repairing and replacing pump impellers, body, shafts, column pipes;
- Repair or Replacing of guide pipe, coupling, duck foot bend.
- Repairing or replacing of soft starters, ATS starters, circuit breakers capacitors;
- Replacing damaged lightning conductor, push buttons, switchgears, MCCB, ACBs,
- Replacing ladders
- Repair & Replacing of damaged railing.
- Waterproofing of leaking roof and painting of structure with two coat of paint (plastic coat).
- Repairing of overhead crane.
- Repairing and replacing of level sensors & flow meters,
- Repairing and replacing of coarse screens, hydraulic arrangements, power pack, motors bearing, jaw mechanism for screens,
- Repairing and replacing of screw/Belt conveyors, motor, etc.
- Repairing of manual & motor operated (actuator type) inlet gates for wet well and for bypass arrangement.
- Repairing and replacing of non return valve, sluice valves, manual or motor operated pumping bypass valves.
- Repairing of manual gates.
- Repairing and replacing of Hydrostatic level sensors.
- Repairing and replacing of cable trays, damaged cables, push buttons etc
- Repairing or replacing of level transmitters, sensors, ultrasonic flow meters float switch, DO sensors and other instruments used for automation system.
- Repairing or replacing of SS or GI railing, roof sheets for walkway.
- Repairing & replacing of blowers and motors.
- Repairing or replacing of soft starters, VFDs, circuit breakers capacitors for pumps & blowers.
- Repairing or replacing of blowers accessories such as filters, inlet and exhaust silencers, acoustic hoods, pressure gauges, damaged pipes and fitting NRVs.
- Servicing of pumps at least once in a year.
- Replacing damaged lightning conductor, push buttons, switchgears, MCCB, ACBs etc for control panel of above unit.
- Repairing or replacing of chlorine toners.
- Repairing or replacing of booster pumps
- Repairing or replacing of motors, shafts, pipes, bearing for above pumps
- Transformers & HT Substation
- Repairing of transformer, oil filtration/oil replacement, breathers, silica gels etc.
- Repairing or replacing of breakers, capacitors, indicating lamps, push buttons, ACBs, MCCBs,
- Repairing or replacing of RMU, CT/PT and metering unit, Main Lighting Panel, Street lighting Panels, LDB's for diff areas, Earthing Grid, Street Lighting, Plant Lighting, Office Lighting.
- Servicing of main breakers, bus couplers etc. at least once in a year.
- Servicing of all earthing arrangement, earth pit, lightning system at least once in a year.
- PLC SCADA / Automation System

- Repairing or replacing of PLC SCADA system, computers, printers etc
- Up gradation of license used for SCADA system, computers system, its antivirus etc for smooth running of system.
- License fees and periodical recharge of the network operator till the completion of 15 years O & M period shall be in the scope of bidder. In case of default the KMC Shall deduct the payments from RA Bill.

4.2 Service 3-Advice

Early Warning: The Operator is to warn the Competent Authority at the earliest opportunity or specific likely future events or circumstances that may adversely affect the Operations or the condition of the Facilities and/or System. The Operator shall cooperate with the Competent Authority in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced and in carrying out any resulting instruction to the Competent Authority.

The Operator shall also advice the Corporation, from time to time, on improving the quality of Operations, reduction in water/energy losses.

5. Extra Work

5.1 The Operator shall carry out all extra work indicated below, in accordance with Good Operating Practices, as set out in this contract. Notwithstanding extra work resulting in increased Operations resulting out of Force Majure events or other than those listed in CC Section 15.4 shall include, but not be limited to the following.

- a) Extension/modifications to the sewerage network ;
- b) Improvement to civil structures; and
- c) Any other work not covered under the Service, enumerated above

5.2 The Corporation shall reimburse the aforesaid extra work based on the prevailing schedule of rates (the lowest rate for an item featuring the PHED/ PWD SOR) or the actual cost of procurement by the Operator, whichever is lower. The Corporation reserves the right to either procure those items of stores or fix a rate contract against which the Operator can procure such stores. However, if the extra work does not feature in the schedule of rates, the value item and work shall be mutually agreed between the Corporation and Operator.

6. Reporting

6.1 The Operator shall utilize the office space, provided by the Corporation to establish kit's monitoring and reporting office along with computer and peripherals. It shall also obtain a telephone connection and maintain the same through the Contract Period. All data transfers and updates made to the Corporation shall be affected through the said telecommunication medium.

6.2 The Operator shall carry out all reporting (Appendix 2-Reporting) indicated below and as set out in the Appendices to this Corporation shall be affected through the shall include but not be limited to, the following;

- a) Attachment 1: Daily summary of Operation at all the pumping Stations – A daily report providing information at all the pumping stations on the hours of pumping, quantity of sewage pumped and energy consumed during the day.
- b) Attachment 2: Daily summary of Operator at Tertiary Sewage Treatment Plant - A daily report of operation of Major equipment at the Tertiary Sewage Treatment Plant providing information on the quantity of sewage treated, hours of equipments, energy consumed and use of chemicals.

- c) Attachment 3: Water Quality Monitoring – A daily report monitoring the quality of treated water through the analysis of samples.
- d) Attachment 4 : Water Quality Monitoring at Tertiary Sewage Treatment Plant
- e) Attachment 5: Desilting Operating Schedules.
- f) Responsibilities

7. Corporation's Responsibilities

- 7.1** The Corporation shall be responsible for procuring, obtaining and maintaining Corporation Clearances. Provided however that the Operator shall be responsible for maintaining the conditionality of any such clearance, if such maintenance falls within the purview of the Operator.
- 7.2** The Competent Authority shall supervise the Operator's Operations at all times and notify the Operator of any defects that are found. Such checking shall not affect the Operator's responsibilities. The Competent Authority may instruct the Operator to search for a defect If the Operator has not corrected a defect within the time specified in the Competent Authority's notice. However, any such tests not specified in the Operations shall be carried out.
- 7.3** The Corporation shall be responsible for
 - a) Energy charges.
 - b) Maintaining administrative control over the personnel Facilities and System.

8. Operator's Responsibilities

- 8.1** The Operator shall maintain properly and keep intact all assets/works/Facilities/Systems of the Corporation throughout the Contract period and shall hand over the same in good working condition at the end of the Contract. The Operator shall not modify or alter any operations regarding the Facilities and / or System without prior written permission of the Competent Authority or it's Representative.
- 8.2** The Operator shall procure all spare parts required for the maintenance of equipment, excluding those to be supplied by the Corporation. The Operator shall warrant to the effect that all the spares shall be procured from the authorized sources and be of the best quality and fit for purpose for which it is being used.
- 8.3** The Operator is expected to carry out the work in such a manner as not be cause any damage to public property on account of negligence or otherwise. The Operator shall be fully responsible for making good the damages so caused by him entirely at his own cost.
- 8.4** The assets/works/Facilities/Systems of the Corporation shall be at the risk and in the sole charge of the Operator and it shall be responsible for making good any loss or damage there to arising from any cause whatever including that due to theft or robbery.
- 8.5** The Operator shall provide adequate engineering equipment, maintenance staff, inventories, plant and machinery and all other things, whether of a temporary or permanent nature required for carrying out Operations under the Contract.
- 8.6** The Operator shall carry out its Operations, so far as compliance with the requirement of the Contract permits, so as not interfere unnecessarily or improperly with
 - a) The convenience of the public or
 - b) The access to, use and occupation of Public or private roads and footpaths to or of properties.
- 8.7** Permissions: The Operator shall obtain all required permissions, sanctions, clearances and permits for carrying out its Operations, including Operator Clearance, and shall be fully responsible for carrying out the Operations in a safe and secure manner, consistent with the

law of the land, laws and regulations regarding such Facilities and/ or System, and directives of any Authority and planning permissions.

- 8.8 Safety:-** The Operator shall be responsible for the safety of all activities on the Site and shall be absolutely for any and all kinds of injuries or damages to person and property of any description whatever may be caused by or result from the Operations carried out, whether may have been carried out skillfully and carefully and strictly in conformity with the provisions of the specifications or not.
- 8.9 Discoveries:** all fossils, coins, articles of value or antiquity and structures and other remains for things of geological or archaeological interest discovered on the Site shall, as between the Corporation and the Operator, be deemed to the absolute property of the Corporation. The Operator shall take reasonable precautions to prevent its workmen or any other persons from removing or damaging any such article or thing and shall, immediately upon discovery thereof and before removal, acquaint the Competent Authority of such discovery and carry out the Competent Authority's instructions for dealing with the Same.
- 8.10** The Operator shall be responsible for payment of reinstatement charges for roads, footpaths, and land as per Corporation's rates.
- 8.11** The Operator shall be taken full responsibility for the adequacy, stability and safety of all site operations. Provided that the operator shall not be responsible (except as stated hereunder or as may be otherwise agreed) for
- Electrical power failure; and
 - Occurrence of breakdown in the network.
 - Staff & Labour

9. Engagement of Staff & Labour

- 9.1** The Operator shall employ skilled. Semi-skilled and unskilled labour in sufficient numbers to carry out its Operations at the required rates of progress and of quality to ensure workmanship of the degree specified in the Contract for timely fulfilling of the Operator's obligations under the Contract and to the satisfaction of the Competent Authority. A tentative requirement of such staff is indicated in Appendix 3 – Operator staff Requirement.
- 9.2** The Operator shall not employ in connection with the Operations any child who has not completed his/her fifteen year of age. It shall also not employ an adolescent who has not completed his/her is eighteenth year unless he/she is certified fit for carrying out Operations as an adult as prescribed under clause (b) of sub-section (2) of Section 69 of the Factories Act. 1948.
- 9.3** The Operator shall provide its staff, a minimum of two sets of uniforms with the titles KMC inscribed on the back and subject to approval of the Corporation. Each worker on duty shall wear a clean uniform whenever on duty.
- 9.4** The Operator shall, if required by the Competent Authority, deliver to it, in such form and at such intervals as the Competent Authority may prescribe, a return showing the numbers of the several classes of staff employed by the Operation on the site and such other information as the Competent Authority may require.
- 9.5** If the Competent Authority asks the Operator to remove a person who is a member of the Operator's staff stating the reasons, the Operator shall ensure that the person leaves the site within seven (7) days and has no further connection with Operations under this contract.
- 9.6** At all times during continuance of the contract, the Operator and its Sub bidders shall abide by all existing and future labour enactment and rules made there under, regulations, notifications and bye-laws of the Central, States or Local Government. The Operator shall keep the Corporation indemnified in case any is taken against the Corporation by any Authority on account of contravention of any of the provisions of any Act or rules made there under, regulations or notifications including amendments.

9.7 If the Corporation is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications/byelaws/acts/rules/regulation including amendments if any, on the part of the Operator and in connection with labour enactment, the Competent Authority shall have the right to deduct any money due to the Operator including its amount of Security Deposit. The Competent Authority shall also have the right to recover, from the Operator, any sum required or estimated to be required for making good the loss or damage suffered by the Corporation.

10. Operator's Superintendence

10.1 The Operator shall provide all necessary superintendence while carrying out its Operations and as long thereafter as the Competent Authority may consider necessary for the proper fulfilling of the Operator's obligation under the Contract. The Operator shall nominate a competent and authorized representative ("Operator's Representative) approved of by the Competent Authority, which approval may at any time be withdrawn. The Operators Representative shall give its whole time to the superintendence of the Operations. The Operator's Representative shall receive, on behalf of the Operator, instructions from the Competent Authority, Which shall be deemed received by the Operator.

10.2 If the Competent Authority withdraws approval of the representative the Operator shall remove the representative from the Operations within Twenty Eight (28) days, and replace him by another representative approved by the Competent Authority.

11. Review and Progress

11.1 Management Meetings: - Either the Competent Authority or the Operator may require the other to attend a management meeting. The business of a management meeting shall be to review the plans for remaining Operations and to deal with matters raised in accordance with any advice. The Competent Authority shall record the business of management meetings and is to provide copies of its record to those attending the meeting and to the Corporation. The responsibility of the Parties for actions to be taken is to be decided by the Competent Authority either at the management meeting or after the management meeting and stated in writing to all who attended the meeting.

11.2 The Competent Authority may instruct the Operator to rectify defects and deficiency in its Operations. Alternatively, the Corporation shall carry out the Operations on its own and deduct the amount incurred in attending to such defaults from the next payment due to the Operator. The deduction of such damages shall not relieve the Operator from its obligation to carry out the Operations, or form any other of its obligation and liabilities under the Contract.

11.3 Notwithstanding anything stated above, if the Corporation is of the Opinion that the actions of the Operator is deemed as an event of default of Service and the event persists beyond One (1) day, the Corporation shall be entitled to invoke the Security Deposit and carry out the Operations through a Successor Operator or departmentally. The Corporation shall then proceed as per CC Section 33.

12. Damages and Penalties

12.1 The basis for applying penalties is to restrict Operator from deviating from supplying treated water efficiently from the TTP – as per fixed schedule with NTPC Korba required norms for supply of tertiary treated water.

12.2 The Operator is also expected to carry out the instructions of the Competent Authority or its representative, from time to time maintain the System in accordance with Good

Operating Practices, attend to Customer complaints promptly provide new connections to Customers. Refrain from offering Operations without due authorization where so required, and follow other requirements under this Contract.

12.3 The Operator shall be subject to the following liquidated damages and penalties for its failure to carry out its Operations as indicated in Conditions of the Contract

Payment shall be done for quantity of water received at NTPC Korba premises only.

Sr.no.	Basis of Penalty	Penalty Benchmark	Penalty Value
1	Failure to maintain parameters of tertiary treated water as mentioned in the tender	Up to 2 Occurrences/month	Rs. Nil
		2 to 5 Occurrences/month	Rs. 5000/- per occurrence
		5 to 10 Occurrences/month	Rs. 20000/- per occurrence
		Above 10 Occurrences/month	Rs. 100000/- per occurrence
2	Inadequate quantity of water supplied to NTPC i.e. 20 MLD	Up to 2 Occurrences/month	Rs. Nil
		2 to 5 Occurrences/month	Rs. 5000/- per occurrence
		5 to 10 Occurrences/month	Rs. 20000/- per occurrence
		Above 10 Occurrences/month	Rs. 100000/- per occurrence
3	Inadequate maintenance of Facilities, Pumping machinery, Mechanical & Electric Equipments etc	For each case detected	Rs. 1500/- per occurrence
4	Inappropriate desilting of sewers and clearing of silt within plant premises	Per Occurrence	Rs. 1500/- per occurrence
5	Inappropriate clearance of blockage or nonattendance to complaints of blockage in sewers within plant premises.	Per Occurrence	Rs. 1500/- per occurrence
6	Non-replacement of damaged and missing manhole covers or frames.	Per Occurrence	Rs. 1500/- per occurrence
7	Inadequate contingency plan within plant premises.	For each case submitted.	Rs. 1500/- per occurrence
8	Delay in recording in feed tank, energy meter reading, power failure time or diesel consumption.	Per Occurrence/Day	Rs. 1500/- per occurrence
9	Duty staff not wearing uniform or it being dirty.	Per Occurrence/Day	Rs. 1500/- per occurrence
10	Non – attendance of Customer complaints in time or adequately	Per Occurrence/Day	Rs, 1,500/- per occurrence/Day
11	Security Personnel not provided	Per Occurrence	Rs, 1,500/- per occurrence/Day
12	Non repairing of Electric Motors, Pumps blowers, or other electro-	Per Occurrence/Day	Rs. 2000/- per occurrence/Day

	mechanical equipments within 30 days of down time (as equipments are send to Manufacturer/ Manufacturer's or authorized representative for repairing) then after 30 days of down time then for each day		
13	Non availability of MPCB records	Per Occurrence	Rs. 2000/- per occurrence/Day
14	Non availability of adequate staff.	Per person/Day	Rs. 1000/- per Day
15	Non-operating of PLC SCADA system	Per Occurrence/Day	Rs. 2000/- per Day
16	Delay in recording of chlorine doses or not using of chlorination unit	Per Occurrence/Day	Rs. 3000/- per Day
17	Non availability of safety equipments	Per Occurrence/Day	Rs. 2000/- per Day
18	Development and implementing contingency plant in respect of responses to natural disasters, period of power failure, de-silting of sump well, fails to operate electromechanical equipments such as pumps, motors, blowers starters etc or it is in non-working condition which leads to overflow or blockage and other units of treatment plants constraint operations or other similar emergencies to maintain the quality of treated water.	Per Occurrence/Day	Rs. 5000/- per Day
19	Power Factor Penalty /Excess demand charges	If P.F. penalty or excess demand charges are applied in energy charges or in CSEB bill then same will be deducted from bidder bill.	Bidder has to pay P.F. penalty or excess demand charges applied in energy charges or in CSEB bill
20	Clogging of sewer, pumping mains, treated water piping etc.	Per occurrence/ day	Rs. 2000/- Per day
21	Biometric attendance of the O&M staff	Submission of monthly records in every month	Rs. 5000/- Per Month
22	Third party testing from NABL Accredited lab (both inlet and outlet parameters)	Submission of Test report in a month	Rs. 5000/- Per Month

13. Method of Affecting Penalties.

13.1 Items warranting penalties will be checked every two months this shall coincide with the billing cycle for Customers. The penalties shall be netted before any

payments/deductions are made. The penalties shall be calculated on a cumulative basis during an Operating year.

13.2 In so far as the penalties are concerned the Competent Authority shall notify the Operator when in its opinion such defaults have occurred. The notification shall instruct the operator to present its case indicating the reasons for not attracting such penalties. If the Competent Authority is of the opinion that the cause of default is not by way of Operator's action it shall drop such defaults and proceed with the final determination of incentives and penalties payable/recoverable from the Operator.

13.3 In the event that the net accrued penalty at any time of the Operating Year is greater than Ten percent of the Contract Price for the concerned Operating Year, the Corporation shall review whether the Contract needs to be continued with the Operator and may consider to proceed as per Conditions of the Contract.

13.4 Contract Price and Payment

13.4.1 Contract Price

The Operator shall be paid the Contract Price every month (The rate quoted by the bidder for the year in 12 instalments after deducting the performance security and taxes). The contract price shall cover all expenditure on staff, establishment, maintenance and repairs, spares and consumables, and any other expenses excluding expenses incurred on power and diesel for generator.

The Contract price shall include all customs duties import duties, excise duties, business taxes, income and other taxes that may be levied in accordance to the laws and regulation in-force on the Operator's equipment, materials supplies (Permanent, temporary and consumables) to be used on or furnished under the Contract and on the Operations to be performed under the Contract. Nothing in the Contract shall relieve the Operator from its responsibility to pay any tax that may be levied on its Operations or on profits made by it in respect of the Contract.

The Operator shall pay Indian income Tax on all payment made to it under the Contract, other than reimbursements made to it by the Corporation to cover payment by Operator of minor custom duties, etc., or any other payment, which the Operator may make on the Corporation's behalf. Under the provisions of Section 194-C of the Indian Income Tax Act the Corporation is required to deduct Tax with surcharge at source at prevailing rates from the gross amount of each bill submitted. The Operator shall perform such duties in regard to such deductions thereof as may be imposed on it by such law and regulations.

The Operator shall pay all the Taxes directly to respective organizations and to the Government of India. The Corporation shall not take any responsibility for any kind of Tax payment to the Government or quasi-Government bodied at any point of time, other than those specified under CC Section 27.4.

All charges pm account of octroi, cases, terminal or sales tax and other duties on material obtained for the Operations from any source including the tax applicable as per GST/ CGST on the transfer of property in the goods involved in the execution of the Operations, etc. shall be borne by the Operator.

The Operator shall submit form-3B or such other forms as are prescribed milder the said Act, , which is required to be produced by the principal employer in the events of any notice by the GST Department within one month of issue of Acceptance Letter.

13.4.2 Procedures for Payment

The Operator shall submit a bill for payment at the end of every month. The bill shall be in accordance with the Operations carried out during the contract Period from the last date of the previous bill and shall also account for any outstanding amounts, which are due from the Corporation.

Payment shall be done only for quantity of tertiary treated water received at NTPC Korba premises only.

The bill, in addition to payments due for the month shall contain supporting documents, which shall include without limitation; statements of Calculations on any amounts due arising from any extraordinary adjustment penalties, extra work, variations, compensation events or incentive payment.

The Corporation shall pay the Operator the amounts certified by the Competent Authority within sixty (60) days of the date of each certificate. All payments shall be made in Indian Rupees.

The Competent Authority shall compute and verify the incentive\penalty applicable in the bill submitted by the Operator, If the Competent Authority is of the opinion that the incentive\penalty was warranted, it shall make necessary adjustments to approve the same and certify complete payments due to the Operator in the next month. However, if the Competent Authority is of the opinion that such penalty is not warranted, the excess amounts shall be adjusted from the payment due to the Operator for the following month.

13.5 Intellectual property & Confidential Information

13.5.1 Proprietary Material

The Parties agree that all details, plans, manuals documentations specifications, schedules, programs, reports, calculations and other work relating to the Facilities and/or Systems and the provision of Operations pursuant to this Contact (hereafter referred to as “Proprietary Material”), which have been or are hereafter written, originated or made by any of them or any of their respective employees, Sub bidders or agents and by the persons related to the Operator in connection with this Contract shall be owned by the persons related to the corporations. The determination of information as proprietary Material shall be made at the sole discretion of the Corporation.

The Operator shall have an irrevocable, royalty-free, non-exclusive license to use the Proprietary Material during the terms of this Contract for all purposes connected with fulfilling its obligations hereunder. However, this license shall not be transferable to any party other than to a permitted assignee under this Contract. Such license shall not continue after the suspension or termination of this Contract or the discharge by the Operator of its duties hereunder.

13.6 Confidentiality

The Operator shall cause the persons related to the Operator not to, without the prior written consent of the Corporation, at any time divulge or disclose to any person or use for any purpose unconnected with the Operations Proprietary Material under this Contract. This condition shall not apply to information.

- a. Already in the public domain, otherwise than by breach of this Contract:

- b. Already in the possession of the receiving party before it was receiving from the other Party in connection with this Contract and which was not obtained under any obligation of confidentiality: or
- c. Obtained from a third Person who is free to divulge the same and which was not obtained under any obligation of confidentiality.

The Operator shall, whenever required, take necessary steps to ensure that all persons employed by it, under this Contract, comply with the India Official Secrets Act 1923 (XIX of 1923) and agree that it applies to them and shall continue to apply even after completion of this Contract.

No photographs of the Facility or system or any part thereof or equipment employed thereon shall be taken or permitted by the Operator to be taken by any of its employees or any employees of its Sub bidder without the prior approval of the Competent Authority in writing and no such photographs shall be published or otherwise circulated without the approval of the Competent Authority in writing

The Corporation shall use its best efforts to ensure that the confidential proprietary information relating to the Operator is not made public. However, the Corporation shall not be liable in any manner whatsoever in case such photographs shall be published or otherwise circulated without the approval of the Competent Authority in writing.

14. Assignment

The Operator shall not subcontract the whole of the Operations or a substantial part thereof. Except where otherwise provided by the Contract, the Operator shall not subcontract any part of the Operations without the prior consent of the Competent Authority. Any such consent shall not relieve the Operator from any liability or obligation under the Contract and it shall be responsible for the acts, defaults and neglects of any Sub bidder, its agents, servants or workmen as fully as if they were the acts, defaults or neglects of the Operator, its agents, servants or workmen.

The Operator shall not be required to obtain such consent for:

- (a) The provision of labour, or
- (b) The provision of materials specified in the contract

In the event of a Sub bidder having undertaken towards the Operator in respect of the work executed, or the goods, materials, plant or Operations supplied by such Sub bidder, any continuing obligation extending for a period exceeding that of the Contract period under the Contract, the Operator shall at any time, the expiration of such period, assign to the Corporation, at the Corporation's request and cost, the benefit of such obligations for the unexpired duration thereof.

15. Default of Operator

15.1 Events of Default

At any time after the Commencement Date, the Competent Authority may investigate each case where the Operator has failed to properly perform the Operations in accordance with this Contract. The Competent Authority shall issue a notice to the Operator, instructing him to rectify the failure within a reasonable time.

An event of default on the part of the Operator, which results from the Operator being unable to fulfil its Service obligations under the Contract, shall be deemed as a serious default, and is said to have occurred due to any of the following caused:

- a) The Competent Authority certifies to the Corporation, with a copy to the Operator, that in its opinion, the Operator:
 - Has repudiated the Contract, or
 - Without reasonable excuse has failed to commence Operations in accordance with this Contract, and pursuant to the Commencement Date; or failed to complete the Operations within the time stipulated for completion;
- b) Gross misconduct of the Operator;
- c) Despite previous warning from the Competent Authority, in writing, is otherwise persistently or flagrantly neglecting to comply with any of its obligations under the Contract;
- d) Operator persistently fails to follow Good Operations in execution of the Contract;
- e) If the Operator changes the use to which any part or whole of the Site is put, or initiates a variation without the required approval of the Competent Authority;
- f) The Operator stops providing the Operations for (1)one and the stoppage has not been authorized by the Competent Authority;
- g) The Competent Authority gives notice that failure to correct a particular defect is a fundamental breach of Contract and the Operator fails to correct it within a reasonable period of time determined by the Competent Authority;
- h) If the Operator is in breach of any law or statute governing the Operations;
- i) The Operator does not maintain a security, which is required; and
- j) The Operator, in judgment of the Corporation has engaged in Corporation has engaged in Corrupt Practices Fraudulent Practices in competing for or in carrying out the Operations under the contract;
- k) If the Operator fails to obtain or keep in force the insurance requirement under this Contract;
- l) The Operator has composition of the responsibility without period approval of the Corporation;
- m) The Operator is unable to maintain the composition and structure of its organization due to any of the following causes;
 - The Operator enters into voluntary or involuntary bankruptcy, or liquidation;
 - The Operator becomes insolvent;
 - A receiver , administrator trustee or is appointed over any substantial part of its assets; and
 - Any act is done or event occurs with respect to the Operator or its assets, which, under any applicable law has substantially similar effect to any of the foregoing acts or events.

15.2 Consequences of Default

If a default by the Operator is said to have occurred pursuant to Conditions of Contract, the Corporation may, after giving three (3) days notice to the Operator, enter upon the Site, the Facilities and/or System, and terminate Contract without thereby releasing the Operator from any of its obligations under the Contract, or affecting the rights and authorities conferred on the

Corporation by the Contract. The Corporation may use so much of the Operator's equipment, temporary works and materials as it may think proper.

If the Contract is terminated because of an Operator's event of default, the corporation shall be entitled to invoke the Security Deposit and carry out the Operations through a Successor Operator or departmentally and at the risk and cost of the Operator, If the total amount due to the Corporation exceed any payment due to the Operator the difference shall be debt payable to the Corporation.

If the Contract is terminated because of an Operator's event of defaults, all materials on Site, plant, equipment and temporary works shall be deemed to be the property of the Corporation.

Unless prohibited by law, the Operator shall if so instructed by Competent Authority within three (3) days of such entry and termination referred to in CC Section 33.1 assign to the Corporation the benefit of any Contract for the supply of any goods or materials or operations, which the Operator may have entered into for the purposes of the Contract.

16. Default of Corporation

17. Events of Default

17.1 An event of default on the part of the Corporation, affecting the performance of the Operator's Operations, shall be deemed to have occurred due to any of the following causes

- The Corporation does not give access to part the site by the Commencement Date;
- The Corporation does not make a payment citified by the Competent Authority's within ninety (90) days from the day of receipt of the Competent Authority's certificate:
- The Competent Authority instructs the Operator to stop providing the Operations and the instruction is not withdrawn within three (3) day and
- The Corporation is in breach of any law or statute governing this Contract.
- The Corporation fails to carry out the responsibilities.

18. Consequences of Default

18.1 Pursuant to Conditions of Contract the Operator may terminate its employment under the Contract by giving notice to the Competent Authority, with a copy to the Municipal Commissioner. Such termination shall take effect fourteen (14) days after giving the said notice.

18.2 If the Corporation, before the expiry of the above notice period, or immediately thereafter remove the cause of its default, the Operator's entitlement under the Conditions of the Contract shall lapse in respect of such defaults, and the Operator's shall continue with resume normal working as soon as is reasonably possible.

19. Risks, Indemnification & Insurance.

19.1 Risks

The Corporation is not responsible for expected risks, arising solely due to the design of the Facility and System as all the designs has been prepared by the agency itself.

All risk of loss of or damage to physical property and of property and of personal injury and death, which arise during and in consequence of the performance of the Contract other than the risks stated in Conditions of the Contract, is the responsibility of the Operator.

19.2 Indemnification

The Operator shall indemnify and keep indemnified the Corporation against all losses and claims for injuries or damage to any person or any property whatsoever which may arise out of or in consequence of the Operations and against all claims, demands, proceedings, damages, costs, charges and expenses whatsoever in respect of or in relation thereto.

The Operator shall at all times indemnify the Corporation against all claims, damages or compensation under the provisions of, i) Payment of Wages Act. 1936 ii) Minimum Wages Act. 1948 iii) Employers Liability Act. 1938 iv) The Workmen's Compensation Act. 1923 v) Industrial Dispute Act. 1947. vi) India Factories Act. 1948; and vii) Maternity Benefit Act. 1961 Or any modifications thereof and rules made there under from time to time or as a consequence or may accident or injury to any workman or other persons in or about the Operations, whether in the employment of the Operator or not, save and except where such accident or injury have resulted from any act of the Corporation, their agents or servants, and also against all cost, charges and expenses of any suit, action of proceedings arising out of such accident or injury and against all sum or sums which may with the consent of the Operator be paid to compromise or compound any such claim without limiting its obligations and liabilities as above provided. The operator shall insure against all claims damages or compensation payable under the various acts mentioned above or any modifications thereof or any other law relating thereto.

19.3 Insurance

The Operator shall provide in the joint names of the Corporation and the Operator, insurance cover from the Commencement Date to one year beyond the end of the Contract period, for the Operator's risks covering. a) Loss of or damage of property (except the Facilities System and Equipment) in connection with the contract; b) Personal injury or death; and c) The Bidder's All Risk (CAR) Insurance Policy.

The Operator may, at its own discretion, provide for the following insurance covers a) Loss of or damage to the Facilities and/or System; and b) Loss of or damage to equipment, Such cover may be taken either from either from the Directorate of Insurance Chhattisgarh State, or from any other insurance company with the approval of the Corporation

The Operator shall deliver policies and certificates to the Competent Authority for its approval before the Commencement Date. All such insurance shall provide for Compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred.

If the Operator or any of its Sub bidders does not provide any of the policies and certificates required, the Corporation may effect the insurance, which the Operator should have provided and recover the premiums the operator has paid from payments otherwise due to the Operator or if no payment is due, the Payment of the premiums shall be a debt due to the Corporation.

Alterations to the terms of insurance shall not be made without the approval of the Competent Authority and both Parties shall at all times comply with any conditions of the insurance policies.

20. Force Majeure

20.1 Force Majeure Events

A Force Majeure event, as defined in conditions of the contract, is said to have occurred if any such event arise after the issue of the Letter of Award of Contract and extends lifers a period greater than thirty (30) days, outside the control of both Parties, thereby rendering it impossible or unlawful for either Party to fulfil its Contract obligations under the law governing the Contract.

The Force Majeure Events are: a) War, invasion, mobilization, requisition or embargo; b) Rebellion, revolution, insurrection, or military or usurped power, or civil war; c) Contamination by radio-activity from any nuclear fuel, or from any nuclear waste form the combustion of nuclear fuel, radio-active toxic explosive, or other hazardous propertied of any explosive nuclear assembly or nuclear component of such assemble; d) Riot, commotion or disorder, unless solely restricted to employees of the Operator or of its Sub bidders; e) Floods and any other calamity resulting from climatic imbalances; and Provided always that such events are beyond the control of the Parties and have a Materially Adverse Effect o the Operations.

The Operator shall be under no liability whatsoever in consequence of any of the force Majeure events referred to in this clause, whether by way of indemnity or otherwise.

Both Parties shall be released from further performance pursuant to any Force Majeure event occurring outside the control of both parties and extending for a period greater that one hundred and eighty (180) days.

If the Contract is frustrated by a Force Majeure event, the Competent Authority shall certify that the Contract has been frustrated. The Operator shall make the site safe and stop Operations as quickly as possible after receiving this certificate.

21. Consultation and Duty to Mitigate.

For so long as the period of Force Majeure is continuing the affected Party shall consult with the other Party, on the period and effect of the Force Majeure event and the affected party shall use all reasonable endeavours to alleviate its effects of the performance of its obligations under this contract. The other party shall afford reasonable assistance to the affected party to alleviate the effect of the Force Majeure event on the performance by the affected party of its obligations under this Contract. The affected party shall use its best efforts to continue to perform its obligations hereunder and to correct or cure the same during the subsistence of such Force Majeure Event.

22. Consequences of Majeure

If and to the extent that any of the Force Majure events listed in CC Section 39.2 above results in loss or damage to the Facility and /or System the Operator shall promptly give notice to the Corporation. The Corporation may direct the operator to rectify this loss or damage to the extent required by the Corporation, at costs to mutually agreed between the parties. The operator shall expeditiously rectify the loss or damage and shall be entitled to payment of such costs. In the event that the parties are not able to reach an agreement on the cost of rectification, the Corporation may carry out the rectification works by itself or through any agency nominated by it. The Operator shall provide all corporation required to complete such rectification expeditiously.

23. Resumption of Performance

When the affected party is able to resume performance of its obligations under this Contract, it shall give to the other party a written notice to that effect and shall promptly, and in any event within three (3) days, resume performance of its obligation hereunder.

The obligations and liabilities of the parties under this Contract would continue as long as Force Majeure Event does not impede the performance.

There shall be no incentive or penalty/liquidated damages applicable in the period of subsistence of a Force Majeure.

24. Taking Over

24.1 Taking over process

At the end of the Contract Period and subject to the provisions of CC Section 11.4 or its earlier termination except on account of default of the Operator the Operator shall request the Competent Authority to take over the Facilities and /or System. The Corporation shall take over the Facilities and / or System within Seven (7) days of such a request being made.

The Operator shall

- a) Cease all further Operation, except for such Operations as may be necessary and instructed by the Corporation's Representative for the purpose of making safe or protecting those parts of the Facilities and /or System and any Operations required to leave the site in a clean and safe condition.
- b) Hand over all documents and supplies for which the Operator has received payments
- c) Remove Operator's equipment which is on the site and repatriate its entire staff and labour from the site.
- d) Hand over TTP in good operating condition except normal wear & tear. all equipments related to TTP are in good operating condition

The Operator shall supply to the Competent Authority a detailed account of the total amount that the Operator considers payable under the Contract before the end of the Contract period. The competent Authority within twenty eight (28) days of receiving the Operator's account shall certify any final payment that is due to the Operator, or indicate to the operator the corrections or additions that are necessary. If the final account is still unsatisfactory, after the operator resubmits it, the Competent Authority shall decide on the amount payable to the Operator and issue a payment certificate.

The Corporation shall any time, within a period of ninety (90) days from the Completion Date or Termination Date as applicable, carry out an independent assessment of the Facilities and/or System departmentally or through a successor operator. Any deficiencies in the Facilities and/or System shall be made good by or at the cost of the Operator so as to bring the Facilities and / or System into Good repairs and proper working condition as handed over at the Commencement Date and subsequent works done pursuant to CC Sections 14 and 16 normal wear and tear excepting.

25. Security Deposit

The Operator shall pay a Security Deposit equal to the amount indicated in 'Schedule ; as security for due fulfilment of the Contract, within Seven (7) days after receipt of intimation in writing of acceptance of Tender.

The mode of making this deposit is as under. a) Initial Security Deposit : It is optional to the operator to make the Initial Security Deposit in bank guarantees/fixed deposit from Nationalised/Scheduled Banks in the enclosed format;

Retention Money : The remaining amount of the Security Deposit (if applicable as per Schedule A) shall be recovered from the Operator's running bills at the rate of five (5) percent and such retention with the Initial Security Deposit made as aforesaid shall not exceed in the Security Deposit as above after which such retention will cease.

In case, the Operator carries out any Improvement work, Additional Improvement work, Extra work, he will have to deposit a Bank Guarantee equal to 10% of contract amount as security towards Improvement work, Additional Improvement work, Extra work to be executed by Operator.

All compensation or other sums of money payable by the Tenderer under the terms of this Contract or any other account whatsoever, may be deducted from or paid by the sale of a sufficient part of this Security Deposit or from any sums which may be due or may become due to the Operator by the Corporation on any account whatsoever, and in the event of its Security Deposit being reduced by reason of any such deduction, the Operator shall within fifteen (15) days of receipt of notice of demand from the Corporation make good the deficit.

In the event of the said Deposit having been made by the Operator by delivery to the Corporation by the guarantee of the bankers of the Operator, and of the Operator under any of the provisions of this Contract becoming subject to or liable for any penalty for damages liquidated or unliquidated or of the said deposit becoming forfeited or any breach or failure or determination of Contract, then and in such case the amount of any such penalty or damages and the deposit so forfeited is not previously paid to the Corporation, shall immediately on demand be paid by the said bankers to Corporation and may be forfeited by the Corporation under and in terms of the said guarantee.

There shall be no liability on the Corporation to pay any interest on the Security Deposit deposited by or recovered from the Operator.

26. Forfeiture of Security Deposit

If during the term of this contract the Operator is in Default of the due and faithful performance of its obligations under this Contract the Corporation shall, without prejudice to its other rights and remedies hereunder or at the Applicable Law, be entitled to call in, retain and appropriate the Security Deposit.

27. Return of Security Deposit.

Subject to excepting the Security Deposit of the last Operating year each Security Deposit shall be returned to the Operator by the Corporation within thirty (30) days following the expiration of its validity, provided that there are no outstaying claims of the Corporation on the Operator. The Security Deposit of the last Operating year shall be returned to the Operator at the end of twelve (12) months after the Completion Date or Termination Date of this Contract.

28. Procedure for Disputes & Arbitration

28.1 Competent Authority's Decision.

IF dispute(s) of any kind whatsoever arises between the Operator and the Competent Authority's Representative the same shall be referred to the Competent Authority for its decision with detailed justification. Such reference shall be stated that it is in pursuance to this clause and is for reviewing and giving decisions by the Competent Authority. The Competent Authority shall give its decision within fourteen (14) days of receipt of notice. If either party is not satisfied with the decision of the Competent Authority or the Competent Authority fails to give decision within the period of fourteen (14) days from the date of receipt of notice under this clause, such a dispute may be referred to arbitration.

28.2 Sole Arbitration

Except where, otherwise provided for in this Contract, all questions and disputes relating to the meaning of instruction hereinafter mentioned or as to any question, claim, right matter of handling whatsoever, if any arising out of relating to this contract, specification, estimates, instructions, orders or these Conditions or otherwise concerning the Operations, or the execution or failure to execute the same where arising during the progress of the operations or after completion or abandonment thereof of any matter directly or indirectly connected with this contract shall be referred to the sole arbitration of the Municipal Commissioner, and if the Municipal Commissioner is unable or unwilling to act as such then the matter in dispute shall be referred to sole arbitration or such other person appointed by the Municipal Commissioner who is willing to act as such Arbitrator. In case the Arbitrator so appointed is unable to act for any reasons, the Municipal Commissioner in the event of such inability, shall appoint another person to act as Arbitrator in accordance with the terms of the Contract. Such person shall be entitled to proceed with the reference from the point at which its predecessors left it. It is also a term of this Contract that no person other than a person appointed by the Municipal Commissioner as aforesaid should act as an Arbitrator.

29. Governing Provisions

As aforesaid the provisions of the Arbitration and Conciliation Act 1996 or any statutory modification or re-enactment thereof and the rules made there under and for the time being in force shall apply to the arbitration proceedings under this clause.

DETAILED SCOPE OF WORK – OPERATION & MAINTENANCE OF TTP

General Requirements for Operation and Maintenance

- i. The Bidder shall operate and maintain the entire plant within its Contract price for a total operation and maintenance period of 15 years from the date of taking over of the plant by the KMC and issuance of “Taking Over Certificate” or the issuance of “Conditional Taking-Over certificate”
- ii. The KMC immediately on issuance of the “Taking over Certificate” or the issuance of “Conditional Taking-Over Certificate” Shall hand over the plant to the Bidder for Operation and Maintenance.
- iii. All necessary repairs, preventive & breakdown maintenance, overhaul, replacements etc., shall be made during the O & M to maintain the plant at the status of formal handing over. Bidder shall be responsible for preventive repair, breakdown repair, comprehensive repair, for operation and maintenance during the 15 years period of O&M.
- iv. At the end of O & M period the plant shall be handed over to the KMC in fully functional condition except normal wear and tear expected during the period of operation and maintenance.
- v. The O & M price by the Tenderer shall include supply of all tools, tackles, spares, oil & lubricants, laboratory chemical, glassware, chemicals like chlorine, coagulants and polyelectrolyte etc.
- vi. Insurance policy to cover accident/fire/earthquake risk will be provided by Tenderer on the cost of TTP during 15 years O&M period. Insurance premium will be paid by Tenderer. & cost to be included in the offer for O&M.
- vii. During O & M period cost of power consumed shall not be in the Bidder price and bills of electric power shall be paid by the KMC as per actual consumption.
- viii. The scope of work shall but not limited to the following items:
 - Operation and Maintenance including Mechanical, Electrical, Electronic, Civil, and all allied works.
 - Preventive & breakdown maintenance of all electrical, mechanical & Electronic equipments.
 - Replacement of electrical, mechanical & Electronic equipments which becomes beyond repair.
 - Sampling and testing of influent wastewater based on the tests and frequency desired by the KMC 's representative and in general in accordance with the CPHEEO manual on Sewerage and Sewage Treatment.
 - Sampling and testing of additional samples for the day to day O & M of the TTP and as mutually agreed from time to time between the Bidder and the KMC 's representative.
 - Sampling of final tertiary treated water to ensure that the guarantee Parameters are as stipulated in the Bid document
 - The sampling frequency to be as per relevant norms of Chhattisgarh pollution Control Board or higher as decided by KMC 's representative. The KMC reserves right to collect samples at random at the will of the KMC through any agency nominated by him.
 - The KMC shall have right to seek part of sample collected by the Bidder without any prior intimation to cross check the result on random basis, however the analysis charges of such samples shall be borne by Bidder.
 - Updation of daily data in the prescribe format to the central SCADA as well as CPCB portal.

- The reports shall contain sufficient appropriate and adequate data to make the records meaningful and amenable to analysis for evaluating the performance of the plant as well as to help in O & M.
- Security of the campus and contents therein shall be Bidder's responsibility.
- The records maintained by the Bidder shall be produced periodically to the KMC 's representative for proper monitoring. The KMC 's representative's remarks shall be attended to on next submission. Consolidated summary report shall be furnished to the KMC monthly, quarterly and yearly containing salient features.
- The Bidder shall also maintain history sheets of overhauling, maintenance, replacement of all the important electrical and mechanical equipment.
- The O & M shall include the appropriate preventive maintenance of equipment as per the Manufacturer's recommendation.
- All the equipment even standby supplied, installed and commissioned by the Bidder should be in operational/ functional condition throughout the O & M period. The Bidder shall take all preventive measures to maintain them in working condition.
- The frequency of break downs of various equipments shall be the lest as far as possible. The total number of such re-occurrences shall not exceed three times per annum otherwise penalty shall be levied on the Bidder at the discretion of Engineer-in-charge and as given in the penalty clause
- The operation, maintenance and repairs services shall be performed according to the standard practices or as per manufacturer recommendations.

a) Down time

- The plant shall never be operated at less than 50% of its design capacity due to maintenance and repair reasons, if adequate quantity of effluent is available.
- The period of such exceptional operation shall not exceed two consecutive days and shall not be more than three days a week otherwise penalty shall be levied on the Bidder at the discretion of Engineer-in-charge.
- The maximum downtime of the whole plant shall not exceed 24 hours.
- The periods for repairs and maintenance have to be communicated to the KMC 's representative at least 5 calendar working days in advance.
- Equipment which needs repair to be carried out by Manufacturer/ Manufacturer's authorized representative, the down time shall not exceed 30 days otherwise penalty shall be levied on the Bidder at the discretion of Engineer-in-charge and as per penalty clause.
- KMC reserves the right to impose compensation, should there be any default by Bidder on this account.
- The penalty will be deducted in the next O & M invoice if adequate reasons are not furnished by the Bidder for delay.

b) Operation of the plant as per O & M Manual

- The plant shall be operated according to the rules and procedures laid down in the O & M manual (as per CPHEEO MoUD Manual)
- The plant must be in position to Work at the design capacity at any time.

Special conditions considering NTPC Agreement

To be discussed and finalised.

c) OPERATION OF PUMPS

The following points should be observed while operating the pumps.

- Dry running of the pumps should be avoided.
- Centrifugal pumps if installed with negative suction should be primed before Starting.
- Pumps should be operated only within the recommended range of the head-discharge
- If pump is operated at a point away from duty point, the pump efficiency normally reduces.
- Operation near the shut-off point should be avoided, as it causes substantial recirculation within the pump, resulting in overheating of sewage in the casing and consequently, overheating of the pump.
- If the pumps are not having sufficient discharge then necessary modification is to be done as per manufacturer recommendations so that pumps will deliver required quantity of sewage.
- Voltage during operation of the pump-motor set should be within $\pm 10\%$ of the rated voltage. Similarly, current should be below the rated current shown on the name plate of the motor.
- When parallel pumps are to be operated, the pumps should be started and stopped with a time lag between two pumps to restrict change of flow velocity to minimum and to restrict the dip in voltage in the incoming feeder and should be adequate to allow the pump head to stabilize.
- When the pumps are to be operated in series, they should be started and stopped sequentially, but with minimum time lag. Any pump next in sequence should be started immediately after the delivery valve of the previous pump is even partly opened. Due care should be taken to keep open the air vent of the pump next in sequence, before starting that pump.
- The running of duty pumps and standby pumps should be scheduled so that no pump remains idle for a long period and all pumps are in ready-to-run condition. Similarly, the running schedules should be ensured so that all pumps do not wear equally needing simultaneous overhaul.
- If any undue vibration or noise is noticed, the pump should be stopped immediately and the cause for vibration or noise should be checked and rectified.
- Generally, the number of starts per hour shall not exceed four. Frequent starting and stopping should be avoided as each start causes overloading of motor, starter, contactor and contacts. Although overloading lasts only for a few seconds, it reduces the life of the equipment.
- Troubles in a sewage pumping station can be mostly traced to the design stage itself. This is all the more true when too much grit is likely to come into the sewage pumping stations from sewage at monsoon time, which is difficult to handle. Hence proper care shall be taken to divert any storm water during monsoon periods.

d) OPERATION of GATES, VALVES AND ACTUATORS

Sluice gates are commonly used to control sewage levels in TTPs. Attention should be made to the following points for proper operation:

- Operate inactive sluice gates by smearing grease on stem threads.
- Clean sluice gate with wire brush and paint with proper corrosion-resistant paint.
- Ensure unobstructed operation of gate and headstock.
- Ensure that the spindle is not touching the stem guide.
- Remove foreign matter like paint, concrete, etc. in the fully open position of gate.

Do's for sluice gates

- Operate the gate at least once in every three months.
- Check the nuts of all construction and foundation bolts once in a year. Tighten the bolts, if loose.
- Examine the entire painted surface for any signs of damage to the protective paint.

Don'ts for sluice gates

- Do not remove lock plates until the gate has been properly installed.

- Do not keep the gate out of operation for more than three months.
- Do not forget to set the stop nut in the correct position.
- Do not disturb the adjustment of wedge block bolts/studs.
- Do not over torque the crank handle/hand wheel.

e) OPERATION OF PUMPS

Operators should check the following items:

- Inlet and outlet flow rate
- Noise or vibration
- Bearing housing temperature
- Running amperage
- Pump speed
- Pressure
- Check the level and condition of the oil in the gear reducer
- Check the shaft alignment
- Check the condition of all painted surfaces
- Visually inspect mounting fasteners for tightness
- Clean dirt, dust or oil from equipment surfaces
- Check all electrical connections
- Stop and start equipment, checking for voltage and amp draw and any movement restrictions because of failed bearings, improper lubrication or other causes
- Check the drive motor for any unusual heat, noise or vibration
- Check mechanical seals and packing for leakage or wear

f) CLEANLINESS

- The Bidder and their personnel shall maintain a high degree of awareness in operation and maintenance of the plant and all relevant safety codes and procedures.
- At all times the plant, its equipment and surrounding shall be kept clean and in order including the buildings, floors, walls, roofs, windows and garden etc.

g) PREVENTIVE MAINTENANCE

- The preventive maintenance shall be carried out according to the preventive maintenance schedule of the plant.
- The regular staff may be reinforced with short-term specialists by the Bidder for special maintenance tasks, after duly informing the KMC 's representative of the need and the schedule.

h) REPAIRS

- Repairs shall be made as and when needed very promptly on the spot or at the Bidder's / Manufacturer's workshop. The need of repair on the spot or at the Bidder's workshop has to be decided in co-ordination with the KMC 's representative and according to the status of spare parts availability.
- The power consumed for repairing of the plant and equipments is recoverable from O & M charges payable to the Bidder and as per concern field of engineer in charge. Replacement of electrical & mechanical equipments which becomes beyond repairs

i) SPARE PARTS

- The Bidder shall keep a reasonable stock of spare parts so that the down time of equipment can be kept within the limits specified.
- The contents of the stock and the reorder level of the inventory have to be approved by the KMC 's representative.

j) TRANSPORTATION

All necessary transportation shall be arranged and made by the Bidder at his own expense. For better communication internet facility is provided throughout the entire operation & maintenance period on his own cost.

k) OIL, GREASE, LUBTRICANTS, CHEMICAL & CONSUMABLES

The Bidder has to ensure that there is always sufficient stock of 15 days of Oil, Grease, Lubricants consumables, and laboratory chemicals.

General Obligations

- The Bidder shall operate and maintain the entire plant under this Contract for the period specified in this Contract.
- The Bidder will submit a detailed operation and maintenance plan for approval of KMC 's representative.
- All operation and maintenance activities shall be carried out strictly in accordance with the approved plan.
- If for any reason the sewage standards are not met and the penalty is imposed by MPCB, the same shall be recovered from the Bidder's payable amount. However KMC reserves right to terminate the Contract on statutory ground or default of the Bidders.
- It is the responsibility of Bidder to insure entire equipments and installation throughout the operation & maintenance period on his own cost.
- The bidder shall provide telephone, internet & communication facility within the plant premises The services shall include but not be limited to the flowing items:
 - a) Operation and maintenance of the Tertiary Sewage Treatment Plant from the inlet chamber up to disposal into channel leading to creek.
 - b) Training for O & M staff designated by KMC as per requirement.
 - c) Generation and maintenance of periodic reports.

Operation

a) Operational services

The Bidder shall operate all the components of projects and the complete Tertiary Sewage Treatment Plant and associated services on a continuous 24-hous basis. The Bidder shall operate and utilize the control and monitoring system provided, if found necessary, he shall make adjustment (within the operation range) of the control system and equipment, so that the plant operation matches the treatment process requirements.

If it is determined that the facility is not capable of meeting the design Parameters for any reason beyond the Bidder's control and not attributable to him, the Bidder shall determine the specific cause of failure/abnormality in the plant functioning and report to the KMC 's representative and seek his directive on the necessary corrective action to be taken /adopted.

The Bidder will be required to furnish the details of electricity consumption in the format prescribed by the KMC 's representative.

All consumables, Polyelectrolyte, Chemical and spare required in operating and maintaining the plant in good condition shall be provided by the Bidder.

The Bidder at his own expense shall provide all tools, cleaning and housekeeping equipment, security and safety equipment.

b) Laboratory Services

The Bidder using the existing facility shall perform all tests, sampling and analysis regularly as stipulated in the Bid document and as required by the regulatory agencies and as directed by engineer-in-charge.

Electronic display showing values of BOD, COD, PH of water at inlet & treated Sewage at outlet shall be maintained.

c) Manpower

- The Bidder shall provide the required qualified managerial, technical supervisory, laboratory, administrative and non-technical personnel and labour necessary to operate and maintain the treatment plant and the premises in a safe way and efficiently on a continuous 24 hours basis for the full term of the O & M period.
- The qualification and capability of Bidder's personnel shall be appropriate for the tasks they are assigned to perform.
- The staff provided shall possess the necessary skills and trained in the operation of the plant prior to assign to the Work.
- If in opinion of the KMC 's representative a person of Bidder's staff is considered to be inadequately trained and skilled or otherwise inappropriate for the assigned task and KMC 's representative may inform the Bidder in writing, the Bidder shall replace him with a person of appropriate skills and training for the task, approved by the KMC 's representative, immediately of being so informed.
- The prime requirement is that the plant should operate by the minimum staff and personnel The Tenderer shall propose in their Bid a staff management structure for operation and maintenance of works.
- The suggested structure of operation & maintenance staff (minimum) at each plant shall be as follows:

Sr. No.	Description	Qty.
1	Supervisors	3
2	Operational person	18
3	Maintenance Team	9
5	Electrician	As Required
6	Fitter	As Required
8	Chlorine operator	1
9	Helper	As Required
10	Gardener/Sweeper	As Required
11	Security Guards	As Required
12	Helpers and operators	As Required

However, Tenderer shall employ additional manpower to get specified output. The cost of the same shall be borne by the Tenderer. In addition to the above personnel, the Bidder shall provide the necessary secretarial support; printing and publishing services office furniture and office are followed including weekly rests, rotation of duties etc. **The deployment of Man-Power indicated in this NIT is Tentative. Bidder is free to deploy required manpower considering 24 hours service delivery pertinent to the penalties and liquidity damages.** The Curriculum Vitae and joining letter of the key personnel only shall be submitted to the KMC 's representative for acceptance.

Normal time duty hours for the Bidder's O & M personnel shall be notified by the Bidder and if necessary be modified in consultation with the KMC 's representative.

A shift schedule shall be established by the Bidder and approved by the KMC 's representative to ensure the presence of necessary number of Bidder's staff for duty at site 7 days a week, including holidays.

In the event it becomes necessary for more than one of the Bidder's key personnel to be absent from the plant, the Bidder shall provide a qualified replacement at his own expense and ensure that specified project duty coverage is maintained.

The Bidder shall include in his cost medical and accident insurance expenses of all the staff employed by him along with all provision of the labour welfare acts prescribed from time to time by the state and central government

Adequate insurance cover shall also be maintained during O & M period for all KMC s as well as casual temporary employees and visitors.

KMC is not liable for any compensation on arising due to any accident/ mishap of any nature occurring in the plant premises.

Safety

The Bidder shall be responsible for safety of his staff during O & M of the plant and shall procure, provide and maintain all safety equipment necessary for satisfactory O & M such as gloves, boots, mats, safety belts, masks, respiratory system for chlorine operation, etc.

1. The Bidder shall utilize awareness procedures in every element of operation and maintenance.
2. The Bidder shall emphasize site safety including adoption of maintenance.
 - a. Safe working procedures, cleanliness and care of the plant as a whole
 - b. Accident and hazardous conditions prevention and reporting
 - c. Shall impart safety training to all members at regular intervals, especially for new comers.
 - d. Shall provide Notice Boards and display boards at appropriate locations, detailing precautions to be taken by O & M personnel to Work in conformity to regulations and procedures and by the visitors to the plant.
 - e. Shall notify the KMC 's representative immediately if any accident occurs whether on-site or off site in which Bidder is directly involved and results thereof 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 comprehensive report
 - f. within 24 hours of the accident.
3. The Bidder may refuse entry into the plant, to all personnel's including KMC 's representative on grounds of safety and person not carrying proper identification.
4. Personnel shall be permitted entry into the plant only on disclosing their identity and those authorized personnel including KMC 's representative shall be issued identity cards with photographs by the Bidder, this also includes casual visitors who shall be issued a temporary visitors entry permit.

Reporting

- a. The Bidder shall prepare consolidated monthly reports on plant operation and maintenance and submit the same to the KMC 's representative within first 7 working days of the next calendar month.
- b. The daily reports are to be prepared and retained at site (in soft and hard copies) for inspection.
- c. Overall reporting formats shall be approved by KMC 's representative and may have to be modified from time to time as required and approved by KMC 's representative.
- d. Bidder may have to prepare and submit additional reports on particular matters and incidents having special significance as and when required by the KMC 's representative.

Maintenance

• General Obligations

- (i) The Bidder shall ensure the continuity of the plant operations and that the break down or the deterioration in performance of the plant are minimized by a preventative maintenance schedule.
- (ii) The maintenance schedule of all critical components shall primarily comprise of preventative and break down maintenance.
- (iii) Regular preventative operational maintenance comprises of planned and regular maintenance carried out by the Bidder on a day-to-day basis, including cleaning, lubricating, minor adjustment, together with the preventive and corrective maintenance plan for those items of the plant and equipment within the treatment works which have been commissioned and made operational.
- (iv) Breakdown maintenance comprises of any unplanned maintenance required.
- (v) Non-commissioned assets / components of the plant if any shall have to undergo a regular "non-operational& storage maintenance".
- (vi) The Bidder shall carry out the maintenance of the plant installations in accordance with the requirements of the O & M Manual and the equipment manufactures instructions and only

approved grades of lubricants will be used. The frequency of lubrication, adjustments to be made regularly and recommended spare parts by the equipment/machine/ instrument manufactures/supplier shall always be carried out and appropriate inventory shall be held in store.

(vii) The Bidder shall maintain a maintenance log of all repairs, oil & lubricant changes carried out for each equipment's maintenance Log Card.

• **Building and Site Maintenance**

The Bidder shall be responsible for:

I. The total maintenance of building and all electrical, ventilation, plumbing and drainage installation in the building.

II. Housekeeping and cleaning of all buildings

III. Preventive and breakdown maintenance of the site water and wastewater services, cabling and earthing systems Lift maintenance, air conditioning and the site road lighting system., The upkeep of landscaped areas, tree plantation and flower pots etc.,

IV. Maintenance of the communication system of the plant.

V. All buildings, exposed equipments, units shall be painted at the end of every year of O & M.

VI. Routine housekeeping maintenance shall be carried out in accordance with procedures.

VII. Normal breakdown maintenance shall be attended to within a period of 3 working days.

VIII. Any unusual breakdown due to forces of nature covered under insurance shall be inspected to and attended to only after being permitted to do so by the insurance agency in writing.

IX. The painting of entire building (plastic coat) and other electro- mechanical equipments, civil structural components shall be done in every year at his cost by the Bidder if found deteriorated by the Engineer-in-charge.

• **Training**

(a) The Bidder shall be responsible for instruction and training of all his personnel in all aspects of plant operation and maintenance till the end of the operation and maintenance period.

(b) The Bidder shall also be responsible for training personnel nominated by the KMC . Such person shall submit their CVs to the Bidder for assessment for assignment of respective work.

(c) The training will be imparted to skilled personnel possessing a basic qualifications as stipulated by the KMC 's representative which shall be similar to those possessed by the Bidders personnel, will operate the plant at the expiry of the Contract, this shall be done in the last six months of the operation and maintenance Contract.

(d) The Bidder shall make available for this purpose competent staff as well as proposed schedule information that may be necessary for effective execution for the training programme.

(e) The bidder shall also responsible for giving training to its staff for proper operation of chlorine plant in normal as well as in emergency condition.

(f) The training shall be organized in three (3) stages as follows :

i. Basic technical training education to be carried out during the final stages of the erection period of the Contract through literature, manuals, handouts demonstration at site, etc.

ii. Intensive on the job training during commissioning and maintenance period.

iii. Examination at the end of the training and only those persons who qualify should be permitted to operate the plant.

(g) By the end of this training period, these personnel should be able to carry out their respective duties efficiently under the supervision of KMC 's representatives and supervisory staff of the KMC .

(h) The Bidder shall provide at his cost all local transportation, literature, computers, CDs and other related hardware and stationery to be used by trainers and trainees during the training period.

• Operation and Maintenance Records

The Following are a typical sample form of records (not an exhaustive and comprehensive) that are required to be maintained by the O & M Bidder. The details of complete records shall be prepared and submitted by the O & M Bidder the KMC 's representative for approval prior to commissioning.

a) Net output flow

Details	To be guaranteed by bidder
Net output Flow	_____
Power Consumption for entire facility for 20 MLD TTP	_____

b) Record of Unit

The record contains the information about the duration of operation and quality from the plant. This record shall kept by the Shift-in-charge and contains data on plant functioning.

Month			Year		
Date	Unit		Quantities	Officer on Duty	Operators
	Hours of Operation per day				

c) Test Report

The performance data sheet shall contain the records of the analytical results at the inlet and outlet all the parameters. These Parameters are pH, Dissolved Oxygen, BOD, COD, TSS, TN, NH3N, TP, pH and Temperature. The log sheet shall be provided by the Tenderer as per their process requirement. Inlet water and Treated water shall be recorded daily for the following Parameters.

Sr. No	Parameter	Secondary Treated water	Tertiary treated water
1.	Flow		
2.	Temperature		
3.	BOD		
4.	COD		
5.	TSS		
6.	TDS		
7.	VSS		

8.	DO		
9.	TN		
10.	NH3N		
11.	TP		
12.	pH		
13.	SVI		
14.	Iron		
15.	Silica		
16.	SDI		

d) Pumping Station annual inspection report

Pumping Station annual inspection report						
Date						
Mechanical		General condition of equipment				
		TT pump			Sump Pump	Remarks
		No.1	No.2	No.3		
1.	Pump					
	Bearings					
2.	Gates					
	Gate operator (Manua)					
	Gate Operator (motor)					
	Stems					
3.	Crane & hoist					
4.	Siphon breaker					
5.	Trash racks					
	Drive chains					
	Bearings					
	Gear Reducers					
Electrical		Date				
1.	Motors					
2.	Motor bearings					
3.	Switchgear controls					
4.	Control Panel					
General						
1.	Water Levels	Elevation		Remarks		
	Forebay					
	Sumps					
	Building and grounds	Date				
		Remarks				
1.	Sump					
2.	Forebay					
3.	Discharge Chamber					
4.	Gate well to river outlet					
5.	Structures					
6.	Fire extinguisher					

7.	Tools & cabinets	
8.	Painting	
9.	Caulking	
10.	Grating, rails & ladders	
11.	Water system and plumbing	
12.	Louvers & Ventilators	
13.	Windows	
14.	Doors	
Remarks		

e) Other Records

- The Bidder shall maintain detailed record of consumption of Chlorine, Coagulants, and other chemicals (if used)
- These records shall be available to the KMC 's representative for scrutiny and copies shall be furnished on demand.
- During O & M period tests for BOD, TSS, TDS, COD, TN, NH₃N, Phosphates and pH, VSS, SDI, SVI shall be done daily on composite samples.
- The results of these Parameters shall have compliance of the guaranteed values.
- The Bidder shall also maintain the records for daily, monthly and annual reporting to the KMC enabling the KMC to review Bidder's performance during 15 year O & M period.

Annexure – F (Main) : Price/Payment Schedule

Korba Municipal Corporation Design, construction, erection, testing and commissioning of 20 MLD tertiary treatment plant at NTPC Korba including operation and maintenance of entire system for 15 years.		
PAC cost A (Cap) + B (O & M) =Rs. 8005.05 + 8433.90 = Rs. 16438.95 Lakh		
S.No.	Component Capital Works A	Percentage Payment to the Bidder wrt Quoted cost against Capital cost of 8005.05 Lakh (Lumpsum)
1	Providing, supply, erecting and installing 20 MLD UF RO based Tertiary treatment plant at Korba with PEB structure, all allied tanks and all equipments	89.88
2	Constructing and commissioning RCC RO Permeate tank cap. 4000000 lit with all allied works	3.52
3	Providing installing and commissioning Pumping machinery Q=1000000 LPH and Head 26 m. at sump well for delivery at NTPC premises	1.51
4	Providing erecting and commissioning 1500 KVA/33/3.3 KV electric sub station	0.79
5	Providing Laying Jointing and commissioning 500 mm dia DI k-9 class Pumping Main of 1300 m from Sump Well to Sump of of NTPC	3.80
6	Allied work comprising of 600 Rm compound wall as per detail drawing, Main gate of 10 sqm area and wicket gates of 2.4 sqm area.	0.50
	Capital Work Total =	100
7	Operation & Maintenance for 15 Years for Tertiary treatment Plant, sump, pumping Main etc. for all capital works under scope of project.	As per Quoted cost in Form F

Note:- 5% for the defect liability period shall be deducted from each running bill of whole works and the same shall be refunded after period is over as per condition of contract.

Annexure – F-1

Providing, supplying, erecting and commissioning 20 MLD UF RO based Tertiary treatment plant at Korba with PEB structure, all allied tanks and all equipments

A) Main Breakup

Sr. No.	Description of work Details	% Break-up
F -1	Providing, supplying, erecting and commissioning 20 MLD UF RO based Tertiary treatment plant at Korba with PEB structure, all allied tanks and all equipments	89.88

B) Sub Breakup

Sr.no	Description of work	Percentage payment wrt % fixed for TTP
1	After approval of Structural design & drawings, QAP sand including topographical surveys, geotechnical investigations (for determination of SBC & other necessary parameters) and other necessary surveys etc	7%
2	After completion of Civil works in all respect such as feed tanks, sumps, reject water tank with overhead pump house and all other allied works.	25%
3	After supply and procurement of all UF-RO equipment's	20%
4	After successful installation of UF RO based TTP system	15%
5	After procurement and successful installation of PEB structure	15%
6	Furnishing lab/ admin/ Scada room including False Ceiling, Electrical Works, Air Conditioning, Audio/Video System, 3D model, Windows & Curtains, Toilets (Male + Female), Plumbing & Sanitary (General)	13%
7	After testing, commissioning, PG Test	5%
	Total	100%

Note: i) The payment of R.A/Final. Bills shall be made as per actual work done at site and as certified by Engineer-in Charge.

ANNEXURE – F2

Constructing and commissioning RCC RO Permeate tank cap. 4000000 lit with all allied works

A) Main Breakup

Sr. No.	Description of work Details	% Break-up
F -2	Constructing and commissioning RCC RO Permeate tank cap. 4000000 lit with all allied works	3.52

B) Sub Breakup

Sr. No.	Items	Release of Payments
1.	Submission of Detail design and drawings and its vetting from IIT/NIT and approval from competent authority	3%
2.	Foundation work complete	15%
3.	Walls up to 50% height	10%
4.	Walls up to 100 % height	10%
5.	Top slab	15%
6.	Internal external plastering internal painting, external painting	10%
7.	Internal ladder, external ladder, CI manhole frame & cover over opening	10%
8.	Inlet outlet overflow pipe including valves	10%
9.	Approach road site cleaning and misc. works including furniture for Scada room	12%
10.	After testing & commissioning	5%
11.	Total	100%

Note: i) The payment of R.A/Final. Bills shall be made as per actual work done at site and as certified by Engineer-in Charge.

ANNEXURE – F-3 & F-4

Electromechanical items

F-3 : Providing installing and commissioning Pumping machinery Q=1000000 LPH and Head 26 m. at sump well for delivery at NTPC premises

F-4 : Providing erecting and commissioning 1500 KVA/33/3.3 KV electric sub station

A) Main Breakup of electromechanical items under F3 & F4

Sr. No.	Description of work Details	% Break-up
F-3	Providing installing and commissioning Pumping machinery Q=1000000 LPH and Head 26 m. at sump well for delivery at NTPC premises	1.51
F-4	Providing erecting and commissioning 1500 KVA/33/3.3 KV electric sub station	0.79

B) Sub Breakup of each item under F3 & F4

Sr. No.	Description of work Details	% Break-up
1	On supply of equipment at site	60%
2	On erection of equipment at site including all civil work	35%
3	On testing and commissioning , PG-Test	5%
	Total	100%

Note: i) The payment of R.A/Final. Bills shall be made as per actual work done at site and as certified by Engineer-in Charge.

Annexure – F-5

Providing Laying Jointing and commissioning 500 mm dia DI k-9 class Pumping Main of 1300 m from Sump Well to Sump of NTPC

S.N.	PARTICULARS	QTY	Unit	RATE	AMOUNT
1	Excavation:				
	Earth work in excavation for pipe trench in ordinary soil areas including dressing, watering, ramming and disposal of excavated earth lead up to 50m and lift up to 1.5m, disposal earth to be levelled, neatly dressed.				
	For Lift 0 to 1.5 m	707.85	cum		
	(CG PHE Amendment 7, 2022-23, 18.15/51)				
	Extra for every additional lift of 1.5m or part there of				
		117.98	cum		
	(CG PHE Amendment 7, 2022-23 18.20.1/52)				
2	Earth work in excavation for pipe trench in Hard soil areas including dressing, watering, ramming and disposal of excavated earth lead up to 50m and lift up to 1.5m, disposal earth to be levelled, neatly dressed.				
	For Lift 0 to 1.5 m	707.85	cum		
	(CG PHE SOR 2020, I.N.18.16/P-52)				
	Extra for every additional lift of 1.5m or part there of				
		117.98	cum		
	(CG PHE Amendment 7, 2022-23 18.20.1/52)				
3	Earth work in excavation for pipe trench in all kinds of rocks in areas including dressing, stacking of useful material and disposal of unserviceable material up to lead up to 50m and lift up to 1.5m.				
	Soft rock with or without blasting or bituminous pavement / cement concrete road.				
	For Lift 0 to 1.5 m	729.30	cum		
	(CG PHE Amendment 7, 2022-23, I.N.18.19.1/P-52)				
	Ordinary soft and Hard rock (over item No. 18.19.1, 18.19.2 and 18.19.3)				
		121.55	cum		
	(CG PHE SOR_2020 18.20.2/52)				
4	Demolishing cement concrete manually / by mechanical means including disposal of material within 50 m lead as per direction of engineer-in-charge.				

	Nominal concrete 1:3:6 or richer mix (i/c equivalent design mix)						
	(CG PHE Amendment 7, 2022-23, I.N.18.29.1/P-52)						
		195.00	1.10	0.3	64.35	cum	
5	Pumping out water caused by springs, tides or river seepage, broken water mains or drains or well or the like.				500	KL	
	(CG PHE Amendment 7, 2022-23 18.21/52)						
6	Providing, laying and jointing including testing following 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:5382/2018						
	500	mm dia			1300.00	Mtr	
	(CG PHE Amendment 7, 2022-23 4.3/3)						
7	Providing and Laying including testing Ductile Iron Double Socket 90° Bends conforming to IS: 9523/2000 having dimension as per table 15 of IS: 9523/2000 in the following nominal diameter/sizes with external bitumen coating and internal cement mortar lining.						
	(CG PHE Amendment 7, 2022-23 4.13/7)						
	500 mm dia				4	Each	
8	Providing and Laying including testing Ductile Iron Double Socket 45° Bends conforming to IS: 9523/2000 having dimension as per table 15 of IS: 9523/2000 in the following nominal diameter/sizes with external bitumen coating and internal cement mortar lining.						
	(CG PHE Amendment 7, 2022-23 4.15/7)						
	500 mm dia				6	Each	

9	Providing and Laying including testing Ductile Iron Double Socket 22.5° Bends conforming to IS: 9523/2000 having dimension as per table 15 of IS: 9523/2000 in the following nominal diameter/sizes with external bitumen coating and internal cement mortar lining.				
	(CG PHE Amendment 7, 2022-23 4.17/8)				
	500 mm dia		4	Each	
10	Providing and Laying including testing Ductile Iron Double Socket 11.25° Bends conforming to IS: 9523/2000 having dimension as per table 15 of IS: 9523/2000 in the following nominal diameter/sizes with external bitumen coating and internal cement mortar lining.				
	(CG PHE Amendment 7, 2022-23 4.19/9)				
	500 mm dia		4	Each	
11	Providing & fixing following ductile iron single chamber triple function temper proof air valves, small orifice with screwed end as per IS : 14845-2000 including jointing & testing with cost of jointing material and rubber insertion all complete as per IS :13095-1991				
	(CG PHE Amendment7, 2022-23 4.23/11)				
	80 mm diameter (PN 1.6)		3	No.	
	Providing and Laying including testing				
	Ductile Iron Double Socket branch				
	flange Tee conforming to IS:9523/2000				
	having dimension as per table 21 of				
	IS:9523/2000 in the following nominal				
	diameter/sizes with external bitumen				
	coating and internal cement mortar				
	lining with finishing as per clause 13				
	of IS:9523/2000.				
	(CG PHE Amendment7, 2022-23 4.23/11)				
	500X500X100		2	EACH	
	500X500X80		3	EACH	

12	Providing & fixing of following Ductile iron double flanged sluice valves as per I.S.:14846-2000 fitted with cap including jointing & testing with cost of jointing material such as bolts, nuts, rubber insertions etc. all complete.						
	(CG PHE Amendment7, 2022-23 4.41/18 & 4.53 pn, 22)						
	Sluice Valve & Scour Valve						
	80 mm diameter	PN-16	3	No.			
	100 mm diameter	PN-16	2	No.			
	500 mm diameter	PN-16	1	No.			
13	Providing and Laying including testing ductile iron PN 16 type flanged sockets conforming to IS: 9523/2000 having dimension as per table 23 of IS: 9523/2000 in the following nominal diameter/sizes with external bitumen coating and internal cement mortar lining with finishing as per clause 13 of IS:9523/2000.						
	(CG PHE Amendment7, 2022-23 4.7/4)						
	Flange Socket Tail piece						
	80 mm diameter		3	No.			
	100 mm diameter		2	No.			
	500 mm diameter		2	No.			
14	Providing and Laying including testing						
	Ductile iron Mechanical joint collar						
	with follower glands conforming to IS:						
	9523/2000 having dimension as per						
	table 24 of IS: 9523/2000 in the						
	following nominal diameter/sizes with						
	external bitumen and internal cement						
	mortar lining.(Including Labour						
	Charges)						
	(CG PHE Amendment7, 2022-23 4.11/6)						
	500 mm diameter		10	EACH			
15	Providing & laying mechanically mixed R.C.C. excluding centring & shuttering and reinforcement in foundation/plinth (20mm graded metal)						
	(CG PHE Amendment7, 2022-23 18.42.1/54)						

	In plinth and foundation, M-20 for thrust blocks	90.00	cum		
16	Providing & laying mechanically mixed cement concrete 20mm nominal size graded crushed stone excluding cost of centring & shuttering.				
	Reinstating the Road Surface of broken C.C Roads in Alignment				
	1:11/2:3 (M-20)				
	(CG PHE Amendment7, 2022-23, I.N.18.41.1.3/P-54)				
		64.35	cum		
17	Providing and placing in position cold twisted steel and hot rolled deformed steel reinforcement for R.C.C. work i/c cutting, bending, binding etc. complete i/c cost of binding wire and wastage.				
	(CG PHE Amendment7, 2022-23 18.44/54)	7200.00	Kg		
18	Providing & fixing form work i/c centring and shuttering including strutting, propping etc. and removal of form work for:				
	Foundation, footing, bases of columns, etc for mass concrete				
		60.48	sqm		
	(CG PHE Amendment 7, 2022-23 18.64.1/56)				
19	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				
	(CG PHE Amendment7, 2022-23 18.22/52)				
		Total Refilling	1628.05	cum	
20	Supply & Filling murum/river sand for pipe bedding or over the pipe (including supply)				
		107	Cum		
	(CG PHE Amendment7, 2022-23 18.24/52)				

21	Construction of RCC Valve chamber with RCC precast Cover				
	Chamber 1.8x1.8x2.2 clear dimension	5.00	each		
22	Provision of Nallah/River crossing /				
	National High way, state high way, by				
	M.S structural stell with piers in				
	Nallah/River bed and roar crossing				
	(For 600 to 200 mm dia. D.I pipe in	50.00	RMT		
	Nallah/River bed 100000/ RMT				
23	Manufacturing, Supplying at site & laying, jointing of following M.S. pipes as per IS specifications, duly testing for usage in Drinking water inclusive of all materials, inspection charges, transit insurance, loading/unloading, FOR site and stacking etc. complete as per direction of Engineer-in-Charge. (Excluding protective coating)				
	Dia of pipe 500.00 mm (I.D) Thickness of pipe :				
	8mm	30.00	RMT		
	(CG PHE, 2020 10.1.9/140)				
24	Fabrication of M.S. pipes & specials from steel plates as per relevant IS specifications inclusive of cost of all materials, for any thickness as per design, inspection charges, testing, transit insurance, loading/ unloading, FOR site and stacking etc. complete as per direction of the Engineer in charge. fabricating of pipes and specials from steel plates.	100.00	KG		
	(CG PHE 2020 10.2/143)				
25	Providing & applying 400 micron epoxy coating as per relevant IS specification on outside face of pipe including testing.				
	(CG PHE 2020 10.10/147)	47.52	Sqm		
26	Providing & applying 400 micron food grade epoxy coating on inside face of pipe as per relevant IS specification including testing.				
	(CG PHE 2020 10.11/147)	47.52	Sqm		
27	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: Micro- processor based, modular design display 2 line back lit LCD for indication of actual flow rate, forward, reverse, sum totalizer, Perfection category : IP 65 Output : One current output (4-20 mA) one scalable pulse output.				
	500 mm Dia	1	Each		
	(CG PHE, 2020 25.5/305)				
28	Designing, supplying, installing, commissioning and testing of flow control valve/pressure releasing valve for inlet with flow measuring, flow controlling, pressure monitoring and web based with cable PLC etc complete hydraulically operated self-actuated flow and level control of (either with float or altitude pilot) with downstream orifice having ductile iron valve body Y-pattern double chamber unitized actuator, fusion bonded epoxy coating copper controlling tubing, with latching solenoid and Pilot operated as per design, additionally speed control feature, drip tight sealing, in line serviceable, internal stainless steel and protecting diaphragm suitable for drinking water WRAS/NSF/DVGW approved. (500mm dia)				
		1	Each		
	(MJP MECH CSR 2023-24 SA8-10/149)				

Note:- After the defect liability period 5% amount shall be deducted from the said work in each running bill. The deducted amount shall be released after specified period is over as per condition of contract.

ANNEXURE – F-6

Allied work comprising of 600 Rm compound wall Main gate and wicket gates

A) Main Breakup

Sr. No.	Description of work Details	%
		Break-up
F -6	Allied work comprising of compound wall, Main gate and wicket gates	0.50

B) Sub Breakup

Sr. No.	Items	% Break-up
1.	Approval of Design and Structural drawings	5%
2.	Foundation complete	15%
3.	RCC Work up to plinth	10%
4.	RCC Work up to top	20%
5.	Brickwork complete	20%
6.	Plaster work	15%
7.	Painting	10%
8	Completion of testing, commissioning & PG Test	5%
	Total	100%

Note: i) The payment of R.A/Final Bills shall be made as per actual work done at site and as certified by Engineer-in Charge.

iii) In case of increase or decrease in length compound wall payment shall be made on prorata basis.

IMPORTANT NOTE

- Lump sum offer has to be quoted for capital work and for O & M work separately for in Form F (Main financial offer to be submitted online)
- For works under Annexure F5 the payment of R.A. Bills shall be made as per actual quantity executed and as per Schedule/SOR for pipeline works SG PHE, PWD & WRD with all up-to-date amendments) with percentage below or above of bidder's lumpsum offer with respect to PAC.
- In case of additional/ reduced work, the additional payment/ deduction shall be made as per Schedule/SOR of PHE/ PWD/ UADD. The percentage above / below shall be applicable on additional work/ reduced work.
- For other Lumpsum work Annexure F1, F2, F3, F4 ,F6 payment shall be made as per main % break up mentioned in annexure F with percentage below or above of bidders offer with respect to PAC. Interim payment shall be made as per sub break up mentioned for each respective annexure for work.

Note: - Percentage cost in Main Break up will not change. However, bidder may submit detail sub breakup for release of interim payment. Sub Break up will be approved by competent authority of KMC. Interim payment shall be released as per approved sub break up.

Note: The payment of R.A/Final Bills shall be made as per actual work done at site and as certified by Engineer-in Charge.

Any items/components which may not be mentioned in the scope of work, technical specifications/payment schedule, tender drawings etc, but are necessarily required for successful commissioning of the complete water supply scheme with desired outputs and complete functions in all respects will be deemed to inclusive in quoted cost by the bidder/bidder and nothing extra shall be paid by Department.

ANNEXURE – F – 7 OPERATION & MAINTENANCE (O&M)

Operation & Maintenance for 15 Years for Tertiary treatment Plant, sump, pumping Main etc. for all capital works under scope of project

BREAK UP OF PAYMENT SCHEDULE FOR O & M WORKS

Sr. No.	Particulars	Release of Yearly % of Payments
	Against Monthly Running Bills	
1	1 st year	3.14
2	2 nd year	3.46
3	3 rd year	3.81
4	4 th year	4.19
5	5 th year	4.61
6	6 th year	5.07
7	7 th year	5.58
8	8 th year	6.13
9	9 th year	6.75
10	10 th year	7.42
11	11 th year	8.16
12	12 th year	8.98
13	13 th year	9.88
14	14 th year	10.87
15	15 th year	11.95
	Total	100 %

Note :-

- The Bidder may claim the payment for O & M on monthly basis after submission of required reports and data as mentioned.
- Payment for O&M: The offer for O&M of the work submitted by successful bidder shall be the total Lumpsum offer for 15 years. However, being the nexus of the project , it shall be paid in connection with the actual quantity of water satisfying the desired quality parameters after approval of NTPC Korba.

The successful bidder shall keep daily record of the quantity supplied in KL to NTPC Korba. The contractor shall be paid as described below :

Sr. no.	Description	Quantity
1	Total water to be supplied to NTPC per day	20,000 KL
2	Total water to be supplied for 30 days (1 month)	6,00,000 KL

3	Bidder's offer for O&M of 1 month	***** Rs.
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***** Computed as below:

Suppose offer for 15 years is “X”, then amount for first year “Y” will be:

$$Y = X \times 3.14 \%$$

The actual payment shall be made as per the actual supply of water to NTPC Korba i.e.

_____ KL x (Y/12) after statutory deductions. From second year onwards, the specified percentage of O&M payment as mentioned in above table of Annexure -7 shall be applicable.

ANNEXURE – G
(Revised form of Bank Guarantee Bond)
GUARANTEE BOND
(In lieu of Security Deposit)
(To be used by approved scheduled Bank)

1. In consideration of Chief Municipal Officer, Urban Local Body_____, Chhattisgarh (here in after called the Government) having agreed to exempt.....
(herein after ailed the said bidders) 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 bidders) of the Terms and conditions in the said agreement on production of a Bank Guarantee for RsRupees.....only..... (*)(herein after referred to as "The Bank" (at the request of the said bidders) do here by undertakes to pay to Chief Municipal Officer, Urban Local Body_____, Chhattisgarh and amount not exceeding Rsagainst any loss or damage caused to or suffered or would be caused to or suffered by Chief Municipal Officer, Urban Local Body_____, Chhattisgarh, by reason of any breach by the said bidder (s) of the terms or conditions contained in the said agreement in cache said bidder and the Government for the work of (indicate name of work) notified vide N.I.T. No..... Dated issued by the Chief Municipal Officer, Urban Local Body_____, Chhattisgarh (herein after called the said Agreement) of earnest money for the due fulfillment by the said bidder (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 Chief Municipal Officer, Urban Local Body_____, Chhattisgarh stating that the amount claimed is due by way of loss or damage caused to or suffered by The Nagar Palika Parishad by reason of any breach by said bidder(s) of any of the terms or conditions contained in is said agreement or by reason or The bidder(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 the Chief Municipal Officer, Urban Local Body_____ Chhattisgarh any money so demanded not withstanding any dispute or disputes raised by the bidder(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 said agreement and that it shall continue to be enforce able till all the dues o the Government under or by virtue of the said agreement have been fully paid and its claims satisfied or discharged or till the Chief Municipal Officer, Urban Local Body_____, certified that the terms and conditions of the said agreement have been fully and properly carried out by the said bidder (s) and accordingly discharged this guarantee, unless a demand to claim under this Guarantee is made on us in writing on or before the (here indicate a date which falls 9 months beyond the due date of completion of the work) we shall be discharged from all liability under the guarantee.
5. We (.) further agree with the government that the Govt, shall have the fullest liberty without our consent and without affecting in any manner our obligation here under to vary any of the terms and conditions of the said agreement or to extend time of performance by the said bidder (s) from time to time or to postpone for any time or for time to time any of the powers exercisable by the Government against the said bidder (s) and to for bear 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 bidder (s) or for barnacle, act or commission on the part of the Government or any indulgence by the Govt. to the said bidder (s) or by any such matter or thing whatsoever which under the lay 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 Bidder (s).
7. We (.) lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Government in writing:-

Dated the Day of
.....
For(*).....

(*) Indicate the Name of the Bank.....

ANNEXURE H – SPECIAL CONDITIONS

(Amendment & Supplement to Clauses in the General Conditions of Contract, Scope of Work, Technical Specifications and Payment Schedules etc. of the tender document)

1. The addresses are: “Employer”: Municipal Corporation Korba
2. Tax will be deducted at source as per prevailing Income Tax Rules
3. **Insurances:** - The risk and insurance coverage shall be as follows:
 - a. Third party vehicle liability insurance as required under India’s Motor Vehicles Act, 1988 by the bidder for its Personnel or for Sub Bidder 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 bidder 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.

Note: - The cost of the all the insurance premium shall be borne/paid by the Bidder.

If the Bidder fails to effect and keep in force any of the insurances required as mentioned above or fails to provide the policies or receipts as aforementioned, then, and in any such case, the Employer may affect and keep in force such insurances and pay premium as may be necessary and recover the amount incurred plus a penalty of 10 % of amount incurred (**i.e. premium amount+10% of premium amount**) from the Bidder’s Bill or available Bank Guarantee/Secured advances.

But it does not mitigate the bidders’ obligations, if there is any time lapse in payment of insurance premium, bidder shall be liable for any accident, injury, damages or any loss whatsoever caused during lapse period also.

4. The arbitration proceedings shall take place in C.G.
5. **Performance Security:** - The Bidder 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 bidder 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**.
Bidder may submit the same amount of Bank Guarantee on a yearly basis. However, it is solely the responsibility of the Bidder to ensure that the Bank Guarantee is renewed before 02 (two) months from the date of expiry each year. This renewal process must continue until the Bank Guarantee covers a duration of 3 months beyond the Defect Liability Period/ Extended Defect Liability.

The Bidder must promptly submit the renewed Bank Guarantee to the client within the designated timeframe. Failure to comply with this requirement gives the department the right to encash or forfeit the Bank Guarantee without providing any prior notification to the Bidder.

The performance Security in the form of Bank Guarantee will be in addition to the normal security deposit to be deducted as per clause 1 of Conditions of contract for the execution of contract.

The performance security deposited for construction shall be released only after the performance security for O&M is submitted by the bidder.

6. **Additional Performance Security:** - “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/BG, in favor of the Commissioner before signing the agreement.

The same shall be refunded along with the normal S.D. after completion of the construction work as mentioned in the NIT. If the bidder 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 clause 14, page no 39 of conditions of the contract. In case the tenderer/bidder refuses to deposit Additional performance security (APS) then his bid will be rejected by the sanctioning authority and earnest money shall be forfeited”

In case, operation and maintenance bid amount is seriously unbalanced i.e. less than the estimated cost by more than 25% in such an event the successful bidder will deposit the Additional performance security (APS) to the extent of difference of 75% of the PAC of O&M and bid amount of O&M in the shape of FDR/BG, in favor of the COMMISSIONER Korba before the end of the trial run period.

The same shall be refunded along with the normal S.D. of O&M after completion of the O&M period (15 Years). If the bidder fails to meet the desired performance, the additional performance security (APS), Shall be forfeited by the department, & the agreement shall be terminated and action shall be taken in accordance with clause 14, page no 39 of conditions of the contract. In case the tenderer/bidder refuses to deposit Additional performance security (APS) then his SD, PBG and APS (if applicable) shall be forfeited”

7. SECURITY DEPOSIT

- (i) 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% (five percent) of the accepted cost of the work, as per clause 1 of condition of contract of form “F”. The five percent Security Deposit may be converted into Fixed Deposit Receipt of any Nationalised and Scheduled

Bank. The security deposit shall be recovered from the running bills @ 5 percent as per clause-1 of the Conditions of the Contract

- (ii) 5% security deposit shall be deducted from each running bill. One moiety of security deposit shall be refunded on completion of work as certified by the engineer in charge. The balance 50% amount shall be refunded on completion of defect liability period or settlement of final bill, whichever is later.
 - (iii) The Security Deposit for O & M period shall be returned after the 15 years period is over and the property has been taken over by KMC.
 - (iv) The amount of the E.M.D. shall not be adjusted when value of work done reaches the limit of the amount of contract or exceeds the probable amount of contract.
8. **Mobilization Advance:** Mobilization advance up to **5.00 %** (Five percent) of the contract value shall be given if requested by the bidder within one month of the date of order to commence the work. In such a case the bidder shall furnish Bank Guarantee from Nationalised/Scheduled bank in favour of the COMMISSIONER, Korba equivalent to the advance amount, before sanction and release of the advance.
- The Bank Guarantee should have a minimum validity of one year and remain in effect until the complete mobilization advance is recovered and it is the responsibility of the bidder to get the BG renewed before 2 months from the date of expiry and submit to client, if the bidder fails adherence to this, department will be at liberty to encash/forfeit the same without any information to Bidder.
- The advance shall be Interest free. The **5.00 %** (Five percent) advance shall be given in two stages
- Stage-1: 2% (Two percent)** of the contract value payable after signing of the agreement.
- Stage-2: 3% (Three percent)** of the contract value payable on receipt of the certificate from the bidder 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 bidder and is duly approved by the COMMISSIONER.
- Recovery of Mobilisation Advance:** The recovery of above advances (mobilizations, plants and machineries) shall be recovered in equal monthly instalments on pro- rata basis (after 15% (Fifteen percent) of contract work is executed) from each of the further running 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.
9. The Bidder 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.

Secured advances: - Advances to bidder are as a rule prohibited, and every endeavour 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 bidder 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 Engineer in Charge) 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 bidder under which ULB secures a lien on the materials and is safeguarded against losses due to the bidder 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 COMMISSIONER, that the quantities of materials upon which the advances are made have actually been brought to site, that the bidder has not previously received any advance on that security and that all the materials are required by the bidder 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 bidder 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 bidder shall sign the prescribed Indenture Bond in the prescribed form.

10. Defect liability

An amount of 5% for the defect liability period shall be deducted from each running bill of whole work. The deducted amount shall be refunded after 18 months of completion work in all respect.

11. Project Management Consultants (PMC) engaged by KMC C.G. & Members of the JOC of KMC and NTPC engaged by Govt. of India, will carry out complete supervision, quality control of activities carried out by bidder including checking measurement, designs, drawings, bidders bill, all deliverables till completion of the contract & rectification of deliverables.

The PMC deployed by the Engineer in Charge shall act as the representative of Engineer in Charge of the Contract. Unless specified otherwise, PMC shall be involved in testing of materials, supervision of works to ensure quality as per required (IS / Technical specifications) standards. Bidder shall provide support and assistance in all field works, checking of

measurements, bills, work done (temporary / permanent) in the field, including all works to be carried out by the Engineer-in-charge. However, written approval of designs of surge control devices, drawings, additions, alterations, omissions, substitutions, approval for non-schedule items / rates as required shall be obtained from competent Authority of ULB.

12. APPROVAL OF DESIGNS & DRAWINGS: All design calculations & detailed drawings of all components (Electrical, Mechanical & Structural) of the project shall be got approved by Indian Institute of Technology (IIT)/ National Institute of Technology (NIT) at the cost of contractor and then submitted to Korba Municipal Corporation for approval. It will be mandatory on the part of the contractor to prepare the detailed designs and the Basic Engineering Package (BEP) from the same institute.

- a. The successful bidder shall first submit General Arrangement drawing accommodating all the proposed units & submit the same for approval by ULB & JOC.
- b. Bidder shall also prepare & submit hydraulic designs & after its approval shall prepare & submit structural design & architectural drawings, get them approved by NIT/IIT and finally submit them for approval of Engineer in Charge/COMMISSIONER through PMC. All costs shall be borne by the bidder.
- c. For approval of design and drawing, the procedure as per latest Govt. order in this regard to be followed.

13. THIRD PARTY INSPECTION of all items beyond procurement shall be carried out by **SGS/ RITES** based on Datasheets, Quality Assurance Plan & complete specifications as submitted by the Bidder to Engineer –in- charge. Third Party Inspection charges will be borne by the Bidder.

Third Party Inspection (TPI) of all pipes, fittings and all kinds of valves, Electro-mechanical equipment shall be carried out based on the Quality Assurance Plan duly prepared and submitted by the bidder. These TPI charges will be borne by the bidder.

Further for witnessing the tests at works of the manufacturer by 2 No. officials of the ULB, the bidder shall arrange the same and bear the entire cost (cost of lodging, to and fro etc).

14. The Successful bidder has to submit the following documents within 30 days from the date of issue of Work order

- a. Local Address of office or Site office at ULB for regular communications and correspondences along with details of Contact Person.
- b. Details & CVs of Technical persons and key Staffs to be deployed in the Project for approval of COMMISSIONER/EE of concerned Divisional office
- c. Detailed Programme of work component wise (Using CPM/PERT Techniques) showing key / sub activities and mobilization schedule for personnel, equipment and procurement of materials for construction for approval of COMMISSIONER/EE of concerned Divisional office.
- 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

- e. Methodology and workplan
- f. Format of Site order Book for Approval
- g. The bidder shall submit in the first week of each month a statement of “target vis-à-vis actual performance” of each item i.e. component of work /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 14 of the conditions of contract.

15. The bidder 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.

Failure of the bidder to rectify the defects properly in the given period, it shall be open for the COMMISSIONER/ 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.

16. Risk and Cost:

In conjunction with clause-14 of conditions of contract, if the bidder(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 or causes fundamental breach of the Contract as mentioned in clause 14 of the conditions of Contract. The COMMISSIONER may give to the bidder (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 bidder(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 bidder(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 Bidder(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 bidder.

Moreover, the bidder shall be debarred from participating in any future tender of Urban Local body/UADD 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.

17. As it is lump sum contract therefore all Survey, investigation, Engineering Procurement Construction, testing commissioning, trial run, defect Liability period and 15 years operation & maintenance of all components of the project are in the scope of Bidder only.

18. The design parameters, technical specifications and others details given in the tender document are indicative and minimum only. Bidders are advised to visit the Nagar

Palika/ Nagar Palika Parishad office and site in advance to assess the exact and complete scope of work before quoting the rates.

19. Levels as mentioned in Tender Document, drawings, etc. are indicative only, Bidder has to verify the same from concerned department before taking up detailed designs of all the components of the project.
20. For Obtaining all statutory, legal and regulatory permissions/NOC such as PWD, NH&I, Forest, Telecom, etc. from respective authorities, ULB shall submit application, necessary fees shall be paid by ULB. The contractor has to depute dedicated Liaisoning Officer to coordinate with concerned departments for all NOCs/ approvals. It would be contractor's responsibility to obtain all statutory, legal and regulatory permissions/NOC from respective authorities.
21. Before procuring any type of valves, bidder to submit the feasibility report along with drawing clearly mentioning the location, diameter and type of valve to be used, for approval of department / PMC.
22. For Pipeline works Payment shall be made as per actual work done, for the items executed, as per PHED SOR 2020 (with latest amendments up to the date of issuance of Tender Document) plus quoted percentage above or below.
23. For Pipeline works in case of variation in length (increase in length or decrease in length), if any, the payment shall be made as per the actual measured length, However, in case the laying of pipe length increases (up to 25%) the payment shall be made as per the agreed rates i.e. rate as per relevant item of PHED SOR 2020 plus quoted percentage above or below.
24. The scope of work covers Operation & Maintenance of all components of scheme
25. During execution and O&M period it is the liability of the bidder to rectify all the damages occurred due to his fault, and if, the damages were due to fault of any other department, it will be the duty of bidder to rectify the same and the amount incurred for rectifying the damages, due to others fault, will be reimbursed based on agreed rates i.e., PHED SOR 2020 rates plus/minus the quoted percentage, for the items executed.
26. The 15-year operation and maintenance will be deemed to be commenced only after successful completion and commissioning (as certified by Engineer in Charge) of all components of the entire water supply scheme. O&M of Partially completed scheme will not be accepted.
27. Department will not entertain any extra financial claim on account of extension of time provided, if the project is extended beyond original contract period.
28. Before commencement of work at any of the sites, bidder to procure prior approval of Engineer-in-charge in writing. If department has not submitted any objections/ observations, for compliance of bidder before start of work, within 21 days from the date of request in writing, the bidder may deem the permission be given and can start the work at the questioned site.

29. It is the responsibility of the bidder to get the BG renewed before 2 months from the date of expiry and submit to client, if the bidder fails adherence to this, department will be at liberty to encash the same.
30. For execution of items related to Pipe line works and providing House service connections, the payment shall be made only for the items executed / used at site, with prior permission of department, any extra item procured or not used at site shall not be reimbursable to the bidder. The secured advance, if paid, on the excess items / items not used at site shall be deducted from upcoming RA bill /Final bill.
31. In conjunction with clause-6 of conditions of contract, it is to elaborate that EE/COMMISSIONER/Nodal can alter the scope of work as regards. Payment shall be made to the bidder as per the actual work done at site and only for the items executed.
32. The bidder shall not remove minor mineral form borrow areas, quarries without prior payment of Royalty charges.

33. Guarantee for Energy Consumption:

The Tenderer shall provide a guarantee for the energy consumption of all electro-mechanical equipment, including but not limited to pumps and motors installed at the tertiary treated water tank.

During the three-month trial period and the subsequent Operation & Maintenance (O&M) period, any energy consumption exceeding the values specified in Table 1: Statement of Power Consumption for Facilities shall be the sole responsibility of the Bidder. KMC shall only be liable to pay for the energy consumption up to the limits specified in the aforementioned table.

Any excess energy cost incurred due to consumption beyond the stipulated limits shall be borne entirely by the Bidder.

Table :1
STATEMENT OF POWER CONSUMPTION FOR FACILITIES

S. No	Name of Unit	No of Working	KW Ratings	Operational KW	Hrs. of Operation/Day	Energy Consumption
	(1)	(2)	(3)	(4) = ((2)x (3))	(5)	(6)= (5)x(4)
2						
3						
4						
5						
6						
7						
7						

9						
10						
11						
12						

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 / Bidders / 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 up to 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 / 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 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 completes his bid and 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 Earnest Money 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 or his 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 their documents 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, the URBAN LOCAL BODY_____ acting through Shri.....(Designation of the officer , Department) URBAN LOCAL BODY_____ (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 URBAN LOCAL BODY_____.

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 URBAN LOCAL BODY_____office 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 URBAN LOCAL BODY_____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 URBAN LOCAL BODY_____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 URBAN LOCAL BODY _____ 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 URBAN LOCAL BODY _____ 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 URBAN LOCAL BODY _____ servant or not, but not include a spouse separated from the URBAN LOCAL BODY _____ servant by a decree or order of a competent court, son or daughter or step son or step daughter and wholly dependent upon URBAN LOCAL BODY _____ servant but does not include a child or step child who is no longer in any way dependent upon the URBAN LOCAL BODY _____ servant, or of whose custody the URBAN LOCAL BODY _____ servant has been deprived of by or under any law, any other person related, whether by blood or marriage, to the URBAN LOCAL BODY _____ servant or to the URBAN LOCAL BODY _____ servant's wife or husband and wholly dependent upon URBAN LOCAL BODY _____ Servant.

(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 URBAN LOCAL BODY _____ 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 URBAN LOCAL BODY _____ 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/Sub bidder(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 15 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

BIDDER

COMMISSIONER

Department /PSU

Witness

1).....
.....
2).....

Witness

1)
.....
2)

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 Bidder, (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)]

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.*

[Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.]

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 Bidder, (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]), _____ 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	Constitution or legal status of Bidder/attach copy]				
	Place of registration of Firm/ Company (in case of other than individuals)				
	Principal place of business:				
	Name of Power of attorney holder of signatory of Bid (bidder)/ attach copy]				
1.2	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	Financial Year	(Rs. in crores)		
			"Civil engineering construction work" Turn over in the year	Add for indexing	Total
				1.61	
				1.46	
				1.33	
				1.21	
				1.10	

Note:

- Proprietary firm, partnership firm with the certificate of registration by register/article and Memorandum of Association with Certificate of Incorporation.
- Mention and highlights the year, which the tendered considers for evaluation for the Committee

Appendix – 2
Information regarding minimum one similar work, performed by Bidder

- (i) **One Work completed as similar work during last Five 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) Tenderer 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 by Bidder on all classes of Civil Engineering Construction Works over the last five years

Sno	Project Name	Name of Employer	Description of Work	Value of Contract	Contract No.	Date Of Issue Work Order	As per Agreement 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: -

- i. Certificate of Completion of the Works, in sufficient detail to verify the contract name, value and completion time issued by Engineer in charge not below the rank of Executive Engineer or equivalent.
- ii. Tenderer to attach the supporting documents in lieu of information provided in Table above

Appendix – 4

Existing commitments and on-going all classes of civil engineering construction works. (For calculation of component B in case of Bid capacity)

S no	Project Name	Description of Work	Contract No & Year	Name & Adders Of the Employer	Value of Contract (Rs. Lakhs.)	Date of Issue of Work Order	Stipulated Date of Completion	Stipulated period of Completion in Months	Anticipated 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) **	Anticipated 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 Statutory Auditor along with UDIN no. with sufficient proof such as work order shall also be accepted) for value of work remaining to be completed, value of work done, anticipated date of completion.
- Tenderer to attach the supporting documents in lieu of information provided in Table above
- The details of works in hand indicating name of work, Agreement 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 Tender.

Appendix – 5

Availability of Major items of Bidder'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

List of Technical person to be deployed on Contract work- Detailed requirement as given in scope of work

Position	Numbers	Professional Qualification	Total Experience years	In similar works (years)	Experience of similar works in the present position (Years)

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.

Sl. 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

Note:- Can use separate sheets for each agreement if necessary

Appendix – 9
MOU with registered Substation Bidder

This MOU is made on this ____day of ____ 202 between M/s. _____ a company incorporated under the Companies Act, 1956, having its _____ and Registered office at _____, (main Bidder) and M/s _____, Registered office at _____ [Substation Bidder's Company Name]

Whereas "_____" is interested in bidding for "Survey, Engineering, Procurement, Construction, testing, commissioning of _____ Water Supply scheme including Trial run, 12 months Defects Liability period and 15 years Operation and Maintenance of all Project Components/whole scheme" TENDER No. _____. (hereinafter referred as "Project").

SCOPE OF WORK

On allotment of the work to "_____" for the said project. "_____" [Substation Bidder's Company Name], shall all execute all sorts of work involved in successfully installation of substation works as per scope of work, technical specifications and other conditions outlined in the tender documents

"_____" [" confirms as under:

1. possesses the minimum experience required for the installation of substations as a pre-qualification criterion.
2. holds all valid and necessary registrations and certifications in Chhattisgarh and India for installation of substation works.
3. has not been blacklisted anywhere in India in the last five years or stopped/abandoned/was asked to stop the works.
4. has the necessary expertise and experience in executing water supply projects involving substations.
5. shall comply with all applicable laws, regulations, and standards related to electrical installations, safety, and environmental protection.
6. shall provide all required documentation, including QAPs, technical drawings, specifications, TPIs and certifications, related to the installation of substations in the water supply project as per requirement of tender document.
7. shall comply with all applicable regulations and guidelines issued by the Central Electricity Authority (CEA), State Electricity Board (SEB), and any other relevant regulatory authorities.
8. shall ensure that all substation equipment and materials used in the project are of approved quality, conforming to technical specifications outlined in the tender document and relevant Indian standards.
9. shall ensure the availability of trained and competent personnel for the Design, installation, testing, and commissioning of the substation, including qualified engineers and technicians.
10. shall adhere to the project timeline and complete the substation installation within the stipulated timeframe.

11. shall ensure the quality and reliability of the substation installation, meeting the specified performance criteria and industry standards.
12. shall provide a warranty for the installed substation equipment and undertake necessary maintenance and repairs during the defects liability period and operation and maintenance phase as per tender document.

Note: All necessary certificates, shall be submitted by the bidder as documentary proof along with the bidding documents for the Project. Failure to provide the required documentation may result in disqualification of the Bidder's bid.

In witness whereof the parties thereto have caused this Contract to be executed the day and year first before written.

WITNESS

SIGNED By: _____

SIGNED

By: _____

For and on behalf of the Bidder in the presence of

For and on behalf of the Electric
Substation Bidder in the presence of

WITNESS

1. Sign:-.....
Name:-.....
Address:-.....
Date:-.....
2. Sign:-.....
Name:-.....
Address:-.....
Date:-.....

Note: If the main bidder has executed the similar nature of work then no separate MOU shall be required.

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 – 11
Affidavit for not being blacklisted
(on Non-Judicial stamp paper of Rs. 100)

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 **as on date**
4. Not being CDR by any bank
5. I hereby authorize the Nagar Nigam/Nagar Palika/Urban Local Body Officials to get all the documents verified from appropriate source(s) and in case of any ambiguity found in any of the information provided or documents submitted at any stage during the currency of project, department is at liberty to take any action, either by penalizing or blacklisting for next at least 3years, in exercise of above action the department can engage other bidder/agency to complete the balance works at my Risk & Cost and the costs and the charges incurred in any way in carrying on and completing the balance works are to be paid to the department by me.

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 5 above are true to the best of my knowledge and believe and
are based on my / our record.

Verified that this date of 202... at (Place).....

Deponent

Seal of attestation by a Public

Notary with date Authorized signature / for and on behalf of.....

Appendix-12
Declaration

(on Non-Judicial stamp of Rs. 100)

Affidavit

I, the undersigned, do hereby declare /solemnly affirm / state on oath that on the behalf of M/s....., that I/We have visited and inspected the site..... (project name and System tender no) carefully and have acquainted myself/ourselves with full and complete knowledge and understanding of the Project/site, prevailing conditions, complete scope of work and other Employer's requirements.

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 are inclusive in our quoted Price and no further extra charges consequent on misunderstanding or otherwise will be claimed.

Deponent

(.....
.....)

Authorized signatory / for and on behalf of

.....

(Affix Seal)

Verification

I..... S/o..... do here by affirm that the contents stated above are true to the best of my knowledge and believe and are based on my / our record.

Verified that this date of 202... at (Place).....

Deponent

Seal of attestation by a Public

Notary with date Authorized signature / for and on behalf of.....

Appendix-13

AFFIDAVIT FOR CONFLICT OF INTEREST

(Note: This affidavit should be on a non-judicial stamp paper of Rs. 100/- and shall be attested by Magistrate/Sub-Judge/Notary Public)

I,.....(Name of the bidder authorized representative of the bidder) son/daughter of resident of (full address), aforesaid solemnly affirm and state as under :

I hereby certify that all the information furnished with the bid submitted in response to notice inviting bid number Dated: issued by ULB (authority inviting bids) for Scheme(name and identification of work) are true and correct.

I hereby certify that I have been authorized by..... (Company name) to sign on their behalf, the bid mentioned above.

Information furnished in the bidding documents is correct in all respects to the best of my knowledge and belief.

The near relations in CGUADD are not in employment of the firm/company. (Note:-By the term near relatives is meant Wife, Husband, Parents and Son, Brother, Sister, Brother-in-law, Father-in-law, Mother-in-law etc.) (if working mention the name/names)

.....
.....
The name of near relative (if any) who retired/ removed within the last two years. (If None, clearly State None)

.....
.....
No near relative is working as Financial Accountant in the CGUADD (if working mention the name)

.....
.....
No person is working in the company in any capacity, who are near relatives to any Officer in CGUADD (If working mention the name)

.....
.....
Our company/firm/ or otherwise is not under the clarification of ineligibility for corrupt and fraudulent practices by the Central Government, the State Government or any public undertaking, autonomous body, authority by whatever name called under the Central or the State Government. as mention in clause 1(F) of tender document.

I hereby authorize the CGUADD to get all the documents verified from appropriate sources (s).

Deponent

Place :

Date :

* Not applicable if the bidder is an individual and is signing the bid on his own behalf.

Verification

I..... S/o..... do here by affirm that contents stated above and contents submitted in technical & financial bid are true to the best of my knowledge and believe and are based on my/our record.

Verified that this date of at (Place).....

Deponent

Appendix-14
List of Similar works

S.No	Name of Department	Name of similar project/work	Components Executed	Date of Award	Date of Completion

- Attach certificates from the Engineer in charge not below the rank of Examiner or equivalent.
- Tenderer may attach certified copies of work order and completion certificate issued by Engineer in charge not below the rank of Executive Engineer

Appendix-15

Non-Judicial Agreement for Technology provider of UF/RO-system

(to be submitted on 500 Rs. Non-judicial stamp paper by UF & RO-system provider separately)

1. In accordance with Tender Ref No. for (Name of the Contractor) to M/s..... (Name of the technology provider), we, the aforesaid /Technology provider/ Company, (M/s) shall be fully responsible for the satisfactory performance of the(Name of the equipment/system) for the project (project name) by(employer).
2. Further, the manner of achieving the objective set forth in point 1 above shall be as follows:

For (Name of the equipment/system):
 - (a) We shall be fully responsible for design, engineering & commissioning and extending all necessary support for putting into satisfactory operation and carrying out the Guarantee Tests for(Name of the equipment/system) to the satisfaction of the Employer.
 - (b) We shall depute technical experts to Bidder's/sub-vendor's works for supervision during manufacturing, assembly, inspection, as and when required by Employer. We shall participate in site erection, commissioning and final testing (as and when necessary) of the.....(Name of the equipment/system).
 - (c) We shall participate in Technical Co-ordination meetings (TCMs) from time to time, as and when required by Employer.
 - (d) We shall promptly carry out all the corrective measures and shall promptly provide corrected design and shall undertake replacements, rectifications, or modifications to the equipment/system as and when required by Employer in case the equipment/system fails to demonstrate successful performance as per contract at site.
3. We, the/Technology provider/do hereby undertake and confirm that this agreement of Technical Support shall be valid for a period of fifteen (15) years or up to the end of defect liability period of the contract, whichever is later.

Signature of the Authorized Representative:.....

For M/s
(Technology provider)

Name

Designation

Date:.....

Common Seal of the Company

(The lowest bidder must submit PBG of Rs. 10.00 Lakhs from the technology provider/ system integrator along with PQ documents within 15 days of LoI. The PBG of technology provider/ system integrator shall be retained by KMC and shall only be released after

Providing, supplying, Construction, Testing & Commissioning of 20 MLD Tertiary Treatment Plant at NTPC Korba successful completion of the defect Liability period. The PBG shall be in favour of "The Commissioner" KMC.)

Appendix-16
SAMPLE POWER OF ATTORNEY

Power of Attorney

(To be executed on 100 Rs Non-Judicial Stamp Paper)

Know all men by these presents, We, _____ (name of firm and address of the registered office) do hereby constitute, nominate, appoint and authorize Mr. / Ms. _____ son/daughter/wife and presently residing at

_____, who is presently employed with us and holding the position of***** as our true and lawful attorney (hereinafter referred to as the "Authorised Representative") to do in our name and on our behalf, all such acts, deeds and things as are necessary or required in connection with or incidental to submission of our Application for RFP for "Name of Work". "proposed to be selected by KMC including but not limited to signing and submission of all applications, proposals and other documents and writings, participate in pre-bid and other conferences and providing information/ responses to KMC, representing us in all matters before KMC, signing and execution of all contracts and undertakings consequent to acceptance of our application and generally dealing with KMC in all matters in connection with or relating to or arising out of our Application and/or upon selection thereof us till the entering into of the Agreement with KMC.

AND we do hereby agree to ratify and confirm all acts, deeds and things lawfully done or caused to be done by our said Authorised Representative pursuant to and in exercise of the powers conferred by this Power of Attorney and that all acts, deeds and things done by our said Authorised Representative in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us.

IN WITNESS WHEREOF WE, _____ THE ABOVE NAMED PRINCIPAL HAVE EXECUTED THIS POWER _____ OF ATTORNEY ON THIS _____ DAY OF _____, 201* For _____.

(Signature)

Notarized

(Name, Title and Address)

Witnesses: 1.
2.

Accepted

(Signature)

(Name, Title and Address of the Attorney)

Notes:

The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required the same should be under common seal affixed in accordance with the required procedure.

For a Power of Attorney executed and issued overseas, the document will also have to be legalized by the Indian Embassy and notarized in the jurisdiction where the Power of Attorney is being issued.

SPARES LIST

Spare Part Name	Equipment/System	Quantity in Stock
UF Modules	membrane tank	11 modules
polyamide RO membrane	RO	100 NOS
Basket strainer cartridge	UF	
RO filter cartridge	RO	
CIP system cartridges	UF and RO	
UF module gaskets	UF and RO	
Pressure Tube gasket	RO	
Victaulic couplings	UF and RO	
Pressure tube End Caps	RO	
All pumps SEAL	UF and RO	
Dosing pump spares	UF and RO	
Automatic valve actuators	UF and RO	
Pressure gauge, transmitter	UF and RO	
Pressure switch	UF and RO	
Level switch, sensors	UF and RO	
Flow meter , Rotameter	UF and RO	
Conductivity sensors	UF and RO	
pH sensor	UF and RO	
ORP sensor	UF and RO	
Ball valves all	UF and RO	
Globe valve	UF and RO	
Butter fly valve	UF and RO	
Air release valve	UF and RO	
Non return valve	UF and RO	
Gaskets for all valves	UF and RO	
Pipe, elbow, tee, sockets	UF and RO	
VFD	UF and RO	
Contactor, OLR, MPCB	UF and RO	
Control and power cables	UF and RO	
Cleaner, antiscalents etc	UF and RO	

Note: The bidder has to keep inventory of all the spares as per the requirement of the project

Approved Make List

A. CIVIL ITEMS

Sr No.	MATERIAL / WORK	SUPPLIER, MANUFACTURER, VENDOR, AGENCY
1.	Cement (OPC) 43 Grade / 53 Grade	As per IS
2.	Cement (SRC)	As per IS
3.	Cement (White)	As per IS
4.	Cement (PPC)	As per IS
5.	Bricks	Ordinary Burnt Clay Bricks of any brand conforming to IS: 1877 with minimum Crushing Strength of 40 Kg/cm ² and Water Absorption Ratio restricted to 25% for Bricks used in Panel Walls and 20% for Bricks used in Load Bearing Walls/Fly ash bricks as per IS
6.	Mild, Tor Steel, CRS Steel	As per IS
7.	Structural Steel	As per IS
8.	Screws	GKW Nattlefold, Oxidised
9.	Dash Bolt Fasteners	Fischer, Hilti
10.	ANIT SKID INDUSTRIAL GRADE TILES	H & R Johnson, Kajaria, Spartex, Naveen, Rommano, SomaniPilkingtm, ECL
11.	Paver Blocks	Conwood Prefab, Hindustan Prefab or equivalent
12.	Adhesives	Pidilite, Fairmate, Bal Adhesive, MC Bauchemie, Cementone India, Fosrock, Sunanda Speciality Coating
13.	MS Door Frames & Shutters (With Galvanising)	Agew, Ferrosteel, Sen Harvic, Weldoors, YashashriPolyextrusion
14.	Door Shutters (Wooden)	Kutty, Anchor, Classic, Goyal, Timber Techniks, Sejpal Doors, Wood Designs, YashashriPolyextrusion, Anand Wood Crafts, Northern Doors
15.	Door Shutters (FRP) & Plastic	Everest fibre glass Industries, Unipals India, Advance Marketing, YashashriPolyextrusion, Sintex
16.	Hardware (Handles, Hinges, Mortice Locks)	Shalimar, Sobeet, Vijayan, Navbharat Brass Works, CIEF, AmarbhoyDossaji
17.	Aluminium Windows	Aluminite, Aluplex, Almech, Indrajit Associates, Aldoweit, Crystal Corporation, Indal, Jindal, Ajit India

18.	Night Latch	Godrej, Sobeet, Vijayan, Yale
19.	Paints:	
20.	a. Internal	Snowcem, Asian, ICI, British Paints, Shalimar, Nerolac, Burger, Jenson & Nicholson
21.	b. External	NITCO Paints, Killick Nixon, Hindustan Colours and Chemicals, Supreme, Shalimar, Burger, Jenson & Nicholson, Super Snowcem.
22.	Synthetic Plaster Finish	Nitco, Accro, Damani Dye Stuff, Supreme, Renova
23.	Waterproofing Works	India Waterproofing Co., Likproof India, Overseas Waterproofing Co.
24.	Waterproofing Compound	Accoproof, Pediproof, CICO, Impermo, Vamiplas 302, Vamiproof 101 & 102
25.	Glazing	Float Glass of Modi, Asahi, Saint Gobain
26.	M.S. Rolling Shutters (With Galvanising)	Swastik, Standard, Shudwar
27.	Aluminium Grills	DECO, Alumnigrille
28.	Aluminium Joinery	Crystel Corporation, Alumlite, Aluplex, Alm
29.	Anti-stripping Agent	Yuva, BE 100
30.	Chemical Admixtures and Compounds for RCC and Mortar	MC Bauchemie, Krishna Conchem Products, Sunanda Chemicals, Pidilite, Fairmate, Fosroc, Sika Qualcrete
31.	Anti-Corrosive Paint	Krishna Conchem Products, CICO Chemisol Adhesive, Shalimar, Burger
32.	Sanitary ware	Hindustan, Parry, Cera, John Gas, Jotisum
33.	Flushing Cistern	Flush Line or equivalent Approved ISI Manufacturers
34.	Sanitary Fittings and Fixtures	Mark, Jaguar, Gem, Dripless, Kingston, Essco, Metro, EssEss
35.	Lead for Lead Joints	Approved ISI Manufacturers
36.	Rubber Ring	Approved ISI Manufacturers
37.	Stainless Steel Sink	Nirali, Tuff, Diamond, Kingston, Neel Kamal
38.	SW Gully Trap and Stone ware Pipes	Perfect, Sonya, Girco, Elecon, Rajura
39.	Cast Iron Covers	RIFCO, Mohit Steel, Ashok Iron Works, JayswalNeco
40.	Piling Works	Kvaerner, Afcons, Michigan Engineering, Larsen & Toubro, DBM Geotechnics, Meher Foundations, Safe Foundations, Simplex
41.	Fire-fighting Works	Monsher, Mather & Platt, Bells Controls, Nitin Fire, Rahul Fire

42.	Elevators	Otis, Mitsubishi, Kone, Bharat Bijlee, Schindler
43.	Sodium Nitrate	Devica Chemicals or equivalent Approved ISI Manufacturers
44.	Sodium Silicate	Devica Chemicals or equivalent Approved ISI Manufacturers
45.	Marine Plywood	Anchor, Kitply
46.	Neeru	Swastic Instant Neeru or equivalent Approved ISI Manufacturers
47.	Lime for Whitewash	As directed by Engineer-in-charge
48.	Tarfelt	Shalimar, Lloyds
49.	Lightening Conductor	Approved ISI Manufacturers
50.	Teak Wood	C.P. Teakwood, First Quality with following Tolerances. Sap Wood to the extent of 25% Wrap to the extent of 10 mm in 3m Knots/meter
51.	S.W. Pipes	Burn & Co., Perfect Potteries, Navroji Vakil, Kashimira
52.	CI Soil Pipes & Fittings as per IS : 3989/84	NECO, CENTRI
53.	G.I. Pipes Class "C"	TATA, Zenith, Jindal, Suryaprakash
54.	G.I. Fittings	Approved ISI Manufacturers
55.	Gate Valve / Non Return Valve	Sant, Zoloto, Leader
56.	S.W. Pipes	Rajura or other Approved ISI Manufacturers
57.	Flush Valve	Jaguar ,EssEss
58.	HDPE/LDPE Tanks	Sintex

B. ELECTRICAL ITEMS

SL. NO.	MATERIAL, WORK	SUPPLIER, MANUFACTURER, VENDOR, AGENCY
1	S.F.U., Breakers	L&T, Siemens, GE, Schneider
2	Distribution Boards	MDS, Siemens, Schneider, Hager
3	Indicating Digital Meters	AE, Meco, L&T, Conzerv
4	Crimping Lugs, Glands of Double Compression Type	Dowells, Jainson, Lotus, Braco
5	Jelly filled Telephone Cables	Finolex, Universal, RPG
6	Tag Block with Boxes	Krone
7	Rossets	ITL, Tele Connectors India
8	MCB, RCCB	MDS, Siemens, Schneider, Hager
9	Main L.T Panels, PDB, LDB	Incorporating L&T, Siemens, GEC, Schneider Switchgear Components, Chavare Engineering Pvt. Ltd.
10	Switches and Sockets	MDS (Leagrand), Schneider, Anchor, Cona, ROMA
11	PVC Copper Wires (FRLS Grade)	Sundeeep, Finolex, RR Kabel, LAPP, Polycab
12	Motors	Siemens, ABB, Bharat Bijlee, Crompton, Kirloskar, Texmo, NGEF, Alstom

13	Cable Glands and Lugs	Dowell, Lotus, A.G. Electricals, Siemens
14	Cat-6 Lan Wire	Lucent, LAPP, AMP
15	PVC Pipe	Diamond, Precision (PPI), Asian
16	Lighting Fixtures	Wipro, Phillips, Clipsal, Crompton, Bajaj, K-Lite, Keselec Shredder
17	Fans & Air-Circulators	Crompton, Bajaj, Almonard, Usha, Cinni, Rallies, Orient, Khaitan
18	Distribution Transformer 11 KV, 433V	Crompton, Kirloskar, Emco, BHEL, Bharat Bijlee, Voltas, Andrew Xule, Pactil, NGEF, Voltamp
19	11 KV VCB Breaker & Panel	ABB, Schneider, Siemens, Alstom, Jyoti, Kirloskar, Crompton
20	Relays	ABB, Siemens, Alstom (AREVA), Schneider, L&T
21	11 KV SF6, Insulated 3-Panel, 4-Panel extensible type RMU	Crompton, ABB, Siemens, Alstom, Schneider, L&T
22	ACB 8-Way, Feeder Pillar 6-Way, 4 Way & Mini Pillars	Popular Brass Metal Works, ABAK, Manish, Fitwell, Super Panel, Control & Switchgear, Chavare Engineering Pvt. Ltd.
23	Fuse Base	Siemens, L & T, Popular Brass Metal
24	Control Cables	LAPP, Finolex
25	Batteries	Amar Raja, HBL Knife, Exide, Emco
26	11 KV End Termination & Straight through Joint	Raychem, Xicon, Danson
27	Measuring Instruments	MECO, IMP, KEW, Rishiline (L&T), Conzerv
28	PVC Insulated Cable for Working Voltage up to 1.1 KV as per IS: 694: 1990	Finolex, Asian, Polycab, Reliance, Fixolite, Torrent, Universal, Fortgloster, Vardhaman, Fixolite, Macro, CCI
29	XLPE – LT Cables as per IS:7098 Part – I: 1988	CCI, Asian, Finolex, Torrent, Macro, Fixolite, KEI, Polycab with Nitrogen Corring, Gloster
30	XLPE – HT Cables as per IS:7098 Part II – 1985	CCI, Asian, Finolex, Torrent, Macro, Fixolite, Polycab, Vardhaman
31	PVC Insulated (HD) Cable up to 1.1 KV as per IS:1554 Part I – 1988	Torrent, Macro, Vardhaman, Finolex, CCI, Asian, Polycab
32	Air Conditioners	Samsung, LG, Voltas, Carrier, Mitsubishi, Lloyd
33	Lamps HPMV,HPSV Metal Hallide Lamps & Accessories	Vallient, Fixolite, Bajaj, Philips
34	MCB,ELCB,RCCB,HRC	Indo Asian, MDS, Datar
35	T. W. Boards & Blocks	Double Folding Polished Board shall be in one Piece. Block up to 8” x 10” shall be in two Pieces
36	T. Switch S.P. or 2-Way S.A. to I.S.A.	Khosla, Keycee, GNE, Modern, Kalki
37	Three Pin Socket: 5A to 15A	Khosla, Keycee, Standard, Ellora
38	Ceiling Rose	Khosla, Keycee, Ellora, Oshan, Modern
39	Ring Main Unit, HT, Switch and Fuse Unit	MEI, South Andrew Yule or Department approved
40	C.T. / P.T.	Department approved
41	Auto Transformer Starter	MEI, Kilburn, JMP, Siemens, Andrew Yule, GEC, KEC
42	Trivector Meter	Department approved

43	Measuring Instrument	IMP, AE, UE, MECO, FE, Rishiline (L&T), Conzerv
44	Current Transformer	AE, Gilbert & Maxwell, IMP, Siemens, SEGC (C.S.), VM Electric or Department approved
45	PVC Conduits, PVC Pipes, HDPE Pipes	Garware, Finolex, Shakti, Circlearc, Popular, Prince
46	GOD Switches and Dropout Fuse Outfit	Kiran, Pactil, Atas or Department approved
47	Chain Pulley Block	Elephants, Herculas, WMI
48	Lugs	Dowels, Lotus, AG Electricals
49	Motor Protection Relays	Universal, Thresold, E.E., L&T, Minilac, Siemens, C&S. Telemechanique, Indo-Asian
50	Feeder Pillar, Mini Pillar	Popular Brass Metal Works, Anil Electrical Industries or Department approved
51	MCB & MCB, D.B.	MDS, Siemens, EE, Telemechanique, Havells, Indo-Asian, Standard, Versa Trip, Helcon, Safeline, Datar, Schneider
52	ELCB	Datar, MDS, Standard, GE, Telemechanique, Havells, Safex, HH-ELCON, Naptune, Gutts, Indo-Asian, Siemens, GE, Schneider
53	PVC Wires, Copper Aluminium Conductor, Flexible Cables	Philco, Phyroflux, Paragon, Polyplast, V-Plast, Apex, Silvex, Delta, Pagoda, Spacecab, HMT, Ralicab, Finolex
54	HRC Fuses	L&T, Indo Asian, Siemens, Havells, ARCON, Standard, Samrat
55	Fuse Switches, SW Fuse	L&T, Siemens, Crompton, Telemechanique, Indo-Asian, Havells, HH-ELCON, Standard, KEW, Kalki, Sentinel, Stenly, Samrat, Schneider
56	Switches, Sockets	Kalki, CPL, Anchor, Precision, MK, HME, EEW
57	Cable Glands	HME, EEW, Conzerv & Department approved,
58	HC Fuse Distribution Board	CPL, EE, EssEss, Stenly, KEW, Kalki, Standard
59	Air, Oil Circuit Breakers (HT,LT)	Kilburn, Easun, MEI, Jyoti, Andrew Yule, Siemens, L&T, GEC, Soutern, BHEL, Telemechanique, Crompton & Department approved
60	Energy Meters	Jaipur or Department approved
61	Capacitors	GEC, KhatauJunkar, Crompton, L&T, Momaya, Madhav, Atlanta, Prabhodhan, Maladay, Asian, Schneider, EPCOS, (S+M) or Department approved
62	Steel Tubular Poles	Indian Electric Poles, Bombay Tubes, Nityanand, Rajan Tubes or approved ISI Manufacturers
63	GI Pipes, Poles	Zenith, Tata, Bharat, Jindal, Suryaprakash
64	Terminal Box, Bracket, Junction Box, Control Pillar	ELM, United, DVK or Department approved
65	Street Lighting Luminaries	Bajaj, Crompton, Philips, Genelec, Keselac, ELM, Mysore, Wipro, GE-Apar, Canara, Glolite, Indo-Asian
66	Chokes, Ignitors	Bajaj, Crompton, Philips, Genlec, Keselac, GE-Apar, Glolite, ECE, Indo-Asian
67	Power Contactors	L&T, Siemens, Bharat Cutter & Hammer, Telemechanique, HH-ELCON, Kirloskar, Crompton
68	Lamps	Bajaj, Crompton, Philips, Cema, HMT, Electron, Surya, Mysore, Sylvania-Laxman, Solarson, ECE, Indo-Asian
69	Rotary Selector Switches	L&T, Siemens, Kaycee, EE, BISOONS (ELM), Schneider

70	Post Top Lantern	Philips, Crompton, Glolite, Bajaj, Parimal, Tulip, Keselec, ECE, Genlec, ELM, Wipro, Indo-Asian
71	Street Light Controller, Timer	L&T, (TSQ 100) 24 hrs. Dial, ELM, GIC
72	ASCR Conductors	Department approved
73	Alternators	Kirloskar, Jyoti, NGEF, AVK-SEGC, KEL, Caterpillar, Stamford, CG Newage
74	Diesel Engines	Kirloskar, Greaves Cotton, Cummins, Ashok Leyland, Cater Piller, Perkins, Volvo, Sterling Wilson, Mahendra&MahendraPowerica
75	Cable Jointing Kit	Raychem, Xicon, Benson, Mahindra (Push on) M Seal
76	Pole Paint	Jenson & Nicholson, Asian (S+M), Nerolac
77	Fluorescent Fixtures	Bajaj, Crompton, Philips, GEC, Genelec, Mysore, Wipro, Glolite, Litwell, Prestolite, Indo-Asian
78	Analyzers	Forbes Marshall, Endress& Hauser, Yokogawa
79	Level Switch, Level Indicator	Levcon, Revathi, Fitzer. S.B. Electro-Mechanical. Endress & Hauser, P&F, Fisher Rosemount, Forbes Marshall
80	Flow Meter – Magnetic, Ultrasonic	Endress & Hauser, Fisher Rosemount, Forbes Marshall
81	Soft Starters	Allen Bradly, Schneider, Innovative Tecno
82	Motors	Bharat Bijlee, Crompton, ABB, Siemens, Kirloskar, NGEF
83	Electrical Panels	Interlec, Positronocs, Jay Switchgear, Chavare Engineering, L&T, Siemens, ABB, Schneider, Crompton, Spark Electro

C. ELETROMECHANICAL & INSTRUMENTATION WORK

Sr No.	MATERIAL / WORK	SUPPLIER, MANUFACTURER, VENDOR, AGENCY
1.	UF System	CERAFILTEC, Meidensha & Nano stone, Toray, DUPONT, Hydronautics, Veolia/Suez, Asahi Kasei, Inge, LG
2.	Dosing Pumps	Prominent/ Milton Roy
3.	Air Blowers	Kay International, Swam, Everest, KPT, TMVT
4.	Automatic chlorine dosing system	Grundfos
5.	RO Membrane	Toray, Dow/ DuPont , Hydronautics, Veolia
6.	RO Pressure Tubes	UKL, PENTAIR
7.	Pressure switch	Danfoss, Orion
8.	Level switch	Aster
9.	SDI kit	Aster

10.	Micron Cartridge Filter	PREMIER
11.	High-Pressure Pumps	Grundfos, Wilo, Leo, CNP, KBL, Calpeda, KSB, LUBI
12.	Flow meters	ABB, E n H, Forbes Marshal etc.
13.	Pressure transducers	Acme
14.	Pumps: Horizontal Centrifugal	Kirloskar, Kishor, Johnson, KSB, Grundfos, Worthington, Mather & Platt, Jyoti, Homa
15.	Pumps: Submersible	Su Motors, Kishor, Kirloskar, KSB, Grundfos, Homa, Jyoti, Dharani, Flowmore, ABS, Aqua, Wilo
16.	Pumps: Vertical Turbine	Kirloskar Brothers Limited, WPIL, Mather & Platt, Jyoti, Homa, Flowmore
17.	Pumps: Screw (Positive Displace / Progressive Cavity Type)	Roto, Ramo, Flosys, Alfa Helical, Tushaco, Netzsch
18.	Pumps: Chemical Dosing (Positive Displacement Type)	Milton Roy, Swellore, Shapotools, Prominent, Sandur, Roto
19.	Air Compressor	Ingersoll Rand, Elgi
20.	Chlorinators	Metito, Chloro Control, Industrial Devices, Pennwalt
21.	Submersible Mixers	ABS, Grundfos, ATE, Grundfos, WILO, Adroit
22.	Agitators	Dorr-Oliver, Voltas, Emco, KCP, Batliboi, Shivpad, Fibre & Fibre, Standard Engineers, Helx, Adroit
23.	Chain Pulley Block, Electrical Hoist, JIB Crane	Elephant, Hercules, WMI, Indef, Brady & Morris
24.	Pipes:	
	GI Pipes	Tata, Zenith, Indus tubes, Swastic, Jindal
	SS Pipes	As per IS
	CI Pipes	As per IS
	DI Pipes	As per IS
	PVC Pipes	Plasto, Supreme, Ashirwad
	UPVC Pipes	Plasto, Supreme, Ashirwad
	HDPE Pipes	Plasto, Supreme, Ashirwad
	RCC Pipes	As per IS
25.	Sluice Gate	Voltas, Emco, KCP, Jash, Yeshwant, IVC, Durga, Adroit
26.	Valves: Butterfly, Non-	Audco, BDK, Crane Process Control, Fouress,

	Return, Knife Gate, Gate, Ball, Globe, Diaphragm, Plug, check/ globe	Intervalve, IVC, Jash, Kirloskar, Vaas, H Sarker
27.	MCC	Interlec, Positronocs, Jay Switchgear, Chavare Engineering, L&T, Siemens, ABB, Schneider, Crompton, Spark Electro, PREMIER
28.	Switch gear	Siemens
29.	Variable Frequency Drive (VFDs)	ABB, Nord, Mitsubishi
30.	PLC	Allen Bradley, Mitsubishi, GE, Siemens, Messung, Honeywell, Schneider, ABB
31.	SCADA	Allen Bradley, Ellipse, Wonderware
32.	Pressure Gauges	H.Guru, Gluck, Baumer, H-Guru
33.	Level Switches, Level Transmitters	Levcon, Revathi, Fitzer. S.B. Electro-Mechanical, Endress & Hauser, P&F, Fisher Rosemount, Forbes Marshall, Aster
34.	PH / ORP Meters, Flow Meters, conductivity meter, silica analyser etc.	Endress & Hauser, Fisher Rosemount, Forbes Marshall, Yokogawa, EURECA, EnH, FM, orion
35.	TOC, Turbidity & other Analysers	Hach, ABB, GE, Yukogawa, Fisher Rosemount, Forbes Marshall
36.	Ozonator	KAUFMANN/ SEWEC / ORAIPL/ TOSHIBA / MITSUBISHI
37.	BOD, COD Analyzer	Krohne Marshall or Equivalent Manufacturers
38.	Cable	polycab

If these makes are not available then equivalent makes shall be used after due approval of engineer in charge.

D. TECHNICAL SCHEDULES

The schedule formats given on following pages for technical details of the bidders are to be necessarily filled in by the bidders. Bidder must fill these schedules.

However, the bidder, should feel that the formats or items are not sufficient to cover all types of plant, machinery, automation system etc. that are to be provided by him. The bidder is free to provide additional formats for the other items. Those formats must provide all technical details of items supplied, to enable the employer to scrutinize the adequacy or functionality of these items in the plan. However, no financial data or cost is to be indicated in the Technical Proposal as the same are to be indicated in a separate financial proposal.