वाप्कोस लिमिटेड
WAPCOS LIMITED
(भारत सरकार का उपक्रम)
जल संसाधन, नदी विकास व गंगा संरक्षण मंत्रालय
(A Government of India Undertaking)
Ministry of Water Resources, River Development & Ganga Rejuvenation

ISO 9001: 2008
- Consultancy Services
- Engineering, Procurement & Construction (EPC)

NIT No.: WAP/ENVT/H-3082/CSEZ/2019-20/6; Dated 12th June 2019

NOTICE INVITING TENDER (NIT)

for

SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF BIOLOGICAL PLANT, MEMBRANE BIO REACTOR (MBR), REVERSE OSMOSIS PLANT (RO) AND ACCESSORIES FOR 1 MLD ZERO LIQUID DISCHARGE (ZLD) PLANT AT COCHIN SPECIAL ECONOMIC ZONE

WAPCOS Limited
(A Government of India Undertaking)
Project Office, Cochin Special Economic Zone,
CSEZ Administrative Building,
Kakkanad, Cochin – 682 037
Telephone: 0484-2413544
E-mail: cochincsez@wapcos.co.in

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NOTICE INVITING TENDER

NOTICE INVITING TENDER

NIT No.: WAP/ENVT/H-3082/CSEZ/2019-20/6; Dt. 12.06.2019

Cochin Special Economic Zone Authority (CSEZA), under the Ministry of Commerce and Industry, Government of India has appointed WAPCOS Limited, as ***'Owner's Engineer'***. WAPCOS Limited, on behalf of Chairman, CSEZA invites **Online Electronic Tenders on item rate mode** from experienced and competent bidders, meeting the prescribed qualifying criteria as mentioned in tender document.

1.	Name of Work:	:	Supply, Installation, Testing and Commissioning of Biological Plant, Membrane Bio Reactor (MBR), Reverse Osmosis Plant (RO) and accessories for 1 MLD Zero Liquid Discharge (ZLD) Plant at Cochin Special Economic Zone
2.	Location	:	Cochin Special Economic Zone (CSEZ), Kakkanad, Kerala
3.	Website for viewing tender/ Corrigendum/ Addendum	:	www.csezauthority.in, www.wapcos.gov.in
	Website for Procurement/ downloading and uploading tender document/ Corrigendum/ Addendum		https://www.mstcecommerce.com/eprochome/
4.	Estimated Cost of Work	:	Rs. 10,00,00,000/-
5.	Tender submission fee	:	Rs.10,000/-, in the form of Demand Draft in favour of WAPCOS Limited payable at Cochin.
6.	Amount of Earnest Money Deposit	:	Rs.1,00,000/-, in the form of Demand Draft (D.D) in favor of 'WAPCOS Limited' payable at Cochin.
7.	Project Completion Period	:	150 days from the Date of Award
8.	Validity of Bid/Tender	:	90 Days
9.	Last date & time of Procurement / download of tender Document	:	05.07.2019 upto 11:00 hours The bidder must officially procure/download the tender documents from the MSTC portal of WAPCOS before the last date and time of sale of tender document in order to bid.
10.	Pre Bid Meeting	:	25.06.2019; 15:00 hours; In the office of The General Manager (SEZ), WAPCOS Limited, Cochin Special Economic Zone Project Office, CSEZ Administrative Building, Kakkanad, Cochin – 682 037
11.	Last date & time for online submission of	:	05.07.2019 up to 15:00 hours

	Technical & Financial Bid.		
12.	Offline Submission of Tender Fees, EMD etc. as detail in Tender	:	05.07.2019 up to 15:00 hours in the office of The General Manager (SEZ), WAPCOS Limited, Cochin Special Economic Zone Project Office, CSEZ Administrative Building, Kakkanad, Cochin – 682 037
13.	opening of Technical Bid	:	05.07.2019; 15:30 hours
14.	WAPCOS Contact information	:	General Manager, WAPCOS Limited, Cochin Special Economic Zone Project Office, CSEZ Administrative Building, Kakkanad, Cochin – 682 037; Telephone: 0484-2413544; E-mail: cochincsez@wapcos.co.in
Exemption in EMD & Tender Fee for Micro & Small Enterprises registered with NSIC/MSME:			
The micro and small enterprises registered with the NSIC/MSME are exempted from the submission of EMD/ Bid security deposit on production of requisite proof in the form of valid certification from NSIC/MSME for the tendered item/services. Micro and small enterprises having Udyog Aadhaar Memorandum are also entitled for the above exemption for which submission of valid memorandum certificate is must.			
If the office of WAPCOS Limited, Cochin SEZ happens to be closed on the last date and time mentioned for any of the event, the said event will take place on the next working day at the same time and venue			

The tender document has to be downloaded from above specified websites. Bidders are advised to visit above specified websites regularly for updates /Amendments/ Corrigendum, if any. The dates/Corrigendum/Addendum shall be followed up to submission of tender and it will be the part of tender. The full details about the work, specifications, Drawings, terms and conditions shall be available in the Tender Document. The tender document has to be submitted online on website https://www.mstcecommerce.com/eprochome/wapcos

The purpose of this NIT is to provide interested parties with information to assist the preparation of their bid. While WAPCOS Limited has taken due care in the preparation of the information contained herein, and believe it to be complete and accurate, neither it nor any of its authorities or agencies nor any of its respective officers, employees, agents or advisors give any warranty or make any representations, expressed or implied as to the completeness or accuracy of the information contained in this document or any information which may be provided in association with it.

Further, WAPCOS Limited does not claim that the information is exhaustive. Respondents to this NIT are required to make their own inquiries/ surveys and will be required to confirm, in writing, that they have done so and they did not rely solely on the information in NIT. WAPCOS Limited is not responsible if no due diligence is performed by the bidders.

IMPORTANT POINTS

i. The bidder should be an Indian Registered Company under Companies Act 1956/ Proprietorship Company/ Partnership Company. Joint venture with Indian or foreign companies are allowed.

ii. All Bidders are hereby cautioned that Bids containing any deviation or reservation as described in Clauses of "Instructions to Bidders" shall be considered as non-responsive and shall be summarily rejected.

iii. WAPCOS Ltd. reserves the right to accept or reject any or all bids without assigning any reasons. No Bidder shall have any cause of action or claim against WAPCOS/CSEZA for rejection of his Bid and will not be bound to accept the lowest or any other tender.

iv. No reimbursement of cost of any type or on any account will be paid to persons or entities submitting their Bid.

v. All information submitted in response to this NIT shall be the property of WAPCOS Limited and it shall be free to use the concept of the same at its will.

vi. It is hereby declared that WAPCOS is committed to follow the principle of transparency, equity and competitiveness in public procurement. The subject Notice Inviting Tender (NIT) is an invitation to offer made on the condition that the Bidder will sign the integrity Agreement, which is an integral part of tender/bid documents, failing which the tenderer/bidder will stand disqualified from the tendering process and the bid of the bidder would be summarily rejected. This declaration shall form part and parcel of the Integrity Agreement and signing of the same shall be deemed as acceptance and signing of the Integrity Agreement on behalf of the WAPCOS.

For and on behalf of WAPCOS LIMITED

(Sd/-)
General Manager,
WAPCOS Limited,
CSEZ Project Office

VOLUME – I

TECHNICAL BID

SECTION – I

INSTRUCTIONS TO BIDDERS

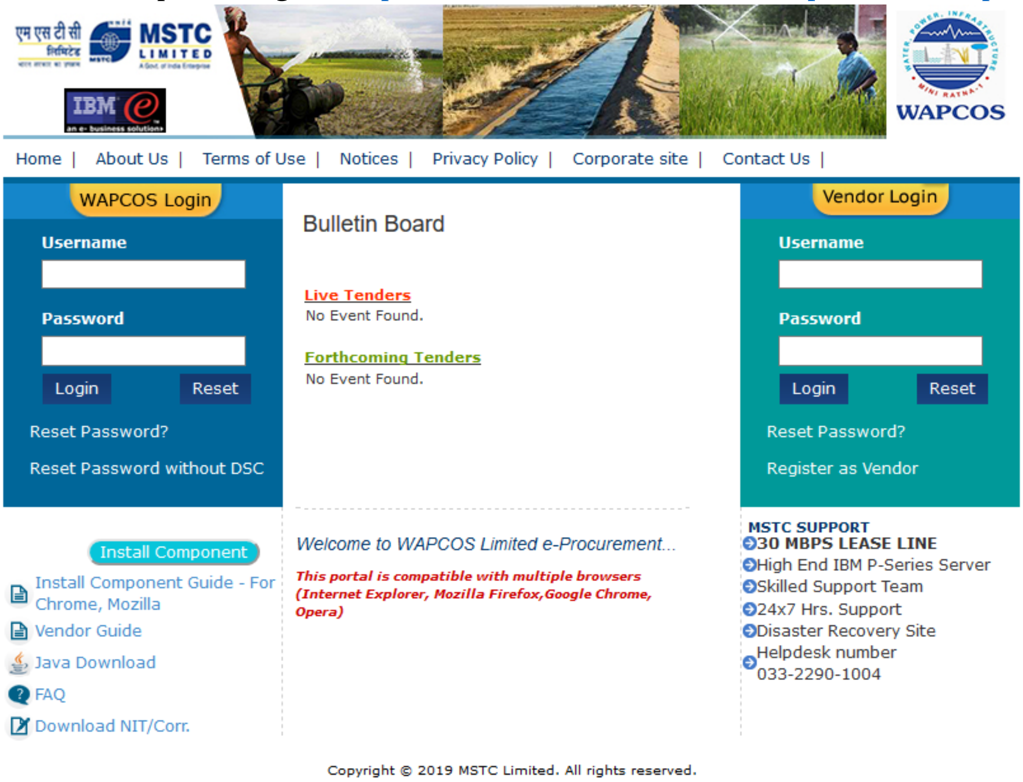
SECTION– I
INSTRUCTIONS TO BIDDER

1.0 SPECIAL INSTRUCTIONS TO BIDDERS FOR E-TENDERING

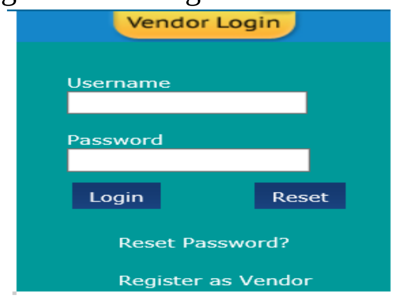
Submission of Online Bids is mandatory for this Tender. For conducting electronic tendering, bidders shall use the portal https://www.mstcecommerce.com/eprochome/wapcos/buyer_login.jsp.

Bidder's guide for WAPCOS portal

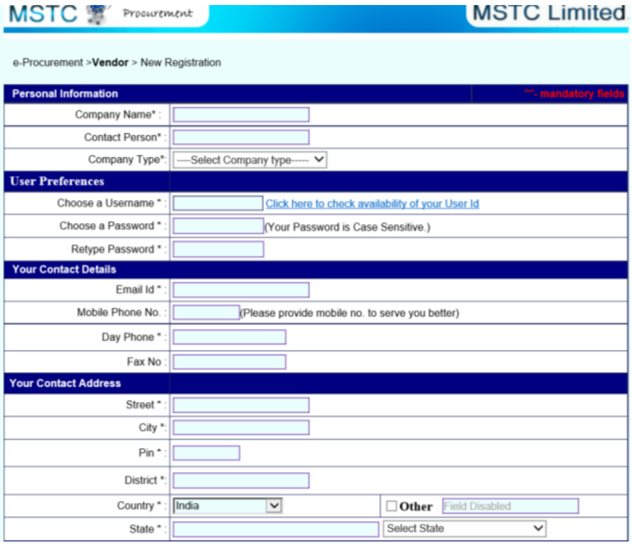
1. Use Internet Explorer to go to https://www.mstcecommerce.com/eprochome/wapcos



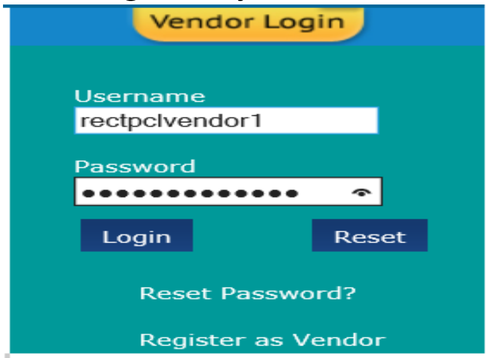
2. On the right side of the page click on Register as a Vendor:



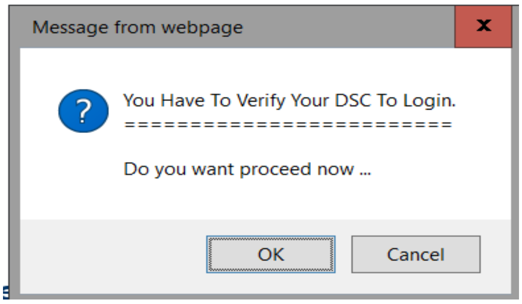
3. Fill the form that appears to create username and password.



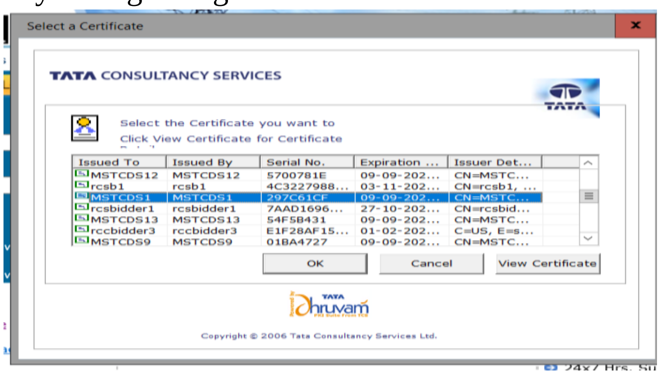
4. Once the registration is done, login with your user name and password:



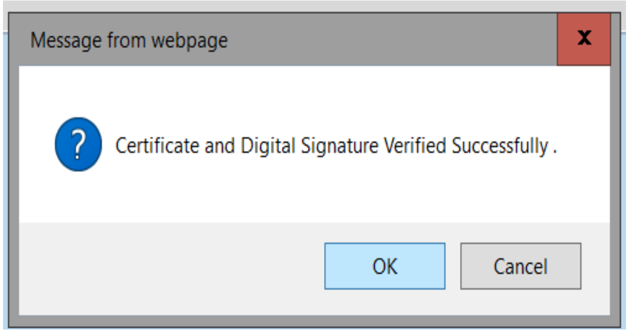
5. System will ask you to verify your digital signature



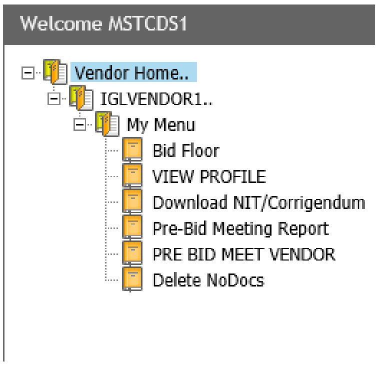
6. Press Ok and select your digital signature from the List:



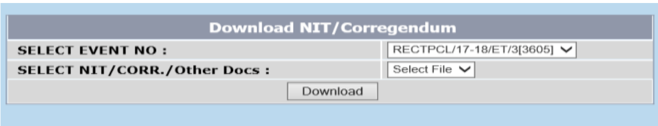
7. Your digital signature will be verified



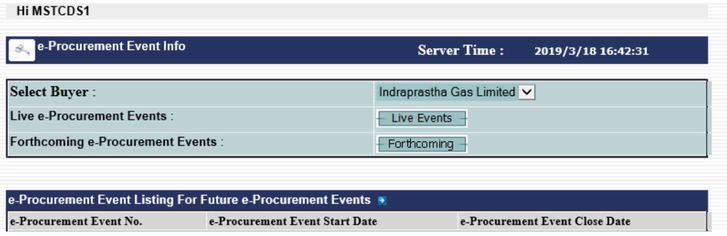
8. Once login is complete, a bidder can access My Menu through the left side of the page:



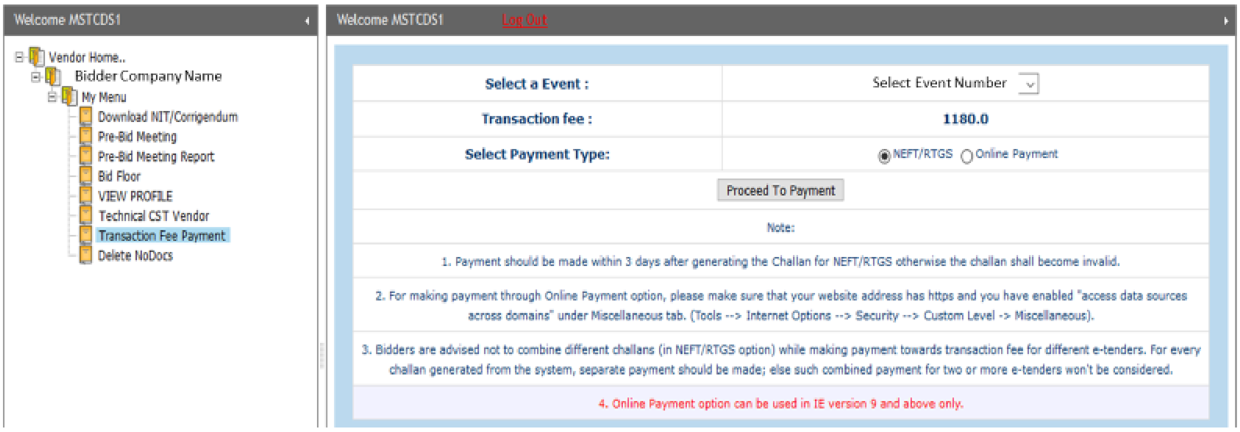
9. Here click on Download NIT/Corrigendum button to download the NIT/Corrigendums. Select Event number and click on download to download the files:



10. To submit the bid a bidder can proceed to Bid Floor through the left side My menu. In Bid Floor click on live events to view a list of Live events. In live events select the tender number where you wish to submit a bid.



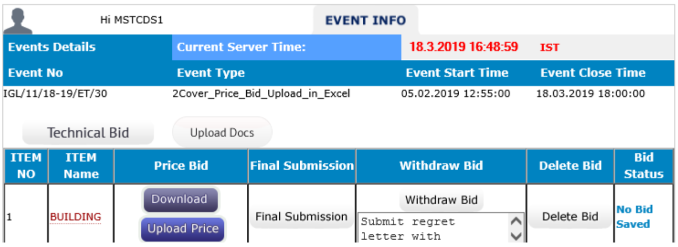
11. On clicking the event number, if the bidder has not paid transaction fee, system will prompt them to pay the transaction fee. They can pay the transaction fee by going to Transaction Fee payment link in their login, and pay the same through online payment (debit card, credit card, net banking etc) or RTGS/NEFT (Challan).



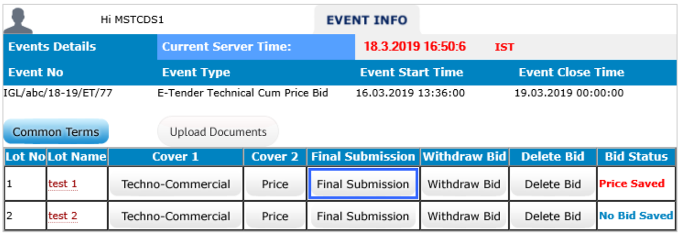
12. Tender can be of multiple types with price bid uploading in Excel or Technical-Price type. The bid floor for each type of event will change automatically.

    On clicking the tender number one of the following screens will appear:

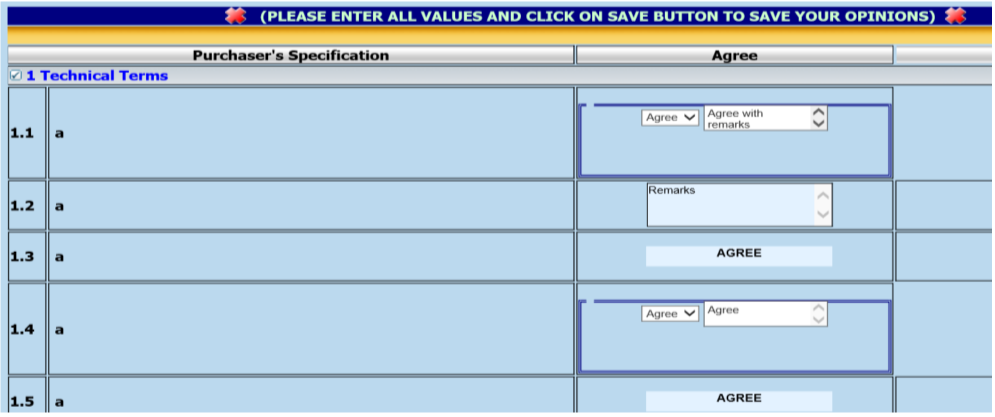
    For 2 cover with price bid in excel



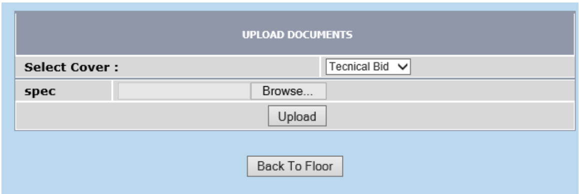
    E-Tender Technical Cum Price Bid



13. For each type of event the event details including start time and close time the details will be given on the top of the page.
14. To submit the tender, the bidder has to start from top left and submit the details one by one.
15. For 2 cover with price bid in excel, the bidder has to submit technical bid, by filling the details and clicking the save button.



a) After the technical bid is saved, a bidder can proceed to uploading documents through the link upload docs:

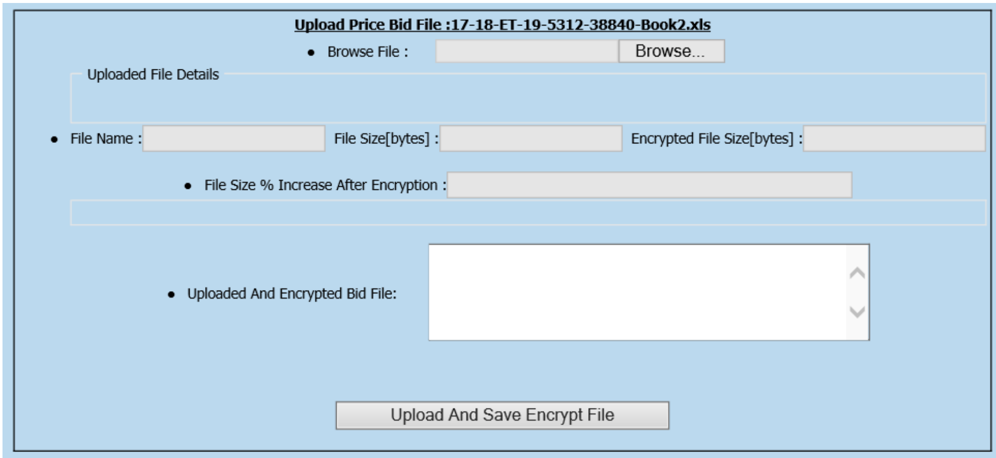


b) Please note that under no circumstance the price bid excel has to be uploaded here.

c) After the documents have been uploaded, the bidder can click on download excel to download the excel format.

d) Fill up the excel sheet as per the details given therein and tender document.

e) To upload the filled up excel click on Upload Price Button, click on browse to select the file and then click on Upload and Save encrypt file.



f) The bidder can then click on final submit to finally submit the bid. In case of any amendments after final submit, click on delete bid button to delete the techno-commercial and price bids and resubmit the same. Please note that at the end the bid must be final submit, otherwise the same will not be considered.

16. For E-Tender Technical Cum Price Bid:

   a. In the manner similar to above the bidder has to fill up Common terms, then press save button to submit.

   b. Then the bidder has to upload documents as per the list shown therein.

c. Once the documents are uploaded the bidder has to submit the Technical and Price bids.
d. The bidder can then click on final submit to finally submit the bid. In case of any amendments after final submit, click on delete bid button to delete the techno-commercial and price bids and resubmit the same. **Please note that at the end the bid must be final submit, otherwise the same will not be considered.**

Bidder's may note that in each case using the Delete bid button will only delete the bids and then the bidder can resubmit upload tender closing time.

Using the withdraw button the bid will be withdrawn and the bidder will not be allowed to submit any further bid in that event.

For any assistance regarding the Tender Document and/or term and conditions the bidders may contact at WAPCOS Limited, CSEZ Project Office: Phone Number: 0484-2413544; Email: cochincsez@wapcos.co.in

For any assistance during bid submission, system settings etc. bidders may contact at MSTC:

Phone Number

03322901004, 01123212357, 01123215163, 01123217850

Email

mstcnro@mstcindia.co.in

Please mention "Helpdesk" as subject while sending emails

Availability

10 AM to 5:30 PM on all working days.

2.0 INSTRUCTIONS TO BIDDER

The purpose of these instructions to serve as a guide to Bidders for preparing offer for carrying out the project in all respect.

a. Submission of a tender by a tenderer implies that the tenderer has read this notice and all other Tender Documents and has made himself aware of the scope, the specifications, conditions of contract, local conditions and other factors having bearings on the execution of the work.

b. WAPCOS Limited desires that the bidders, suppliers, and Sub-contractors under the Project, observe the highest standard of ethics during the performance, procurement and execution of such contracts. In pursuance of this requirement, WAPCOS Limited:

Defines, for the purposes of this provision, the terms set forth below:

i. “Corrupt Practice” means the offering, giving, receiving, or soliciting, directly or indirectly, anything of value to influence improperly the actions of another party;

ii. “Fraudulent Practice” means any act of submission of forged documentation, or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation, or to succeed in a competitive bidding process;

iii. “Coercive Practice” means impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;

iv. “Collusive Practice” means an arrangement between two or more parties designed to achieve an improper purpose, including influencing improperly the actions of another party.

Will reject the award of Contract, even at a later stage, if it determines that the bidder recommended/ selected for award/awarded has, directly or through an agent, engaged in Corrupt, Fraudulent, Collusive, Or Coercive Practices incompetent for the Contract;

Will sanction a party or its successors, including declaring ineligible, either indefinitely or for a stated period of time, to participate in any further bidding/procurement proceedings under the Project, if it at any time determines that the party has, directly or through an agent, engaged in Corrupt, Fraudulent, Collusive, Or Coercive Practices in competing for, or in executing, the contract; and

The party may be required to sign an Integrity Pact, if required; and WAPCOS Limited will have the right to require the bidders, or its suppliers, contractors and consultants to permit WAPCOS Limited to inspect their accounts and records and other documents relating to the bid submission and contract performance and to have them audited by auditors appointed by WAPCOS Limited at the cost of the bidders.

The Bidder must obtain for himself on his own responsibility and at his own expenses all the information which may be necessary for the purpose of making a bid and for entering into a contract, must examine the Drawings, must inspect the sites of the work, acquaint himself with all local conditions, means of access to the work, nature of the work and all matters pertaining thereto. WAPCOS Limited will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

c. The Contract shall be governed by each SECTION OF TENDER DOCUMENT i.e. instructions to bidders, selection & qualifying criteria, scope of works, General Conditions for Contract (GCC), Special Conditions for Contract (SCC), Annexures, Forms, Drawings, Technical Specification, Addendum / Clarification / Corrigendum etc. and all other Conditions mentioned in the tender documents.

d. All Bidders are hereby explicitly informed that conditional offers or offers with deviations from the Conditions of Contract, the bids not meeting the minimum eligibility criteria, Technical Bids not accompanied with EMD and Tender Document Fees of requisite amount in acceptable format, Bids in altered/modified formats, or in deviation with any other requirements stipulated in the tender documents are liable to be rejected.

e. The bidders shall not tamper or modify any part of the tender documents in any manner. In case in part of the bid is found to be tampered or modified at any stage, the bids are liable to be rejected, the contract is liable to be terminated and the full earnest deposit/retention money/performance guarantee will be forfeited and the bidder will be liable to be banned from doing any business with WAPCOS Limited.

f. Incomplete Price bid shall be liable to be rejected, at the discretion of WAPCOS Limited. The total bid price shall cover the entire scope of works covered in the tender.

3.0 EARNEST MONEY DEPOSIT (EMD)

The Earnest Money Deposit **as mentioned in NIT and shall be submitted** in physical form in favour of WAPCOS Ltd payable at Cochin.

The earnest money may be accepted only in the following forms:

Demand Draft of a Scheduled Bank.

The EMD of unsuccessful tenderer(s) except lowest three will be refunded after finalization of tender process. The Earnest Money deposit submitted by the successful tenderer shall be retained by WAPCOS Limited until the Performance Bank Guarantee (PBG) is submitted. The successful Tenderer shall accept the LOI within 15days days from receipt of the same, failing which the EMD shall be forfeited and the award of work may be liable to be cancelled.

If any tenderer withdraws or make any changes in his offer already submitted before the expiry of the above validity period or any extension thereof without the written consent of the company, the EMD amount will be forfeited for such act of the tenderer.
WAPCOS Limited reserves the right of forfeiture of Earnest Money deposit (EMD) in case of the successful tenderer.

ii. After opening of Tender, revokes his tender within the validity period or increases his earlier quoted rates.

iii. Does not commence the work within the period as per LOI/Contract. In case the LOI/Contract is silent in this regard then within 15 days after award of contract.

iv. EMD shall not carry any interest.

4.0 COST OF BIDDING

The Bidder shall bear all costs associated with the preparation and submission of the Bid as well as costs associated for facilitating the evaluation. WAPCOS Limited shall in no case be responsible or liable for these costs, regardless of the conduct or outcome of the bidding process.

5.0 LANGUAGE OF BID

The Bid and all related correspondence and documents relating to the Project shall be in English language only. Supporting documents and printed literature furnished by the

Bidder may be in another language provided they are accompanied by an accurate English translation which shall be certified by a qualified translator. Any material that is submitted in a language other than English and which is not accompanied by an accurate English translation will not be considered.

6.0 CURRENCY OF BID

Bid prices shall be quoted in Indian Rupees.
Tender submitted by tenderer shall remain valid for acceptance as mentioned in NIT from the date set for submission of the tender. The tenderer shall not be entitled within the said period to revoke or cancel or vary the tender given or any item thereof, without the consent of WAPCOS Limited. In case tenderer revokes, cancels, or varies his tender in any manner without the consent of WAPCOS Limited, within this period, his earnest money will be forfeited.

7.0 ANNEXURES

The Bidder follow the guidelines as per "**Section of Annexures"** mentioned in tender document.

WAPCOS Limited reserves the right to reject any or all the bids or to cancel the Tender, without assigning any reason(s) whatsoever.

For and on behalf of WAPCOS LIMITED

(Sd/-)
General Manager,
WAPCOS Limited,
CSEZ Project Office

SECTION – II

SELECTION AND QUALIFYING CRITERIA

SECTION– II
SELECTION AND QUALIFYING CRITERIA

1.0 SITE VISIT

Intending Bidder(s) have to visit site to inspect and examine the site at his own cost and its surroundings and satisfy themselves before submitting their bids as to the nature of the ground and sub-soil (so far as is practicable), the form and nature of the site, the means of access to the site, the accommodation they may require and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their bid. A bidder(s) shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charge consequent on any misunderstanding or otherwise shall be allowed. The bidder(s) shall be responsible for arranging and maintaining at his own cost all materials, tools & plants, water, electricity access, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a bid by a bidder(s) implies that he has read this notice and all other contract documents and has made himself aware of the scope and specifications of the work to be done and of conditions and rates at which stores, tools and plant, etc. will be issued to him by the Government and local conditions and other factors having a bearing on the execution of the work.

The site visit can be done to understand the actual scope of work/ site condition and can be held on any working days within the last date of submission mentioned in NIT of this tender in the presence of WAPCOS representative.

2.0 QUALIFYING CRITERIA: ONLINE TECHNICAL BID SUBMISSION

The intending bidders must read the terms & conditions of tender documents carefully. He should only submit his technical bid if he considers himself eligible and he is in possession of all the documents required.

The Technical Bid shall be submitted **of following documents, all the documents must be Serial wise as stated below along with check list .**

The Technical Bid shall be uploaded **with *coloured scanned* copies of following documents. All the documents must be Serial wise as stated below along with check list**

Format of Check List				
Sl. No.	**Particular of Document**	**Yes**	**No**	**Page Nos (from-to)**
a)	Original Authorization Letter to sign the Tender.			
b)	Scanned copy of Demand Draft for EMD.			
c)	Scanned copy of Demand Draft for Tender Fee.			
d)	Letter of Transmittal on bidder letter Head to submit Technical Bid.			

<table>
<tr><td>e)</td><td>Yearly sales Turnover and Audited Balance Sheet for Last 3 (three) years ending on the financial year 2017-18. (Form-A)</td><td></td><td></td><td></td></tr>
<tr><td></td><td>• The contractor should not have incurred any loss (profit after tax should be positive) in more than two years during last five years ending 2017-18 duly audited by the Chartered Accountant.</td><td></td><td></td><td></td></tr>
<tr><td></td><td>• Turnover: Average annual financial turnover should be at least 30% of the estimated cost of work during the immediate last 3 consecutive financial years ending 2017-18. This should be duly audited by the Chartered Accountant.</td><td></td><td></td><td></td></tr>
<tr><td></td><td>• Full Balance Sheet and Profit & loss Statement of Bidder should be verified by Independent Chartered Accountant.</td><td></td><td></td><td></td></tr>
<tr><td>f</td><td>• The bidder/JV/Consortium must have jointly or separately constructed/ implemented successfully in India as mentioned below during the last Seven years ending previous day of last date of submission of tender.
i) One similar work including Supply Installation and Commissioning Biological Treatment, MBR and RO, not less than 1 MLD for ETP.

Or
ii) Two similar works including Supply Installation and Commissioning Biological Treatment, MBR and RO, not less than 0.8 MLD for ETP.
Or
iii) Three similar works including Supply Installation and Commissioning Biological Treatment, MBR and RO, not less than 0.6 MLD for ETP.</td><td></td><td></td><td></td></tr>
<tr><td colspan="5">“Similar work” refers work involving supply, installation and commissioning of Effluent Treatment plant with Biological Treatment, MBR and RO plant.

Details of similar type of work executed should have the following:
i. Copy of completion Certificate indicating date of completion
ii. LOI(s)/ W.O(s) from respective Owner(s)/ Client(s) mentioning name and nature of work and value of work</td></tr>
<tr><td>g)</td><td>The bidder should not be insolvent, in receivership, bankrupt or being wound up, not have had their business activities suspended. Accordingly, Bidder shall submit Solvency certificate with details of Financial Status i.e. Name of the Banker & Current Solvency Certificate not older than 3 months from the Banker in original or copy (attested from bank) for a sum of at least 30 % of the estimated cost of work. (Form-B)</td><td></td><td></td><td></td></tr>
<tr><td>h)</td><td>Name, Address, details of the Organization, Name(s) of the Owner/Partners/Promoters and Directors of the firm / company. (Form-C)</td><td></td><td></td><td></td></tr>
<tr><td>i)</td><td>Copy of P.F and PAN Number.</td><td></td><td></td><td></td></tr>
</table>

j)	Goods and Service Tax (GST): Bidders are advised to get themselves registered for GST in at different place, which are mandatory, as per Govt. of India notification regarding GST. Accordingly bidder shall submit relevant documents if already registered. If not registered till date of submission of bid, bidder will give undertaking on bidder letter head stating that they will get registered in GST as per Govt. norms before submission of bills.			
k)	Letter of Undertaking (LUT): Bidders are advised to execute LUT and should be able to supply goods and services at zero rate through LUT. The SEZ Developers/units, its agencies appointed by them have been exempted from Payment of Customs Duty for goods or services imported into SEZ for its authorised operations in terms of Section 26 of SEZ Act, 2005. As per 16(1) of Chapter VII of IGST Act, all supplies of goods or services or both to SEZ Developer and Units are zero rated. Accordingly bidder shall submit LUT if already registered. If not registered till date of submission of bid, bidder shall give undertaking on bidder letter head stating that they will get registered before submission of bills. For the purpose of availing this exemption, billing address should be taken as "WAPCOS ACCOUNT CSEZA".			
l)	The bidder should be an Indian Registered Company under Companies Act 1956/ Proprietorship Company/ Partnership Company/ Limited company private or public or corporation. Copy of Certificate of Incorporation/ Registration/ Partnership Deed or any other relevant document, as applicable, should be submitted along with a copy of address proof. Or JV or consotrtium members will comprise of two members who would bid as a single entity to qualify technically for the bid & in which there would be a lead bidder who would take the entire responsibility of the contract & would be submitting the financial securities to the owner from his side. All the technical & financial guarantees would be applicable to the main bidder only & in case of breach of contract , the securities & the financial guarantees of the lead bidder will be fortified. Hence The financial PQ will be applicable to the lead bidder only & not the individual JV partners or consortium members.			
m)	Bidder should not be blacklisted/ debarred by any government/ semi government department/ PSU. **Bidder should submit the declaration (Form-D) of not being ineligible for corrupt or fraudulent practices**			
n)	Letter of understanding the project site on bidder letter Head **(Form-E).**			
o)	'No Deviation Certificate' in prescribed format in Bidder's Letter Head **(Form-F).**			
p)	Consent Letter to execute the Integrity Pact **(Form-G).**			

q)	Bidder shall submit Information on litigation history, liquidated damages, disqualification etc. in bidder Letter Head.			
r)	Each page of the all Volume of Tender document & Addendum/Corrigendum shall be Digitally signed (use scanned signature) by the bidders submitting the Tender in token of his/their having acquainted himself/ themselves and accepted the entire tender documents including various conditions of contract. Any Bid with any of the Documents not so signed is liable to be rejected at the discretion of WAPCOS Limited.			

No information relating to financial terms of services should be included in the technical bid. Bids are to be submitted to determine that the bidder has a full comprehension of the tendered work. Where a bidder technical submittal is found non - compliant with the requirement or work, it may be rejected. This process is to assure that only technical acceptable bids are considered for the tendered work.

3.0 OFFLINE SUBMISSIONS OF DOCUMENTS

The Bidder shall submit following Document offline also.

Originals EMD and Tender submission fee in the form of Demand Draft in separate sealed envelope clearly labelled as "EMD AND TENDER FEE" for the Work (Write Name of Work/Project as mentioned in NIT) along with Details of Bidders Address, Phone, E-mail on Envelope.

NOTE: The offline submissions as mentioned above shall be submitted on WAPCOS address mentioned in NIT as per date & time mentioned in NIT otherwise bids will be rejected.

4.0 CONTENTS OF FINANCIAL BID

The Financial Bid should be uploaded separately along with Technical bid before last date & time of submission of Tender Document.

It is mandatory to bidders to execute LUT and supply the goods and services at zero rated GST.

The company shall be performing all its duties of deduction of TDS and other deduction on payment made to the contractor as per applicable legislation.

The tenderer shall quote rates up to zero decimal and as well as in words. In case of any discrepancy lowest rate quoted shall prevail.

The payment will be made for actual measurements certified by Engineer in Charge at the accepted rates in the price schedule (BoQ).

4.1 Terms of Payment:

- 10% of the cost against submission of bank guarantee of equivalent amount valid upto date of commissioning
- 10% on submission and approval of detailed engineering including layout, GA, P&ID, HFD, PFD etc.
- 60% on delivery of materials/equipments at site and mobilization of team at site after certification of the original bill by the concerned officials.
- 20% on installation, testing, commissioning and submission of performance Bank Guarantee of equivalent amount valid for 2 years from the end of trial run.

5.0 OPENING OF FINANCIAL BID

The financial bids of the technically qualified bidders shall be opened as mentioned in NIT.

The company reserves the right to waive minor deviations if they do not materially affect the capability of the Tenderer to perform the contract.

For and on behalf of WAPCOS LIMITED

(Sd/-)
General Manager,
WAPCOS Limited,
CSEZ Project Office

SECTION III

SCOPE OF THE WORK AND TECHNICAL SPECIFICATIONS

SECTION III

SCOPE OF THE WORK AND TECHNICAL SPECIFICATIONS

1.0 GENERAL

Cochin SEZ is a Special Economic Zone in Cochin, in the State of Kerala in southwest India, set up for export- oriented ventures. The Special Economic Zone is a foreign territory within India with special rules for facilitating foreign direct investment. The Zone is run directly by the Government of India. Cochin SEZ is a multi-product Zone. Cochin is strategically located. It is in southwest India, just 11 nautical miles off the international sea route from Europe to the Pacific Rim. Cochin is being developed by the Dubai Ports International as a container transshipment terminal with direct sailings to important markets of the world, which could position it as Hub for South Asia. CSEZ is a multi-product zone, of 136 different industrial units at CSEZ which mainly includes Information Technology Support, Agro & Food Processing, Textile &Garments, Plastic & Rubber, and Ceramics etc.
The proposed 1.0 MLD ZLD comprises of Collection and Conveyance system, Reverse Osmosis system (RO) and Reject Management system. The recovered products like recovered water with very low salinity permeate from RO, condensate from evaporator system, and Glauber's salt ($Na_2SO_4.10H_2O$) from the adiabatic chiller are proposed to be supplied/returned back to its associated member units for reuse in their process.

2.0 SCOPE OF THE WORK

The scope of the work of this assignment includes the Supply, Installation, Testing And Commissioning of Biological Plant, Membrane Bio Reactor, Softener, Degaser, Reverse Osmosis RO (III Stage), Saturator, Ultrafiltration, Ro IV and Accessories for treatment of 1000 KLD of industrial effluent **as per the drawings given in the NIT.**

As part of the project, the Industrial Effluent Generated from various industries shall be collected directly to One Equalization tank. Then same shall be treated in Biological tank and to Membrane Bio Reactor (MBR). This will help to reduce the use of chemicals. After that, the water will pass through various stages RO. The RO Recovery should be 95% of the effluent.

Screen → Equilization Tank → Biological Tank → Membrane Bio Reactor → Softener Degaser → RO (3 Stage) → Saturator → Ultra Filtration → RO-IV

The capacity of the various units should be as follows:

S No	Item	Capacity (KLD)
1.	Biological System	1000
2.	Membrane Bio Reactor (MBR)	1000
3.	Softner	1000
4.	Degaser	1000
5.	3 Stage RO	1000
6.	Staurator	60
7.	Ultrafiltration	60
8.	RO IV	60

After the treatment the system has to provide the quality as per the table given below at each stages of treatment:

Parameters Unit		**Inlet Water**	**Bio + MBR out**	**SF Out**	**Degaser Out, RO Inlet**	**RO Permeate**	**RO reject**	**Saturator Out**	**RO IV Permeate**	**RO reject IV**
Daily flow rate	m^3/day	1000	1000	1000	1000	940	60	60	27	33
COD	ppm	2000	200-250	200-250	200-250	0	3500-4000	1500-2000	0,00	3000-3500
BOD_5	ppm	1200	05-15	05-15	05-15	0	150 - 180	70-100	0,00	150-300
TDS	ppm	4617	4800-4500	5000-5300	4500-5000	40 - 70	69070 - 69100	68120 - 68150	1080 - 1110	122970 - 123000
pH	0	11	5.5-6	5.5-6	5.5-6	5.5-6	5.5-6	5.5-7	5.5-6	5.5-6
Temperature	°C	50	35-35	35-38	35-38	35-38	35-38	35-38	35-38	30 - 45
Colour	Pt/Co	3000	1300-1600	1300-1600	1300-1600	0,0	24990 - 25010	1000-2000	0,00	2000-4000
TKN	ppm	70	05-10	05-10	05-10	0	60-80	30-50	0	60-90
Phosphorous	ppm	15	03-05	03-05	03-05	0,0	30-50	Oct-25	0,00	25 - 40
Surfactants	ppm	40	01-02	01-02	01-02	0,0	10-20	05-10	0,00	10-25
SS	ppm	300	0-5	0-5	0-5	0,0	25 - 40	25 - 40	0,00	40 - 70
Total Hardness	ppm $CaCO_3$	200	150-250	20 - 30	20 - 30	0-2	250-350	50-80	0,5-5	150-200
Alkalinity	ppm $CaCO_3$	800	750-850	400-500	40 - 70	0 - 10	500-700	100-150	30 - 45	400-500
Na+	ppm	1400	1300-1500	1300-1500	1300-1500	35-55	20000-24,000	21000-25000	500-600	28000-32000
Cl-	ppm	800	750-900	750-900	690 - 710	30-50	11000-14000	12000-15000	600-700	21000-24000
SO_4^{2}-	ppm	1800	1700-1900	1700-1900	1700-1900	20-40	28000-32000	30000-34000	200-300	52000-56000
Iron	ppm	1	0.05-0.1	0.05-0.1	0.05-0.1	0.00	0,5.1	0.2-0.3	0.00	0.4-0.6
Silica	ppm	25	15-20	15-20	15-20	0.5-1	200-250	50 - 80	0 - 15	100-160
Oil and greases	ppm	10	0	0	0	0	0	0	0,00	0
			100%	**100%**	**100%**	**94%**	**6%**	**6%**	**3%**	**3%**

3.0 TECHNICAL SPECIFICATION:

The general scope of work shall include but not limited to the following:

1) The capacity, efficiency and performance of Effluent Treatment Plant (hereinafter called as "entire plant") should be guaranteed as per performance parameters for individual items/guarantees.

2) All the machinery and equipments supplied should be of latest design, fabricated as per IS or equivalent Standards and tested along with material test certificates including bought out items according to technical specifications and as per given Engineering standards (of tender document) for construction material and latest design model.

3) Scope of Supply includes all the necessary equipments, plant & machinery with structural staging, platforms, approach ladders, walkways, sheds, supports of every section, etc., electrical, instrumentation, duly coated with protective paints both internally and externally and insulation as applicable. This also includes other tools & tackles required for the fabrication, erection at site and adequate manpower quite conversant with the fabrication & erection work of such plant and machinery. All foundation bolts, foundation wedges, alignment packings, liners etc. are also included in the scope of supply.

4) After the award of work, the Bidder will prepare all civil foundations, structural and the detailed fabrication drawings and loading data of each and every plant & machinery, piping, electrical cabling, instrumentation, circuit drawing, layout drawing, isometric drawings, equipment layout drawings, elevation drawings for approval from WAPCOS/CSEZA as well as concerned government authorities and shall be submitted well in advance to Employer for prior examination and approval thereof.

5) All the consumables required for erection & commissioning like gas, all types of welding/ brazing or soldering rods, emery papers, grinding paste, hold lights, graphite, Kerosene Oil, Rustburg, back joints, steam packings etc. are also included in the scope of bidder.

6) All types of tools & tackles like hoisting tools, chain blocks, pulleys, wire rope hooks, tube expanders, hydraulic pumps and all special tools etc. shall be arranged by Seller. All staff including engineers, technicians, skilled, unskilled workers, Khalasi required for loading/unloading, fabrication, erection, testing and trials etc. shall be arranged by Bidder. The machinery & other equipments delivered at site should be properly stored at site. The transportation of machinery and equipments from the stored place to their respective position shall also be in the scope of Bidder.

7) The Bidder shall prepare and submit to Employer the time schedule as per PERT/CPM chart. Bidder should ensure that it will maintain the time schedule as per the chart. The equipment delivery shall strictly be in the order of priority as per erection requirements.

8) All materials of construction and fabrication shall be as per relevant ASME/ASA/AISI/ASTM/ANSI/BS/IS Standards and acceptable equivalent standards referred to in the Technical Specifications herein and in the tender document. They should also comply with standard and good engineering practices acceptable to the Employer.

9) The Bidder shall be fully responsible for any mishaps/casualty/fatal accidents of their employees during the contract period of project. WAPCOS/CSEZA shall not be responsible at all for such mishaps whatsoever. The Bidder shall also be fully responsible for any mishaps/casualty/fatal accidents of Employer's employees /machinery during erection and commissioning.

10) The layout for Installation of the entire plant and machinery will be prepared by the Bidder in consultation of Employer and will conform to various statutory requirements and guidelines of various Acts/Statutes/Rules.

11) First filling of lubricants: It shall include oils, grease and oil used for all the equipment, wherever required.

12) All designs with respect to civil, structures, foundations etc. should follow the standard code practice for earth quake resistant designs viz. as per IS 1893.

13) First oil filling of transformers, Insulation, lagging with aluminium cladding wherever

necessary, earthing, lightening arrester, etc.

14) The installation of the items supplied shall be to the satisfaction of the Employer. Installation shall be carried out according to well-established practices.

15) Providing erection tools tackles. Hoists, derricks, slings scaffolding, rigging tools, welding sets, instruments, appliances, consumables etc. required for erection, inspection, testing and commissioning to accomplish the work.

16) Arranging necessary inspection and IBR approval, if applicable to related activities.

17) Stress relieving of weld joints as required.

18) Providing complete supervisory personnel.

19) Ensuring pre-commissioning checks, mass flushing alkali boil out, trial run of all rotating equipment, calibration of instruments, controls etc.

20) Planning, designing, engineering, construction, testing & commissioning of, all mechanical equipment, all electrical & instrumentation equipment for all units and ancillary structures, all piping, valves and specials etc.

21) Submission of as-built drawings after completion.

22) Submission of equipment drawings, technical specifications / catalogues

23) Bidder shall arrange for Pre-shipment inspection at the manufacturers premises of the Electro-mechanical component/items of the RO and in advance prior to dispatch to site of works. All expenses towards such pre-shipment inspection viz. TA & DA, lodging etc. shall be borne by the bidder.

24) Defect Liability Period of shall be for a period of 24 months after trial run and successful commissioning of entire plant. Manufacturing, installation and operational defects shall be covered under the Defect Liability Period.

25) Bidder shall arrange and organize visit of employer’s personnel to functional installation of RO of similar capacity in India as part of the evaluation process. All expenses including TA & DA, accommodation towards the visit shall be borne by the bidder.

26) All the bidders are required to include preliminary engineering drawings such as Layout Plan, Hydraulic Flow Diagram, Piping & Instrumentation (P&I) Diagram in their technical bid along with Process Calculations, Hydraulic Calculations, Pipe Sizing calculations and any other necessary details. For assessment of site conditions and actual topography, bidders are advised to visit site before bidding.

27) The bidder shall also submit technical data sheets for all electrical, mechanical and instrumentation items to the department and obtain approval from the department before procurement of the same from various vendors.

28) All works shall be carried out strictly as per following order of precedence:-

(a) NIT requirements and specifications
(b) CPWD specifications
(c) IS Codes

(d) Manual of Sewerage & Sewage Treatment (CPHEEO)
(e) Manual of Water Supply & Treatment (CPHEEO)

In case of any discrepancy, the decision of Employer shall be final and binding.

29) The bidder shall not disturb/damage or destroy any hedge, tree, building, etc., within the site or his area of operation without the written permission of the Engineer.

30) All clearances / approvals from Pollution Control Board or any other Government Authority shall be the responsibility of the bidder.

31) The selected bidder shall liaison with the civil works contractor during the execution of the civil works and undertake supervision during the execution of civil works in order to ensure full compliance in accordance with the designs and drawings submitted by the bidder.

PART 'A':

PLANT AND MACHINERY

3.1 Biological Plant (1000 KLD):

S No	Functional Descriptions	Specification	Number of Items
1	Channel Rotary Grid	80 mc/h	1
2	Lifting Pump	42 m3/h; 12 l/s; 6m	2
3	Diffusers Primary Storage Tank		70
4	Blower Primary Storage Tank	250 mc/h; 600 mbar	1
5	Motors	2; 50 Hz; 6 KW	1
6	Pump For Biological Feeding	42 m3/h; 12 l/s; 12.5m	2
7	Cooling Tower	45 m^3/h da 50°C a 36°C - T bulboumido 27°C	1
8	Mixer With Ring For Selector		1
9	Flow Maker For Biological		1
10	Kit Mixer		2
11	Diffusers Biological Tank		480
12	Biological Blower	1680 mc/h; 600 mbar	1
13	Biological Blower With Inverter	800-2250 mc/h; 600 mbar	1
14	Motors	poli 2 50 35	1
15	Motor With Inv.	poli 2 50 15/50	1
16	Inverter (Speed Regulator)	55	1
17	Soft Starter	55	1
18	Lift Kit For Pumps (Cricket, Rope ...)		4
19	Lifting Equipment For Pumps (Bases)		7
20	Lifting Equipment For Pumps (Cranes)		1
21	Dosing Pump Hydrochloric Acid 33%		1
22	Tank Hydrochloric Acid 33% +	500	1

S No	Functional Descriptions	Specification	Number of Items
	Scrubber		
23	Tank Acid	10000	1
24	Dosing Pump Antifoam	50	1
25	Dosing Pump Hypochlorite		1
26	Dosing Pump Kit		2
27	Tank Antifoam	1000	1
28	Tank Hypochlorite	5000	1
29	Float Water Level Control		1
30	Pressure Water Level Control		1
40	Pressure Gauge	0-2,5 bar, SS316	1
41	Ph Neutralization		1
42	Instrument Kit		1
43	Float Water Level Control		1
44	Pressure Water Level Control		1
45	E.M. Flow Meter Biolo Feeding	magnetico; DN 80	1
46	Flow Meter Converter		1
47	Pressure Gauge		1
48	Pressure Gauge	0-2,5 bar, SS316 - 80 mm , G.M.3/8"	1
49	Oxygen Meter O2		1
50	Instrumentation Kit		1

3.2 Membrane Bio Reactor (MBR)

1. Dialy flowrate to the MBR unit is around 1000 m^3/day. This MBR unit will be working 22 hours a day. Around 9% of the permeate will be used for backwashing. Hence, the total flowrate to the MBR unit is 1090 m^3/day or 49.5 m^3/h. The number of basins is fixed to 1.
2. MBR Module: The main criteria behind choosing the module is to have an effective filtration flux closer to 20 l/m^2h. The module was chosen to an effective hydraulic flux of 17.8 l/m^2h, Hence, the area of the membrane will be 1394 m^2 each. 2 Number modules will be installed in the single basin, with a total filtration area of 2788 m^2.
3. Feed Pump: Feeding pump will be used to pump 148.6 m^3/h flow into the MBR basin. 2 feeding pumps will be used in which 1 will be used as standby.
4. Suction Pump: The suction pumps will be used to take the permeate from the membrane. 2 Nos. suction pumps will be used in which 1 will used as standby. Pump should have a capacity to supply a flowrateof 83.6 m^3/h
5. Blower: The criteria behind choosing the blower is to have an air flux of 0.45 l/m^2h. 1 No. blower will be used to aerate the 2 modules in alternate mode and another 1 will be in standby. Blower was chosen to supply around 627 Nm^3/h of air.
6. Chemicals: A) Citric acid- Citric acid with 50% concentration will be used. The acid will be supplied at a concentration of 1500 ppm for both maintenance cleaning (MC) and recovery cleaning (RC). 1 No. dosing pump will be used to dose citric acid. The capacity of the pump is about 170 l/h. B) Sodium hypo chlorite (NaOCl): NaOCl

with 12% concentration will be used. It will be supplied at 125 ppm for MC and at 1500 ppm for RC. The capacity of the pumps is respectively 18 and 700 l/h.

S No	**Functional Descriptions**	**Specification**	**Number of Items**
1	MBR Modules		2
2	Beams For Module Support		2
3	Profile For Sludge Recirculation		1
4	Deflector		0,4
5	Pump For Feeding	149 m^3/h; 42 l/s; 1 m	2
6	Pump For Suction	16,728 - 83,64 m^3/h; 1 m	2
7	Inverter For Suction Pump		2
8	Bubble Trap		1
9	Viewer		1
10	Blower	627,3 Nm3/h;10,5 Nm3/min;450 mbar	2
11	Blower Motor		2
12	Soft Starter Blower		2
13	PUMP FOR DRAINING For RC	56 m^3/h; 16 l/s; 10 m	1
14	DOSING PUMP Naclo For MC	17,425 lt/h	1
15	DOSING PUMP Naclo For RC	697 lt/h	1
16	TANK Naclo		1
17	Dosing Pump Citric Acid	167,28 lt/h	2
18	Tank Citric Acid		1
19	E.M. FLOW METER For Feeding		1
20	Flow Meter Converter		1
21	E.M. FLOW METER For Suction		1
22	Flow Meter Converter		1
23	Ph Meter		1
24	Temperature Meter		1
25	Instrument Kit		2
26	Pressure Transmitter		1
27	Pressure Transmitter		1
28	Float Water Level Control		5
29	Pressure Water Level Control		1

3.3 Sludge Dehydration Unit

- Sludge is pumped from a collecting sump to the biological oxidation tank continuously. This sludge provides to keep the bacteria mass well balanced and it makes their regular and intense growth possible, independently of the organic matter content in the water which enters the oxidation tank.
- Excess sludge should be thickened in a storage tank (so called thickener) where a reagent, cationic polyelectrolyte, is dosed to improve the thickening process, before a

further treatment of dewatering and compacting (i.e. filter press, belt type or frame type).

Belt Press

Total daily flowrate = 1000 m^3/d

Number of belt press = 1

Specific production of sludge (at 20% concentration) = 1.5 kg/m^3

Hourly sludge flowrate was used to choose the belt press model. The chosen model has a minimum hourly flowrate of 0.5 m^3/h and maximum of 2.5 m^3/h.

S No	Functional Descriptions	Number of Items
1	BELT PRESS	1
2	PUMP FOR FEEDING	2
3	AUTOMATIC POLYPREPARER	1
4	DOSING PUMP POLY	2
5	PUMP FOR BELT WASHING	2
6	SWITCHBOARD	1
7	FLOAT WATER LEVEL CONTROL	2

3.4 Softener Filter Unit

- One of the most important water quality parameters in industrial applications is the hardness which is the sum of Ca^{2+} and Mg^{2+} ions which are present in the water. In addition to the problem of fouling caused by carbonates, the hardness of water can affect the work processing dramatically, especially the dye works.
- Also it is a needed pre-treatment for the Reverse Osmosis to prevent the membranes from blocking.
- ***Filter* Dimensions:** Number of filters = 1 , Diameter-1.7 m, h$ourly flowrate\ per\ filter$= 49.84 m^3/h, $Resinquantity\ per\ filter$= 3300 L, $Filterbed\ height$= 1.45 m, $Water\ velocity$= 21.96 m/h, $Contact\ time$= 3.96 min

S No	Functional Descriptions	Specification	Number of Items
1	Filter Tank	Ø = 1500 mm - Hcc = 3000 mm; ebnitized iron	1
2	Weak Cationics Resin		2700
3	Pump For Filter Feeding	Q 49 m³/h - 2,5 bar	2
4	Dosing PUMP For Hcl	flow rate 998 l/h	1
5	Kit Dosing Pump		1
6	TANK FOR Hcl		1
7	Scrubber For Acid Tank		1
8	Pressure Gauge	glycerin 0-4 bar - cassainox Ø80 mm - connection g.m. 1/2"	2
9	Pressure Transmitter		2
10	Float Water Level Control		5
11	Pressure Water Level Control		1
12	E.M. FLOW METER For Feeding		1
13	Flow Meter Converter		1
14	FLOW METER FOR Hcl 33%	flow meter in PVC - scale 200 - 1500 lt/h	1

3.5 Degasser Unit

- Degassing is a process which allows carbon dioxide removal that is present in the water. It is obtained by means of a degassed tower realized in polypropylene which uses rashing- type- rings, also realized in polypropylene, as filling material.
- **Degasser Tower Dimensions:** flow passage velocity which should be at around 30 – 40 m/h. $Diameter\ of\ the\ tower$=1.8 m, $Volume\ of\ the\ tower$= =2.5 m^3
- $HCl\ dosage$= 818 ppm
- **Air Flow :** Specific air flow is fixed at 23 m/min. , Air flow necessary for our degasser tower= 1960 m^3/h

S No	Functional Descriptions	Number Of Items
1	Degaser Tank	1
2	Rashing Rings	2,53,125
3	Fan	1
4	Dosing Pump For Hcl	2
5	Ph Meter	1
6	Kit Instrumentation	1

3.6 Reverse Osmosis Unit (III Stage)

The main parameters that determine all the sizing of the RO are the salinity of feeding flow and the Recovery that the designer wants or can achieve.
From here, the designer defines the number of stages, filtration surface, filtration speed and working pressures of the system.
The working values of the RO are the follow:

- Flow rate=50 m^3/h
- Vessel Numbers - I STAGE=10
- Vessel Numbers - II STAGE=3
- Membrane Numbers - I STAGE=50
- Membrane Numbers - II STAGE=15
- Membrane surface - I STAGE=1.811 m^2
- Membrane surface - II STAGE=549 m^2
- Flux - 1S1A =19.5 LMH
- Flux - 1S2A =22.5 LMH
- Flux - 2S1A =20.8 LMH
- Flux - 2S2A =14.2 LMH
- Pressure - 1S1A =11.3 bar
- Pressure - 1S2A =23.9 bar
- Pressure - 2S1A =33.6 bar
- Pressure - 2S2A =40 bar
- Recovery - I STAGE= 74 %
- Recovery - II STAGE= 20 %
- TOTAL RECOVERY = 94.1 %
- Permeate TDS= 120 mg/l
- Reject TDS =66,200 mg/l
- kW/m^3 on feeding flow =1,02 kWh/m^3
- kW/m^3 on permeate flow= 1,08 kWh/m^3

Cleaning in Place

CIP is on demand, and frequency can range from 1- to 6-month intervals.

$CIPtankvolume$ =2 m^3

$Capacityofthepump$=56 m^3/h

S No	Functional Descriptions	Specification	Number of Items
1	Pump For Feeding	50 m³/h- 3 bar	2
2	Pre-Filter Cartridges		15
3	Skid Ro		0,6
4	Pre-Filter Container		1
5	Hp Pump - 1° Stage 1° Array	52 m³/h - 10 bar	1
6	Pressure Vessels		7
7	Vessel Connection Changing		28
8	Vessel Connection Added		14
9	Hp Pump - 1° Stage 2° Array	27 m³/h - 13 bar	1
10	Pressure Vessels		3
11	Vessel Connection Changing		12
12	Vessel Connection Added		6
13	Hp Pump - 2° Stage 1° Array	15 m³/h - 10,5 bar	1
14	Pressure Vessels		2
15	Vessel Connection Changing		8
16	Vessel Connection Added		4
17	Hp Pump - 2° Stage 2° Array	8 m³/h - 7 bar	1
18	Pressure Vessels		1
19	Vessel Connection Added		0,00
20	Membranes		35
21	Membranes		15
22	Membranes		10
23	Membranes		5
24	Pump Cip 1	56 m³/h - 4 bar	1
25	Inverter Pump Cip 1		1
26	Skid Cip		1
27	Inverter Pump 1° Stage 1°Array		1
28	Inverter Pump 1° Stage 2° Array		1
29	Inverter Pump 2° Stage 1° Array		1
30	Inverter Pump 2° Stage 2° Array		1
31	Tank Antiscalant		1
32	Dosing Pump Antiscalant		2
33	Tank Biocide		1
34	Dosing Pump Biocide		2
35	Tank Smbs		1
36	Dosing Pump Smbs		2
37	TANK Hcl (33%)		1
38	DOSING PUMP Hcl (33%)		2
39	Kit Dosing Pump		8
40	Tank Cip		1
41	Pressure Water Level Control		1
42	Float Water Level Control		5
43	E.M. Flow Meter - Feeding		1
44	E.M. Flow Meter - Permeate 1s1a		1
45	Flow Meter - Ricirculation 1° Stage		1

46	E.M. Flow Meter - Permeate 2s1a		1
47	E.M. Flow Meter - Permeate 2s2a		1
48	E.M. Flow Meter - Final Reject		1
49	Flow Meter Converter		6
50	Ph Meter		1
51	Orp Meter		1
52	Instrumentation Kit		1
53	Pressure Transmitter Inlet Prefilter		1
54	Pressure Gauge Inlet Prefilter		1
55	Pressure Tranmitter Outlet Prefilter		1
56	Pressure Gauge Outlet Prefilter		1
57	Pressure Transmitter - Inlet 1° Stage 1° Array		1
58	Pressure Gauge - Inlet 1° Stage 1° Array		1
59	Pressure Transmitter - Outlet 1° Stage 1° Array		1
60	Pressure Gauge - Outlet 1° Stage 1° Array		1
61	Pressure Transmitter - Inlet 1° Stage 2° Array		1
62	Pressure Gauge - Inlet 1° Stage 2° Array		1
63	Pressure Transmitter - Outlet 1° Stage 2° Array		1
64	Pressure Gauge 1° Stage 2° Array		1
65	Pressure Transmitter -Inlet 2° Stage 1° Array		1
66	Pressure Gauge - Inlet 2° Stage 1° Array		1
67	Pressure Transmitter - Outlet 2° Stage 1° Array		1
68	Pressure Gauge - Outlet 2° Stage 1° Array		1
69	Pressure Tansmitter - Inlet 2° Stage 2° Array		1
70	Pressure Gauge - Inlet 2° Stage 2° Array		1
71	Pressure Transmitter - Outlet 2° Stage 2° Array		1
72	Pressure Gauge - Outlet 2° Stage 2° Array		1
73	Conducibility Meter - Feeding		1
74	Conducibility Meter - Permeate		1
75	Instrument Kit		2
76	E.M. Flow Meter - Permeate 1s2a		1

3.7 Saturator Unit

The main purpose of the saturator is to reduce the silica concentration of the RO reject. So, the reject can be sent to RO again to recover some permeate without damaging the membranes in Stage IV RO.

Chemicals Addition

$FeCl_3\ daily\ addition$=40 kg/d
$Polyelectrolyte\ daily\ addition$= 0.32 kg/d
HCl (33%) $daily\ addition$=0.32 kg/d

Retention Time in Saturator Tanks

2 tanks with a volume of 1600 litres or 1.6 m^3 each will be used. The minimum retention time should be 15 minutes. In our case it is 30 minutes which is better than the minimum required.

S No	Functional Descriptions	Specification	Number of Items
1	Pump For Feeding	3.3 Cum/hr. 10 m, DN 40-25	2
2	Lamellar Clarifier	5 m3/h 2,2 x 2,2 per chimico	0,6
3	DOSING PUMP Fecl3	10 l/h - 3 Bar (500 ppm)	2
4	Dosing Pump Soda 50%	20 l/h - 3 Bar (pH11-11,5)	2
5	Dosing Pump Poly	20 l/h - 3 Bar (3-4 ppm),	2
6	DOSING PUMP Hcl	20 l/h - 3 Bar (3-4 ppm),	2
7	Kit Dosing Pump		8
8	Tank Fecl3	1000	1
9	Tank Soda	500	1
10	Tank Poly	1000	1
11	TANK Hcl	1600	1
12	Tank For Saturation	0,5 mc/h 5 m	2
13	Pumps For Sludge Extraction	for tank 500lt	2
14	Float Water Level Control		4
15	Flow Meter		1
16	Agitator For Poly		1
17	Agitator For Saturator		2
18	Ph Meter		2
19	Kit Instrumentation		2

3.8 Ultrafiltration Unit

- Ultra-filtration (UF) plant is made of capillary membranes for the treatment of reject of RO in order to protect the membrane of RO Reject.
- The daily flowrate to the ultra-filtration unit is around 60 m^3/day.
- This UF unit will be working 20 hours a day.
- Around 15% of the permeate will be used for backwashing.
- Hence, the total flowrate to the UF unit is 69 m^3/day.

Modules

- For our total hourly flowrate of 3.65 m^3/h, 2 modules with 60 m^2 area for each module was chosen to have an optimum membrane flux.

Chemically Enhanced Backwashing

A chemically enhanced backwash or CEB can be used if the feedwater quality is bad and the normal backwashes are not effective. Chemicals are added to improve the backwash cleaning ability. Sodium hypochlorite (NaOCl) and sodium hydroxide (NaOH) are used for CEB.

S No	Functional Descriptions	Specification	Number of Items
1	Pump For Feeding	4 m^3/h - 3 bar	2
2	Prefilter In Vessel	8,5 m^3/h 10 micron fiberglass, DN80 victaulic	1
3	Cartridge For Prefilter	20",1 micron	1
4	Uf Modules	1 array with 2 modules each for every line	2
5	Pump Fr Backwash	28 m^3/h - 3 bar	2
6	Inverter		1
7	Skid Uf		1
8	DOSING PUMP Naoh		1
9	DOSING PUMP Naocl		1
10	Kit Dosing Pump		2
11	TANK Naoh	100 lt	1
12	TANK Naclo	100 lt	1
13	Pressure Water Level Control		1
14	Float Water Level Control		4
15	E.M. FLOW METER For Feeding	DN 25	1
16	E.M. FLOW METER For Backwash	DN 65	1
17	Flow Meter Converter		2
18	Pressure Transmitter - Prefilter Inlet	0-6 bar	1
19	Pressure Gauge - Prefilter Inlet	0-6 bar	1
20	Pressure Transmitter - Prefilter Outlet	0-6 bar	1
21	Pressure Gauge - Prefilter Outlet	0-6 bar	1
22	Pressure Transmitter - Backwash Inlet	0-6 bar	1
23	Pressure Gauge - Backwash Inlet	0-6 bar	1
24	Pressure Transmitter - Backwash Outlet	0-6 bar	1
25	Pressure Gauge - Backwash Outlet	0-6 bar	1

3.9 Reverse Osmosis Unit for Reject

Project Data

The main parameters that determine all the sizing of the RO are the salinity of feeding flow and the Recovery that the designer wants or can achieve.
From here, the designer defines the number of stages, filtration surface, filtration speed and working pressures of the system.
The working values of the RO are the follow:

- Flow rate=3 m^3/h
- Number of vessel - I STAGE= 1

- Number of membrane - I STAGE= 4
- Membrane surface - I STAGE= 164 m^2
- Flux - 1S1A =8.5 LMH
- Pressure - 1S1A= 74.14 bar
- TOTAL RECOVERY= 46.5 %
- Permeate TDS= 1400 mg/L
- Reject TDS=1,20,000 mg/L
- kW/m3 on feeding flow= 13.34 kWh/m^3
- kW/m^3 on permeate flow= 28.8 kWh/m^3

Cleaning in Place

CIP is on demand, and frequency can range from 1- to 6-month intervals.

$CIPtankvolume$ =0.2 m^3

$Capacityofthepump$= 8 m^3/h

S No	Functional Descriptions	Specification	Number Of Items
1	Pump For Feeding	3 M³/H- 4 Bar	2
2	Pre-Filter Cartridges		3
3	Skid Ro	In Ss 304	0,4
4	Pre-Filter Container	In Ss 316	1
5	Hp Pump - 1° Stage 1° Array	6 M³/H - 40 Bar	2
6	Pressure Vessels	1200 Psi Side Port 4 Membrane	1
7	Vessel Connection Changing		0,00
8	Vessel Connection Added		0,00
9	Membranes		4
10	Pump Cip 1		1
11	Skid Cip		0,5
12	Inverter Pump 1° Stage 1°Array		2
13	Tank Antiscalant		1
14	Dosing Pump Antiscalant	1 L/H - 3 Bar	2
15	Tank Biocide		1
16	Dosing Pump Biocide	1 L/H - 3 Bar	2
17	Tank Smbs		1
18	Dosing Pump Smbs	1 L/H - 3 Bar	2
19	Tank Hcl (33%)		1
20	Dosing Pump Hcl (33%)	1 L/H - 3 Bar	2
21	Kit Dosing Pump		8
22	Tank Cip		1
23	Pressure Water Level Control		1
24	Float Water Level Control		5
25	E.M. Flow Meter - Feeding	0 - 3 M³/H - Dn20 - Pn6	1

26	E.M. Flow Meter - Permeate 1s1a	0 - 2 M^3/H - Dn15 - Pn 16	1
27	Flow Meter - Ricirculation 1° Stage	0 - 3 M^3/H - Dn20 - Pn6	1
28	E.M. Flow Meter - Final Reject	0 - 2 M^3/H - Dn15 - Pn 16	1
29	Flow Meter Converter		3
30	Ph Meter		1
31	Orp Meter		1
32	Instrumentation Kit	Centralina/Cavo..	1
33	Pressure Transmitter Inlet Prefilter	0 - 5 Bar	1
34	Pressure Gauge Inlet Prefilter	0 - 5 Bar	1
35	Pressure Tranmitter Outlet Prefilter	0 - 5 Bar	1
36	Pressure Gauge Outlet Prefilter	0 - 5 Bar	1
37	Pressure Transmitter - Inlet 1° Stage	0 - 115 Bar	1
38	Pressure Gauge - Inlet 1° Stage	0 - 115 Bar	1
39	Pressure Transmitter - Outlet 1° Stage	0 - 115 Bar	1
40	Pressure Gauge - Outlet 1° Stage	0 - 115 Bar	1
41	Conducibility Meter - Feeding	0-19,99 Ms	1
42	Conducibility Meter - Permeate	0-1999 µs	1
43	Instrument Kit		2

4.0 GENERAL SPECIFICATIONS:

Battery Limits

(a.) Electricity

During construction of the plant up to completion and successful commissioning, the electricity & diesel charges shall be borne by the bidder. The power tariff per unit may be considered as per the latest prevailing circulars of Kerala State Electricity Regulatory Commission (KSERC) as amended from time to time. The current tarrif is Fixed Charges at Rs. 150/KVA/month plus Rs. 6.00 per unit.

Piping, Channels & Valves

The scope of works shall include all piping, channels and valves in the entire plant.
Notwithstanding above the bidder shall submit a list of pipelines with flow, size selected format in line and valves at basic engineering stage with the detailed P&I Diagram and the same shall be furnished for approval of the Engineer prior to any further engineering or procurement/fabrication and installation. The information shall be provided in following format:-

S No	Line No	From	To	Type of Flow	Flow m^3/h	Pipe Dia in mm	Velocity in m/sec	Type of Valve	Remarks

Piping Material of Construction

Generally the piping material will be selected based on the following guidelines. The bidder can make suitable selection depending upon service, type of flow (i.e. If gravity or pressure) and diameter of pipe.
Note: In case the material of any pipe given above is in variance with the material specified elsewhere in the NIT, in that case, the decision of Engineer shall be final and binding.

Valves-Type & Material Selection Basis

The valves shall conform to the following requirement of type / Material &Type (unless specified otherwise elsewhere in the NIT)

Service	Type	Material of Const	Limitations
Sewage & Waste Water Gravity / Low Pressure	Butterfly/Gate	CI / DI / Bronze	
Sewage & Waste Water Gravity / Low Pressure	Butterfly / Gate/Ball Knife gate Valve	CI / DI /Bronze	
Service Water Pressure	Gate/Globe	Bronze	
Air	Butterfly/Ball	Cast Steel	
Chemicals	Needle/ Diaphragm/ Plug	SS/ PP (Diaphragm of Neoprene / Teflon)	Material as per Service / chemical
Scum/ Sludge	Butterfly/Ball, knife, plug, diaphragm	Cast steel / CI / DI	

Pipes and specials

All the MS/DI/CI pipes & specials and other equipment shall be painted with two coats of approved make anti corrosive paints.

General Points
The scope of work for electrical items shall also include following:
(a) Provision of standard safety equipment in the same as approved by relevant authorities.

(b) LV capacitor bank, with control panel consisting of automatic power factor correction (APFC) relay, shall be provided to improve the overall plant 'PF' to a minimum of 0.95.

(c) Local Start/Stop push button stations shall be provided near those motors, which are not controlled from a local console/panel.

(d) All the motors shall conform to the requirements of latest editions of application Indian Standards. The motors shall be squirrel cage, TEFC type and shall be rated for continuous duty. The winding insulation shall be of Class 'F' while the temperature rise shall be limited to that for Class 'B'. The degree of protection of enclosure shall be IP 54 for indoor motors and IP 55 & 56 for outdoor motors.

Piping

The specifications given under this clause shall cover guide lines for providing all types of pipes for water supply, sewerage, rising mains, plumbing, interconnecting pipes in water, wastewater treatment units etc.

The diameters and types of pipes shall be as described in the approved drawings. The pipes shall include all types of pipes. All the materials shall be as per relevant Indian Standards. The specials and fittings like SV, FH etc. shall be installed in locations as per approved drawings or as directed by Engineer.

The work includes supply of all types of pipes at the site of work, road cutting and remaking, excavation of trenches in all types of soil, lowering of pipes into the trenches, concrete bedding where specified, aligning to line and grade, jointing, testing, back filling of trenches to meet the requirements of Indian Standards codes of practices in a best workmanlike manner.

The CPWD Specifications / IS Codes should be followed for work of pipe laying

Puddle Collars

CI D/F Puddle Collars shall be provided wherever CI / DI pipe has to pass through RCC work. Puddle Collars shall be provided of sufficient length and puddle height. The quality and thickness of puddle collar shall be equivalent to CI DF specials (as per IS: 1538)

HDPE pipes

HDPE pipes shall be used only if specifically permitted by Engineer-in-charge.

Jointing

The HDPE pipes shall be jointed properly with HDPE socketted specials to get smooth inner side surface without any extrusion to avoid any obstruction to flow of wastewater. If in any particular case butt welding has to be done, smooth inner surface of pipe without intrusion inside shall be ensured.

Glazed Stone Ware Pipes

The drain pipes and filtrate pipes shall be of GSW. The GSW pipes to be provided should be ISI marked as per IS 651. They should be laid to proper gradient and as per CPWD specification as approved by Engineer-in-charge.

RCC Pipes with HDPE lining

The RCC pipes to be provided shall be NP-3 S&S ISI marked with rubber rings as per IS 458 (Latest edition) and these shall be laid to proper gradient and as per CPWD specification as approved by Engineer. All RCC Pipes shall be HDPE lined from inside.

PIPES AND SPECIALS

DI S&S Pipes

All DI pipes / fittings used for different units as described in the scope of work shall be Class K-9 as per IS 8329 and IS 9523 with up to date amendments. The pipes shall be cement mortar lined on inner face suitable for sewage and painted with Bituminous paint on outer surface.

DI Double Flanged Pipes

The DI welded D/F pipes shall be conforming to IS 8329 with up to date amendments Class K-9 barrel. The pipes shall be cement mortar lined on inner face suitable for sewage and painted with Bituminous paint on outer surface. The flange rating shall be PN 1.6 with working pressure of 10 kg/m^2.

CI Double Flanged Pipes

The pipes shall be Double flanged horizontally cast iron pressure pipes ISI marked as per IS 7181 – latest edition Class B in standard length of 2.75 m.

CI / DI Specials

Cast iron (IS 1538) / Ductile Iron (IS 9523) standard socketted and / or flanged fittings shall be ISI marked suitable for CI / DI pressure pipes. The metal used for manufacturing shall be of a quality not less than specified for grade 15 of IS 210.

VALVES

General

All valves shall be guarantee during defect liability period and full operation & maintenance period & in case of any damage, replacement would be given free of cost.

Sluice Valves

Valves upto ø300 mm sluice valves shall generally conform to IS 14846 / ISO 7259 / BS EN 1171, with length over flanges as per PD of IS 14846 corresponding to BS EN – 558 / ISO 5752 Basic Series 3 in DI construction having resilient seating with rubberized (fully vulcanized with EPDM) DI wedge. **Spindle shall be outside screw – rising type (SS 304 grade).** Valves should be pocketless design. Shall be coated internally and externally with epoxy powder / liquid coating (minimum DFT 200 micron) – Shade: BLUE / GRAY.

Valves 350 mm and above sluice valves shall generally conform to IS 14846 & outside screw Rising Spindle of SS 304, with length over flanges as per PD of IS 14846 corresponding to BS EN – 558 / ISO 5752 Basic Series 3 in DI construction having metal seating (IS 318 Gr. LTB 2 with 2% Nickel).

Valves 400 mm dia and above shall be fitted with ball thrust bearings, enclosed spur gear box, back seat bush as accessories for ease of operation. Shall be coated internally and externally with epoxy liquid coating (minimum DFT 200 micron) – Shade: GRAY. Valves shall be rated PN 1.0 / PN 1.6 (as per final design & BOQ) and flanges faced and drilled as per IS 1538 Table 4 & 6 / IS 9523 / BS EN 1092 – 2.

Electrically operated valves to be complete with electrical actuators complete with integral reversing contactor starter, push button station, local – off – remote selector switch, potentiometer, space heater, continuous local indicator and top bevel gear unit (with hand wheel) for side orientation and ease of operation.

Non Return Valves

Valves upto 600 mm dia. shall conform to IS 5312 Part 1 & above to IS 5312 Part 2. Valves upto 300 mm dia shall be in graded DI with soft slant seat. Hinge pin shall be of SS AISI 304. The hinge shall be in DI and integral with the door. Valves 350 mm dia shall be in graded DI with metal to metal (IS 318 Gr. LTB 2 with 2% Nickel) seating; SS AISI 304 stub pins & slant seat design. Valves above 600 mm dia must be of multi – door design with doors having minimum two integral lugs for hinging of the door. Valves shall be rated PN 1.0 / PN 1.6 (as per final design & BOQ) and flanges faced and drilled as per IS 1538 Table 4 & 6 / IS 9523 / BS EN 1092 – 2. Shall be coated internally and externally with epoxy liquid coating (minimum DFT 250 micron) – Shade: GRAY.

Butterfly Valves

- Butterfly valve shall be of double eccentric and resilient seated. The valve shall generally conform to IS 13095. The butterfly valves should be compatible for buried installations without the construction of chambers.
- Butterfly valves shall be suitable for mounting in any position. The valve shall be free from induced vibrations.
- Bearing bushes shall be supported with O rings to avoid entering of water from the disc side into the gear box.
- Gear box shall be irreversible worm gear, corrosion resistant, protection class of IP 67 with mechanical position indicator, 100% fluid grease filling.
- The valve seal shall be of replaceable design. When the valve is fully closed, the seal shall seat firmly. The seat surfaces shall be micro finished to provide a long life for the seal. All fasteners shall be set flush so as to offer the least resistance possible to the flow through the valve.
- The shaft shall be stainless steel with self-lubricating bearings.
- All valve spindles and hand wheels shall be positioned to give good access for operational personnel. The valve disc shall have a 90 degree turn.
- Valves shall be provided with a continuous mechanical position indicator to show the position of the disc, mounted on the driven shaft end.
- Valves shall be capable of closing against the maximum flow that can occur in practice. The breakaway torque under maximum differential head conditions shall be within the manufacturer’s limit.
- All hand wheels shall be arranged to turn in a clock wise direction to close the valve.

Air Valves

- Air valves shall be installed at the high points in the systems and at regular intervals along the pipe line.

- Air valves shall be of single chamber double orifice type and internals of stainless steel. A buoyant rigid float shall seal the large orifice and the chamber housing shall be designed to avoid premature closing of the valve by the air whilst being discharged. Small orifice shall discharge small air volume during operation under full internal pressures.
- Both the large and small orifices should be housed in 1 chamber.
- The valve shall be capable of exhausting air from the pipe automatically when being filled, the air being released at a sufficiently high rate to prevent the restriction of the inflow rate. Similarly, the valve shall be capable of ventilating pipe work automatically when being emptied or under water hammer condition, air inflow rate being sufficiently high to prevent development of vacuum in the pipe lines. The valve shall also automatically release air accumulating in pipe work during normal working conditions.
- The valves shall be designed to prevent premature closure prior to all air having been discharged from the line. The orifice shall be positively sealed in the closed position with the
- float only raised by the liquid and not by a mixture of air and liquid spray. The sealing shall be so designed to prevent the float sucking after a long period in the closed position.
- Air valves shall thus to be designed to automatically operated so that they will,
    - Positively open under internal pressure less than atmospheric pressure to admit air in bulk during pipe line draining operation.
    - Exhaust air in bulk and positively close as water, under low head, fills the body of the valve during filling operation.
    - Not blow shut under high velocity air discharge
    - Exhaust accumulated air under pressure while the pipe is flowing full of water.

- All air valves shall be constructed so that internal working parts which may become necessary for repairs shall be readily accessible.
- Valves shall have nominal diameters up to DN 200, with working pressure for air valves shall not be less than PN 16.
- The air valve shall be capable of handling air up to sonic velocities [300 m/s.]

Reference Codes

The pipes and specials shall conform to the Indian Standard Specifications (latest issue/revision). Commonly used IS codes are listed below:

I.S. 458	Concrete pipes with or without reinforcement
I.S. 651	Salt glazed stone ware pipes and fittings
I.S. 784	Pre stressed concrete pipes
I.S. 1239	Mild steel tubes, tubular and other wrought steel fittings (parts I and II)
I.S. 1536	Centrifugally cast (spun) iron pressure pipes for gas, water and sewage
I.S. 1537	Vertically cast iron pressure pipes for water gas and sewage
I.S. 7181	Horizontally cast Double Flange Pipes
I.S. 1538	Cast iron fittings for pressure pipes for water, gas and sewage
I.S. 1592	Asbestos cement pressure pipes
I.S. 2685	Code of practice for selection, installation and maintenance of sluice valves

I.S. 3006	Chemical resistant salt glazed stone ware pipes and fittings
I.S. 3076	Low density polyethylene pipes for potable water supply
I.S. 4984	High density polyethylene pipes for potable water supply
I.S. 4985	Unplasticised PVC pipes for potable water supplies
I.S. 8329	Centrifugally cast (spun) Ductile Iron Pressure pipes for water, gas and sewerage – specifications
I.S. 9523	Ductile Iron fittings for pressure pipes for water, gas and sewerage – specifications
I.S. 14333	High Density Polyethylene pipes for Sewerage – specifications
I.S. 13592	Specification for UPVC pipes for soil and waste discharge systems inside buildings including ventilation and rainwater system
I.S. 14735	Unplasticised Polyvinyl Chloride (UPVC) Injection Moulded Fittings for Soil and Waste Discharge System for Inside and Outside Buildings Including Ventilation and Rain Water System Specification
I.S. 14846	Sluice Valve for Water Works Purposes (50 to 1200 mm Size) – Specification
I.S. 14333	HDPE Pipes for Sewerage - Specifications
I.S. 13095	Butterfly Valves for General Purposes
I.S. 783	Code of practice for laying concrete pipes
I.S. 2685	Code of practice for selection, installation and maintenance of sluice valves
I.S. 3114	Code of practice for laying cast of iron pipes
I.S. 4111	Code of practice for ancillary structures in sewerage system-manholes etc (Part I to IV)
I.S. 4127	Code of practice for laying of glazed stoneware pipes
I.S. 5822	Code of practice for laying of welded steel pipes for water supplies
I.S. 6530	Code of practice for laying asbestos cement pressure pipes
I.S. 7634	Code of practice for plastic pipe work for potable water supplies (Part I to III)
I.S. 12288	Code of practice for use and laying of Ductile Iron Pipes

Construction

Transportation of pipes

The transportation of pipes to the site of works has to be done in such a way that pipes are not damaged while handling.

Light pipes and pipes of smaller diameter shall be handled manually. Heavy pipes shall be loaded and unloaded using lifting tackles like chain pulley blocks and shear legs. The pipes shall be protected against impact, shocks etc. Pipes shall not be allowed to fall freely on to the ground and hard surfaces so as to cause cracks in pipes. Transportation of pipes and stacking by the side of the trenches shall also be done in such a way that it causes minimum inconvenience to the traffic.

Lowering of the pipes into the trenches shall be done equally carefully so that the pipes are not damaged and also the trenches and bedding for pipes are not disturbed and damaged. Smaller and lighter pipes can be lowered using rope slings and shall not be dropped on to the trench bottom.

Transfer of levels to bottom

Permanent bench marks shall be established at convenient and frequent intervals all along the pipe alignment for carrying the levels to the place of laying of the pipes. The levels shall be transferred by using boning rods and sight rails. The lowering of pipes shall not be commenced until the Engineer-in-charge has checked levels and permits the lowering of pipes.

Heavy pipes shall be lowered into the trenches by means of shear legs, chain pulley blocks and tackle. Care shall be taken while lowering the pipe into the trench. Each pipe which is laid in the trench is examined for damage. Cracked, broken or damaged pipes shall not be allowed to be used in the works.

Cleaning of pipes

The pipes shall be checked for absence of cracks and damaged parts of pipe ends. The pipes shall also be cleaned to remove all dirt and soil and other foreign materials before lowering into the trenches. After jointing it shall be ensured that the extra jointing materials are removed. It shall also be ensured that no foreign material enters the pipes after they are laid by covering the pipe ends suitably.

The specified jointing materials shall be used and methods of jointing the pipes of different materials shall be followed as per relevant IS specifications/directions of the Engineer. For flanged joints necessary gaskets/packing material, bolts and nuts shall be provided without any extra cost. The gaskets/packing materials shall be of full diameter and of approved quality.

The bedding of the pipes where specified shall be as detailed in the approved drawings/ direction of the Engineer. The locations of the bedding, the thickness of the bedding, the width of the bedding, material specifications and proportion of mix shall all be as indicated in the approved drawings/ direction of the Engineer.

Thrust blocks

In case of rising mains/pressure pipes, at changes of directions of pipes thrust blocks to resist unbalanced forces shall be provided. The dimensions, material specifications shall be as approved by Engineer / I.S specifications.

Valve chambers

Chambers/masonry pits to protect the valves or other special fittings on the pipe lines shall be constructed as per site requirements. The dimensions and material specifications, covers shall be as approved by EIC.

Back Filling

Back filling of the trenches shall not be commenced till the pipes are tested for I.S. specified hydraulic pressure and till approval for filling of the trenches is given by the Engineer. Back filling of the trenches shall be done with approved back fill material free from boulders, sharp objects, rubbish. The filling shall be carried out in layers not more than **150** mm thick. The filled up material shall be well watered and consolidated, taking proper care to see that the pipes are not disturbed.

Hydraulic Testing of Pipes

Each section of the pipe shall be tested for water tightness of the pipe line as per I.S. Specification. Any part thereof that does not meet the above requirements shall be emptied and repaired, or re-laid as required and tested again.

Air Testing/Smoke Testing

The Bidder shall be bound to follow the instructions of the Engineer regarding the test procedure, test pressures, lengths of sections for testing etc. The tests shall be carried out only in the presence of the Engineer.

Joints

Movement joints such as expansion joints, complete contraction joints, partial contraction joints and sliding joints shall be designed to suit the structure. However, contraction joints shall be provided at specified locations spaced not more than 7.5 m in both right angle directions for walls and rafts. Expansion joints of suitable gap at intervals not more than 30 m shall be provided in walls, floors and roof slabs of water retaining structures. Construction joints shall be provided at right angles to the general direction of the member. The locations of construction joints shall be decided on convenience of construction. To avoid segregation of concrete in walls, horizontal construction joints are normally to be provided at every 2 m height. PVC water stops of suitable type and 230 mm width, shall be used for walls and base slabs.

Joints are to be provided in the structures as per approved drawing / I.S specification. The item of providing expansion joints and construction joints in concrete includes all the labour, tools and plants necessary for completing the item in best workman like manner. Either RCC key joints or PVC water bar joints shall be provided as per directions of EIC. The material for the PVC water stops shall be a plastic compound with the basic resin of polyvinyl chloride and additional resins, plasticizers, inhibitors, which satisfies the performance characteristics specified below as per IS:12200.

Construction joints will be as shown on the drawing or as approved by the Employer. Concrete shall be placed without interruption until completion of work between construction joints. If stopping of concreting becomes unavoidable anywhere, a properly formed construction joint shall be made with the approval of the Employer.

Dowels for concrete work, not likely to be taken up in the near future, shall be coated with cement slurry and encased in lean concrete as indicated on the drawings or as approved by the Employer.

As soon as the exposed concrete has sufficiently hardened, the surface of the joint shall be water jetted or brushed with a stiff brush to expose the larger aggregate without being disturbed. Alternatively, if the preparation is not satisfactory, or proper joint preparation is not possible due to inclement weather, the Bidder shall thoroughly remove the laitance of hardened concrete by mechanical chipping after seven days of concrete work at his own cost. Before placing fresh concrete against a construction joint all loose material shall be removed and the surface sluiced with water until it is perfectly clean, thereafter all ponded water should be removed. When concreting is to be resumed on a surface which has not fully hardened, all laitance shall be removed by wire brushing, the surface wetted, free water removed and a coat of cement slurry applied. On this, a layer of concrete not exceeding 150 mm thickness shall be placed and well rammed against the old work. Thereafter work shall proceed in the normal way.

Storage

The Bidder shall arrange for safe and proper storage of all materials and tools. Paints shall be kept covered at all times and mixing shall be done in suitable containers. All necessary precautions shall be taken by the Bidder against fire hazards.

Preparation of Surface

Before starting the work the Bidder shall obtain the approval of the Engineer regarding the soundness of the surface to be painted on.

Masonry, Concrete and Plastered Surface

Surface shall be free from all oil, grease, efflorescence, mildew, loose paint or other foreign and loose materials. Masonry cracks shall be cleared out and patch filled with mortar similar to the original surface and uniformly textured. Where this type of resurfacing may lead to the finishing paint being different in shade from the original surfaces, the resurfaced area shall be treated with minimum one coat of cement primer which shall be continued to the surrounding area for a distance of minimum 100 mm.
Surface with mildew and efflorescence shall be treated as below:

Mildew

All mildewed surfaces shall be treated with an approved fungicide such as ammonia wash consisting of 7g. of copper carbonate dissolved in 80 ml liquid ammonia and diluted to 1 litre with water, or 2.5 per cent magnesium silico fluoride solution and allowed to dry thoroughly before paint is applied.

Efflorescence

All efflorescence shall be removed from affected surfaces with a solution of muric acid in water (1:6 to 1:8), washed fully with clear water and allowed to dry thoroughly.

Metal

All metal surfaces shall be absolutely clean, dry and free from wax, grease and soap films. All steel and iron surfaces in addition shall be free from rust. All galvanised iron surfaces shall be pre-treated with a compatible primer according to the manufacturer’s direction. Any abrasion in shop coat shall be touched up with the same quality of paint as the original coat.

Specification:

SL NO	DESCRIPTION	UNIT	MOC	SPECIFICATION
1.	Piping	Lot	-	Low pressure line < 3 Bar shall be UPVC, PN 16, Make : FIP, GF, Sanking, High Pressure line > 3 Bar shall be SS 316 L schedule 40 seamless /Duplex , Make: Sail/Jindal/Aceronix/Sumitomo. 1 inch M.S pipes & fittings for air line to all pneumatic valves.
2.	Butterfly Valves	Lot	-	EPDM lined Butterfly valve, Make: "Intervalve /Crane/BDK/", Body: CI, Disc:, SS 316, Seat : EPDM Rubber Lined, Rating: suitable(necessary approval to be obtained) , Butterfly valves with Actuator, Solenoid coil & Limit switch arrangement details. Make: Rotex/EI-O-Matic, Type: Double Acting.
3.	Globe Valves	Lot	-	MOC: SS 316, Seat : Hardened Steel, Class:suitable, "Intervalve/Crane/BDK", Type: Drilled & Flanged end
4.	Non Return Valves	Lot	-	SS 316, Type: Ball / Lift Check, Class: 600, Make: "Intervalve/Crane/BDK", with flanged end.
5.	Pressure gauges	Lot	SS 316	Pressure gauges shall be provided at each pump delivery line, across PSF, across the MCF. For high pressure pump PG shall be provided at each pump inlet and outlet. Also across the RO for permeate and reject. The pressure element shall be of bourdon type. White dial of 4" with black scale marking. Accuracy shall be +/- 1% of full span. IP-65 Weatherproof protection. Accessories like snubber shall be provided as per the application. Diaphragm seal shall be provided for the application where fluid in contact with wetted parts is corrosive / with very high density /acidic/ alkaline/ service with jacketed line. Pressure gauges for the discharge application shall be filled with the Glycerine. All the gauges shall be provided with range marking illuminator on the gauge dial. The pressure gauges shall be installed in the vertical position only. Make: Baumer / Wikia / General Instruments.

6.	Level Indicator Transmitter (Ultrasonic type)	Nos	-	LIT shall be provided at the UF feed tank, each RO feed tanks RO permeate tank. For clean liquid and above ground tanks level measurement application differential pressure transmitter shall be used for level measurement (with or without remote diaphragm seals). In case of sump type shall be ultrasonic. Transmitters shall 2-wire smart type instruments with 4-20mA output & HART protocol. Local 5 - digit LCD display with Polycarbonate sheet. 24V DC power supply. Cable entry: 1/2" NPT (F). Accuracy +/- 0.075% of span &rangeability to be 100:1. Stability: + 0.5% of upper range IP-65 Weatherproof protection. Material of wetted parts to be minimum SS316. External zero & span adjustment required. For pressure and differential pressure transmitters with remote seals, MOC shall be as follows: (i) Remote seal : SS 316 (with suitable coating as per the application) (ii) Capillary shall be of SS 304 with PVC coating &armouring. (iii) Housing material : Die cast aluminium (b) Displacer Type Level transmitter Measuring Element shall be torque tube. The Transmitter shall be provided with chamber. The Instrument shall be supplied with drain valve & counter flange. Make : Emmerson / E&H / Yokogawa
7.	pH Indicator & Transmitter	Nos		pH transmitter shall be provided at the inlet of RO system & CIP system. Make : Emmerson / E&H / Yokogawa
8.	Conductivity Indicator Transmitter	Nos		CIT shall be provided at each RO inlet & common permeate outlet. Make : Emmerson / E&H /Yokogawa
9.	ORP Indicator Transmitter	Nos		Make : Emmerson / E&H /Yokogawa
	Note: The transmitters shall 4 - Wire smart type instruments with 4-20mA output & HART protocol. Local 5 - digit LCD display with Polycarbonate sheet. 250 V AC, 50 Hz power supply. Cable entry: 1/2" NPT (F). IP-65 Weatherproof protection. Material of wetted parts to be minimum SS316. Sensor shall be mounted in the flow through chamber and the sampling lines to be of impulse tubing SS 316. Sensor shall be with min 5 Meters of cable with moulded type / v pin type. Sensor to withstand the -10 to 80 Deg C Temperature rating & 2 Bar pressure rating. The flow through chamber process connection shall be of 1/2 "NPT (F) Threaded. Make : Emmerson / E&H / Yokogawa			
10.	Rotameter	Lot	SS 316	Rotameters shall be mounted in-line for pipe sizes upto 2 inches & for higher line sizes bypass rotameters shall be used. Rotameter rangeability

				shall be 10:1. Rotameter shall be metal tube type & the measuring tube materialshallbeSS316. Make : Aster / Eureka
11.	Flow Meter (Electro Magentic Flow Meter)	No s	-	Transmitters shall 4-wire smart type instruments with 4-20mA output & HART protocol. Local 5 - digit LCD display with Polycarbonate sheet. 250 V AC, 50 Hz powersupply. Cable entry: 1/2" NPT (F). Accuracy +/-0.075% of span &range ability to be100:1. Stability: + 0.5% of upper range. IP 65 Weatherproof protection. Material of wetted parts to be minimum SS316. PTFE lining / hard rubber lining to be provided. Housing material: Die cast aluminium. Process Connection shall be Wafer / Flanged (ANSI 150# B16.5). Flow tube shall be of SS 304, Electrodes shall be of Hastelloy C. Grounding rings 2 Nos for each flow meter shall be provided with min SS 316. Signal converter cum incdicator transmitter shall be of integral model with Micro process based. Actual flow rate and totalized flow in cyclic

Programmable Logic Controller -1 unit: Panel shall be considered with IP 54 enclosure. The panel to be provided with adequate no of cooling fans, louvers, tube light, tower lamp, hooter on the door there should be indication lamps , hooter acknowledgement, emergency push button, overall panel isolator handle. PLC system selected should be modular in construction and expandable in future by at least 20% wired additional I/O modules /additional communication modules on controllers / relays & other accessories. All the Digital Inputs shall be of 24 V DC via fused TB's, if the digital inputs are of difference in voltage then interposing relays to be considered. All Digital Outputs to be through interposing relays. All Analog Inputs to be of shielded cable only.

Make : Allan Bradley / Mitsubushi / Siemens / Schneider.

Control Processor loading	Maximum of 60%
Spare capacity in RAM	Minimum 40%
Battery back up for RAM	Rechargeable Ni. Cd
Processor	Non redundant
Communication between CPU and I/O Modules	Non redundant
Power Supply Modules	Non redundant
Program changes	Automatic
Processor Module diagnostics	Required
I/O Module diagnostics	Required
DI/DO channels	Optical isolation
AI/AO channels	Optical/Galvanic

Status indication for each channel in DI/DO card	LED indication
Power supply healthiness status in all modules	LED indication
Maximum no of channels:	
Analog I/O modules	8 channels
RTD, Thermocouple	16 channels
Digital I/O modules	32 Channels
Power supply to the field transmitters	Loop
Interrogation voltage for DI signals	24 V DC
Interposing Relays	24 V DC with freewheeling diode across the coil – Relay contact rating 5A at 220 V AC
Main Power Supply for PLC System	220 V AC, single phase, 50Hz, dual redundant with 2 hours UPS backup
Earthing Requirement	Separate Enclosure Safety earth and Electronic/Signal earth
Spare I/O	10% wired-up to terminal
Spare terminals	20% free terminals
Spare space PVC cable duct in cabinet	40% free space for future
SCADA System (1 Unit): The SCADA shall acquire process and record operational data. The entire plant shall be controlled through SCADA. UF and RO system shall be fully automatic. Manual operating provision in SCADA shall be given and authorization for the same shall be provided to designated personnel. The Operating system and application software shall reside on the hard disk. Necessary UPS shall be provided with half and hour back up.The computer hardware/software shall be of current technology at the time of installation, with standard PC technology.	
Processor	Minimum - Intel I3
Graphics card	PCI Express Graphics Accelerator Card with 1GB memory & DVI or HDMI sockets
RAM	2GB DDR3 SDRAM
Storage	Minimum 1 TB HDD
Optical storage drive	CD R/W drive, 2 MB Memory
Network Interface card	1 no. of 10/100/1000 Mbps Half or Full-duplex, Ethernet Cards - TCP/IP & IPX/SPX compliant with IEEE802.3, IEEE802.3u
PCI Express Port/Slots	3 Nos.
PCI port/Slot	1 No.
DD3 RAM Card Ports/Slots	4 Nos.
USB Port	4 Nos. USB 2.0
PS2 Ports	2 Nos.
Sound Port	1 No. S/PDIF
Serial Port	1 No.

eSATA port	1 No.
Keyboard	Qwerty Keyboard with Function Keys
Mouse	Optical Mouse
Monitor	21 inch LED Monitor, 1600 x 1200 pixel, viewing angle of 89 Deg
Power supply units	Single SMPS Units
Operating System	Windows-7 Professional
Spare terminals	20% free terminals
Spare space PVC cable duct in cabinet	40% free space for future

Electrical panel shall be of compartmental & non draw out type.	
System	3 phase AC
Rated voltage & Frequency	415 V & 50 Hz
Panel type	Totally enclosed, Compartmentalized, Indoor-IP- 54 protection, single / Double Front
Degree of Protection	IP 54, Dust Proof w ith proper door gaskets
Bus bar material	High purity, electrolytic grade Aluminum with heat shrinkable PVC sleeves
Incomer/Outgoing/ starter feeders	Fuse less type – MCCB,MPCB,MCB
Panel sheet	CRCA (Doors & side walls -2mm,Top & bottom- 1.6mm, Side walls & rear covers -2mm,Gland plate-3mm Thickness
Base frame	100 mm Channel with Black matt paint
Control Voltage	110V, AC, 1 phase, 50 Hz
Motor feeders	Type 2 coordination shall be followed
Starter feeders	1. Upto 15 KW MPCB 2. 15 KW above Thermal OLR with MCCB
Digital Meters	MCC incomer - Voltmeter/Ammeter/Energy mete
Contactor type & rating	AC3 duty rating of the contactor. Minimum contactor rating shall be 9A.
Incomer section	R, Y & B phase indication lamp
Motor Feeder (DOL,S/D feeders)	ON, OFF, and OLR TRIP
Paint /Finish	RAL 7032 (SIEMENs Grey)with MATT finish/ Shot blasted
Cable tray	Top

Panel earthing	Considered in entire length of the panel. Aluminum flat.
Panel lamp indication	110 V AC cluster type LED type
Control transformer	2 nos of 110V AC
Control wiring inside panel	650/1100 V grade PVC single core copper conductor of minimum cross section 2.5 Sq.mm for CT wiring and 1.5 Sq.mm. for others.
Inter panel wiring	Through PVC duct
Feeder identification	Each & every feeder marked with engraved name plate.(Tag number & Name)
Constructional (Floor Mount)	Height – 2200mm max including base frame, Operating height does not exceed 1800mm
Power wiring	PVC copper conductor cable, 3 core x Copper conductor, Armored, 1100V grade, PVC insulated cable up to 6 sq mm above which Al cables shall be considered
Field Power & Control Cables	Copper conductor, Armored, 1100V, 1.5 Sq.mm Copper Armored
Connectors & Terminal blocks	shall be provided with different colours
Cable Trays	G1 perforated, ladder type, shall be provided with necessay supports.

LIST OF ITEMS AND APPROVED MAKES:

S.NO	ITEM	APPROVED MAKES
1.	**Structural steel & Steel Reinforcement**	SAIL / TISCO / Rashtriya Ispaat Udyog / ISSCO / JSPL /equivalent
2.	**DI Pipes & Specials**	Jindal Hissar / Electrosteel / TATA /equivalent
3.	**CI Pipes & Specials**	ISI marked
4.	**RCC Pipes**	ISI marked
5.	**SW Pipes**	ISI marked
6.	**GI Pipes**	Tata / Jindal Hissar/equivalent
7.	**HCI Pipe & Specials**	ISI marked of make NIF / NIC / BF / HIND /equivalent
	C.P. Pillar Cock, Bibcock, Stopcock and other CP Fittings	EssEss / Jaguar / Excel /equivalent
8.	**Brass Bib & Stop Cock**	GPS, Sant, L&K /equivalent
9.	**PVC Syphon**	ISI marked of Superflow / Nova /equivalent
10.	**Plastic Seat Cover**	ISI marked of Hindware / Hindustan /

		Cera/equivalent
11.	**Mirror**	ISI marked of make Modi guard / Saint Gobain / TATA /equivalent
12.	**Stainless Steel Sink**	Neelkanth / Jayna / JMC/equivalent
13.	**Ball Cock**	ISI marked
14.	**RCC Manhole Cover & Frame**	ISI marked
15.	**Electric Geysers**	ISI marked, Bajaj , Everon , Crompton, Venus /equivalent
16.	**Pig Lead**	99.97% Purity /equivalent
17.	**GI Fittings**	SVW / UNIK / UCO /equivalent
18.	**Gun Metal Valves**	Leader, Sant, Zoloto/equivalent
19.	**UPVC Pipes**	Supreme, Finolex, Prince, Georg Fischer, Astral /equivalent
	Self-Sustaining Breathing Apparatus	Drager/equivalent
20.	**Gas Mask**	Drager/equivalent
21.	**Glazed Tiles**	Somany, Kajaria, Orient, Johnson /equivalent
22.	**Epoxy Paint**	Hindustan Ciba GiegyFosroc, Naptha, Seiko Roffec& Berger /equivalent
23.	**Bituminous Paint**	Berger, Asian Paints and Shalimar Tar Products /equivalent
24.	**Synthetic Paint**	Berger, Asian, Nerolac, Dulux, Shalimar /equivalent
25.	**Cement based paint**	Super Snowcem, Duracem, Accrocem /equivalent
26.	**Water Tanks**	Sintex / Diplast /equivalent
27.	**Sanitary wares**	Hindware / Parryware / Cera/equivalent
28.	**DI Sluice Valves, NRV, Reflux Valves, Check Valves, Butterfly Valves**	Kirloskar / VAG Valves / AVK / IVC/ TALIS /equivalent
29.	**CI / Aluminium Open Channel Gate**	Jash / Shivpad / BIC / Oriental Castings /equivalent
30.	**Zinc cromate primers**	Shalimar, Asian Paint, Berger, ICI /equivalent
31.	**Water proofing compound**	Sika, Fosroc, ACCO proof, Overseas Waterproofing Corpn., India Waterproofing Co, CICO /equivalent
32.	**Dash Fasteners**	Hilti, Fischer /equivalent
33.	**Concrete Admixtures**	Sika, Fosroc, CICO /equivalent
34.	**Water Proofing Treatment**	India Water Proofing Company / Overseas Water Proofing Corp / FOSROC Chemicals /equivalent
35.	**PLC / SCADA**	ABB / Schneider / Alstom / L&T / GEFanuc / Siemens / Allen Bradley/equivalent
36.	**SMPS**	Schneider / ABB / Rockwell / APC / Pyrotech / Siemens/equivalent
37.	**Cable Trays / Glands**	Elcon / Sales Link / Comet / Lapp / HMI / Pinnacle / RATAN-Kolkatta/equivalent
38.	**Starters for motors**	L&T / Siemens / BCH / Schneider / ABB/ C&S /equivalent
39.	**Ceiling Fan**	Usha / bajaj / Orient / Crompton / GEC / Havells/equivalent

40.	**Exhaust Fan**	Bajaj / Crompton Greaves / GE / Almonard/equivalent
41.	**Bus Duct**	Trijal / Shivalik / Madhu Electrical / Vasutech/equivalent
42.	**Distribution Boards**	ABB / Legrand / Siemens / L&T /equivalent
43.	**Crimping Lugs / Glands of double compression type**	Phoenix / Dowells / Jainson / Comet /equivalent
44.	**MCC / L.T Panels / PDB / LDB Panel**	ABB / L&T / BCH / Siemens / Schneider/automatic controls /equivalent
45.	**Control Desk**	ABB / L&T / BCH / Siemens / Schneider / Rittal/equivalent
46.	**Actuator Panel SCADA compatible**	AUMA / Rotork / Marsh /automatic control /equivalent
47.	**Distribution Transformer**	Crompton Greaves / AREVA / BHEL / ALSTOM / ABB / Kirloskar / L&T/T&R/VoltAmp/equivalent
48.	**22/11 KV VCB breaker & panel**	ABB / Siemens / AREVA / ALSTOM / Kirloskar / L&T / Jyoti/equivalent
	22/11 KV SF6 insulated 3 panel / 4 panel extensible type RMU.	ABB / Siemens / AREVA / L&T / Schneider /equivalent
	ACB 8 way / feeder pillar 6 way / 4 way &minipillars	Pyrotech/ABB / Siemens / AREVA / L&T / Schneider/Havells/equivalent
49.	**Control multistrand single core Cables 1.1 KV grade**	LAPP/ KEI / PolyCab / Thermo Cables/Finolex/NICCO/Delton/Universal /equivalent
50.	**11 KV End termination & straight through joint**	Raychem, Xicon, Denson /equivalent
51.	**Measuring Instruments**	Krykard / Nipon / Trinity / Rishiline (L&T) / AE / Secura/equivalent
52.	**Air Conditioners**	Samsung / LG / Voltas / Carrier / Hitachi / Panasonic/equivalent
53.	**Cables**	Havells / CCI / Gloster / Polycab / KEI / Deltton / Universal / NICCO /equivalent
	Lamps HPMV/HPSV Metal Hallide Lamps & Accessories	Bajaj, Philips, Wipro, Halonix, Havells/equivalent
54.	**Ring Main Unit/HT, switch and fuse unit**	ABB, Schneider, Crompton, South Andrew Yule, Siemens, L&T /equivalent
55.	**Soft Starter**	Jaishree/Areva / Rockwell / Schneider / BCH Electric / ABB /equivalent
56.	**LT Variable Frequency Drive (VFD)**	Schneider / BCH / Allen Bradley / Danfoss / Siemens / L&T / ABB / Crompton /equivalent
57.	**LT Capacitors**	L&T / EPCOS / ABB / BCH/Schneider /equivalent
58.	**Steel Octagonal Poles**	Bajaj / BPP / PE / TLL / Surya / Aster /equivalent
59.	**Chokes/ignitors**	Bajaj, Wipro, Crompton, Philips, Halonix/equivalent
60.	**Air Compressor**	Ingersoll Rand / Elgi / KG Khosla/equivalent

61.	**Instrument Control Panels**	Industrial Control & Appliances (P) Ltd. / Electric Automation / Jaisum& Hutchison Controls (P) Ltd. / Industrial switch gear & Controls / Rittal/Hensel/Positronics Baroda /equivalent
62.	**LT bar primary/ wound CTS & PTS**	Kappa / NIPPON / Control Switchgear / AE / C&S /equivalent
63.	**HRC Switch Fuse Unit / Fuses**	Siemens, L&T, Schneider, Control &Switch Gear, ABB, GE /equivalent
64.	**Luminaries**	Wipro / Phillips / Bajaj / Halonix / GE /equivalent
65.	**Receptacles**	BCH/ Hensel / Legrand / Havells/ C&S/ /equivalent
66.	**Actuators**	Marsh Automation (Pune) / Rotork / AUMA/SMC/Rotex/equivalent
67.	**Switchgear**	L & T / BCH / ABB / Control & Switchgear / GE / Siemens /equivalent
68.	**Control Gear**	L & T / BCH / ABB / Control & Switchgear / GE / Siemens /equivalent
69.	**Indicating Meter**	Krykard / Enercon / Nippon / IMP / AE /equivalent
	Push Buttons and Push Button Station type 22.5mm dia	C&S/L&T / BCH / Schneider/ Teknik/equivalent
70.	**Vacuum Circuit Breakers**	Siemens / BHEL / ABB /AREVA / ALSTOM /equivalent
71.	**Air Circuit Breaker**	C&S/L&T-C Power/Siemens-Germany/Schneider-France BCH-Terasaki Japan/ ABB- E max/equivalent
72.	**Moulded Case Circuit Breaker (MCCB)**	C&S/L&T / Schneider-NS / Siemens-Sentron / ABB-Isomax/ BCH-TerasakiJapan/equivalent
73.	**Volt and Ampere Meter with Selector Switch**	C&S / L&T / Kay Cee/Secura/AE / ABB /equivalent
74.	**Selector Switch**	C&S / L&T / Kay Cee/Siemens/BCH / ABB/equivalent
75.	**Indicating Lamps LED type 22.5mm dia**	C&S / L&T / Teknik / Siemens / Schneider / ABB /equivalent
76.	**Contactor**	C&S / L&T / ABB / BCH / Schneider /Siemens /equivalent
77.	**Over Load Relay**	C&S / L&T / ABB / BCH / Schneider France/Areva/equivalent
78.	**LT Electronic Over current/ Overload Relay**	C&S/BCH / C&S / Siemens/Jyoti/ABB/Alstom /equivalent
79.	**MV/HT Electronic Motor Protection Relay**	C&s / AREVA / SIEMENS / ABB / SCHNEIDER /equivalent
80.	**Battery Charger**	Amaraja / Chabbi / Statecon/equivalent
81.	**Battery Bank**	Excide / HBL/equivalent
82.	**Street Light / Flood Light Fixtures**	Wipro / Philips / Crompton / Halonix /Bajaj /equivalent
83.	**Bus Bar**	Indal / Valco / Balco / Hindalco /equivalent
84.	**Bus Bar Supports**	C&S/Powermat / Everest Electricals /equivalent
85.	**Single Phase Preventor**	L&T / Minilec/ABB/Schneider /equivalent
86.	**Engine for DG set**	Cummins / Kirloskar / Ashok Leyland / Greaves Cotton /equivalent

87.	**Alternator**	Crompton Greaves / Alstom / BHEL / Jyoti / Leroysomers / Kirloskar / Stamford /equivalent
88.	**Air Blowers**	Everest / Kay International / Swam Pneumatics/equivalent /aerzen
89.	**Electric Hoist / Chain Pulley**	Indef / Reva / W.H. Brady & Co / Hercules Hoists Ltd./ Avon Cranes/ Krane/equivalent
90.	**Motors**	Siemens / Crompton / ABB / Kirloskar/ Bharat Bijlee / Marathon /equivalent/aerzen
91.	**Belt Conveyor**	Indiana / Konal Corporation / Voltas / Batliboi / Dynamic/equivalent
92.	**Gear Box**	Radicon – Greaves / Elecon / Flender/equivalent
93.	**Submersible Pumps**	Grundfos / ABS / Kirloskar / Flygt/equivalent
94.	**Centrifugal Pumps**	Grundfos / KSB / ABS / Kirloskar / Flygt / Mather & Platt /equivalent
95.	**Screw Pump**	ROTO / Tushaco / Netzsch / ABS / Alfa Helical /equivalent
96.	**Agitators**	Milton Roy / Fibre&Fibre / Remi / Voltas/OSDPL /equivalent
97.	**Dosing Pumps**	Milton Roy / XEED / Prominent
98.	**Flow integrators**	ABB / Blue Star / Level Tech / Nova / Forbes/Eureka /equivalent
99.	**Digital LED Indicators**	ABB / Nishko / Switzer / Lectrotek / System devices / Sun Industrial / Eurotherm / Yokogawa / Masibus/equivalent
100	**Timer**	ABB / Siemens / Schneider /equivalent
101	**Chlorine Tonner**	ISGEF / ANUP /equivalent
102	**Pressure Switch**	Indfoss, Switzer, Varma, GIC /equivalent
103	**Temperature Scanners**	Pyrotech, Masibus, Nishko, Lectrotek, Emerson /equivalent
104	**Analog Signal Multiplier**	MASIBUS, Sai Tech, MTL INSTS, NISHKO, P&F/equivalent
105.	**Lightening Protection Unit**	MTL Instruments, Rittmeyer, P & F, Phoenix, OBO Bettermann, National Resistors
106.	**Instrumentation :**	
(a)	**Level Transmitter , Flow transmitter, Level Switch**	Forbes Marshall / Endress Hauser / ABB / Emerson / Nivo Control / Siemens
(b)	**DO Meter**	Endress Hauser / ABB / Forbes Marshall / Fischer Rosemount / HACH / Emerson/SCAN
(c)	**Air Flow Meter**	Forbes Marshall / Fitzer Instruments / George Fitcher / Toshniwal/ABB/Emerson
(d)	**Wastewater Flow Meter**	Forbes Marshall / Endress Hauser / ABB / Emerson / Toshniwal
(e)	**Pressure Gauge**	H. Guru / Fiebeg / Waaree / GIC/Switzer

Note: The firm shall install the equipment as per list of approved makes only. In case

make of any item is not figuring in the list of approved makes specified in the tender document, WAPCOS/CSEZA shall decide make for the same and the decision shall be final and binding.

PART 'B':

ELECTRICAL & MECHANICAL WORKS

This section covers mainly the job requirements before and after the supply of Electrical & Mechanical equipment at site and before / after start of work. This section also covers the liabilities of the Bidder and the quality standards that the Bidder has to maintain for the work to be carried out by him. Power supply by Electrical Panel of LT 415 V MCC shall be provided. 2 Nos. 440 Volt, 4C, 240 mm2 X LPA cables will be provided to the Main Panel Incomer of the project provided by the bidder, from a 500KVA/11 KV/415 V, 3 Ph, 50 Hz transformer through a 600 A, TPN MCCB. The tenderer has to arrange distribution of the supply to different equipment / pumps from the panel. The main incomer panel should have provision for energy meter of 0:23 class accuracy to record the power consumption to the project. The energy meter should be compatible to the energy meter being used in CSEZ, capable of remote monitoring and billing.

Prerequisites before the supply of equipment

Submission of Drawings / design sheets / Data sheets

The Bidder shall submit the following detailed drawings for review and approval of the Engineer.

- Detailed Design Calculation sheets for electrical and mechanical works / equipment.
- General arrangement drawings for all electrical works/equipments to be supplied.
- Technical Specification sheets showing rating, make and quantity of various components used in a specific mechanical/electrical item.

Approval of Drawings \ Documents \Technical Data Sheets

Drawings will either be approved by EIC or he will convey comments that Bidder shall incorporate by modifying the drawings accordingly.

The review of design calculations and drawings shall be carried out only in respect of orientation and sizes of important members, general design principles and approach, adherence to requirements of the relevant IS or other statutory codes, compliance with the technical specifications given in the tender document, general or specific notes and with the requirements of good engineering practice. Check for any interference and taking remedial action is the responsibility of the Bidder.

Approval by the Engineer of the Bidder's design or drawings shall not relieve the Bidder of any of the contractual obligations or liabilities under the contract or his responsibilities for correctness of dimensions, material of construction, weights, quantities, design details, assembly fits, performance particulars and conformity of the supplies with the Indian statutory laws as may be applicable.

Should it be found at any time after approval has been given by the Engineer that any drawings or documents submitted by Bidder are not consistent with any technical data, drawings or documents submitted or approved previously or substantially deviate from any major aspect of the contract, then such alterations or additions as may be deemed necessary by the Engineer shall be made therein by the Bidder and the works carried out accordingly without any extra cost.

The Bidder shall make no revision after a design; drawing or document is “approved” by the Engineer. In case the Bidder desires to incorporate any amendments in any amendments in an “approved” drawing, he shall re-submit the same for formal approval giving reasons for the change required.

Tests and Inspection before supply of equipment

Inspection of material is to be arranged by the Bidder for bonafide use of work at manufacturer’s premises. The bidder shall have to made arrangement of all the material / equipment for testing at his own cost. All the major equipment (such as pumps, blowers, motors etc.) shall be inspected within 15 days of inspection call. The inspection of material shall be carried out by the officer authorized by the Engineer. The department will also have the right to get the material inspected from the 3rd party. 3rd party inspection charges, if any, will be borne by the department.

Shop Tests

For tests carried out at the manufacturer's factory, relevant test certificates shall accompany the supply of equipment however two copies of test certificates shall be provided by the Bidder immediately to the Engineer at the time of completion of the shop test. Some of the equipment may have to be tested for certain parameters only when installed in position at site. The Engineer or his representative reserves the right to visit manufacturer's workshop or at site on their own without informing the Bidder. 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.

Prerequisite along with supply of equipment

Submission of Document related to installation, operation and maintenance

The Bidder shall submit instructions / operation & maintenance manual to the Engineer at the time of delivery of items at site.

- Information supplied by the sub-Bidder and Manufacturers employed by the Bidder shall be coordinated into the comprehensive manual. The instruction manual 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 each item of the plant including the erection, commissioning, testing, operation, maintenance, dismantling and repair.
- Where applicable, fault location charts shall be included to facilitate tracing the cause of manufacture or breakdown.
- A section dealing with procedures for ordering spares shall also be included in the instruction manual.

- Technical Specifications of equipment.
- Schedule of preventive maintenance, calibration and repair instructions.
- Parts list and spare parts recommendations.
- Safety precautions to be furnished while handling different units and First aid instructions.
- Do’s and don’ts in equipment operation. Operators attention shall be drawn to all operations considered to be dangerous to operate or likely to cause damage to the plant. Complete list of recommended lubricants, oils and their charts.

Prerequisites after completion of supply of equipment

- Bidder shall make arrangements for proper storage of the equipment supplied by him at site before being installed at their respective positions.
- All equipment shall be installed in accordance with the equipment manufacturer’s recommendations and good practice. Sufficient notice shall be given to the EIC prior to equipment installation in order that the EIC or his representative may be present during installation.
- Some of the equipment may have to be tested for certain parameters only when installed in position at site.
- Bidder shall also submit a proper commissioning schedule for commissioning of the entire plant as agreed by the Engineer. The commissioning of machinery shall be run in order to ensure the normal functioning of the plant to the satisfaction of E.I.C. The problems faced shall be trouble-shooted immediately.
- Final test certificates carried out during the construction or on completion of the whole works/at the successful commissioning of the equipment shall be submitted within seven days of the completion of the test.

Tests on Items of Plant during Erection

Devices and equipment shall be checked for correct functional performance in accordance with apparatus rating, operating sequence and code requirements. All motors shall be checked and adjusted for correct direction of rotation. Loading of circuits and feeders in panel boards shall be checked and balanced.

Interior installation and distribution systems, 600 volts and less, shall be tested for insulation resistance after all wiring is completed and fixtures and equipment are connected being ready for use. Tests shall be made with an instrument capable of measuring accurately the resistance involved and having a voltage rating as specified by IS Reading shall be taken after the high voltage test of insulation resistance between conductors and also between each conductor and ground.

The Bidder shall carry out all tests on plant witnessed by the Engineer or his authorized representative. All tests shall be to the satisfaction of the Engineer / authorized representative appointed by him who may require tests to be repeated prolonged or modified as may be necessary to ensure that any or all items of plant confirm with the contract.

If during or after testing any item of plant fails to achieve its intended duty or otherwise proves defective, it shall be modified or altered as necessary and re-tested and re-inspected as required by the Engineer and the Bidder shall bear all costs for such rectification/modification / replacement work.

The Engineer or his representative will have the power to omit, add, modify or adjust during stages of erection of any item of work as may be necessary or expedient for the work. No claim for compensation or damage will be entertained on the account of such changes.

Commissioning and Testing

Commissioning shall commence after installation of all equipments and their installation checks carried out successfully and inspected / approved by the Engineer's or his authorized representative.

Ground Tests

Ground readings shall not exceed 5 ohms when tested as per I.S. 3043. After installation and before placing in service, the system shall be given a high potential test by applying alternating or direct current between each conductor of the system as one terminal consisting of the ground. Prior to making the tests, the wires and cables shall be disconnected from the equipment. The method, voltage, length of time shall be in accordance with the cable manufacturer’s and I.S.I Standards.

Special tools and accessories

All special tools, equipment, or accessories required for the installation and maintenance for plant equipment as well as five sets of copies each of instruction manuals necessary for the proper use of such tools, equipment or accessories shall be provided by the equipment manufacturer.

Quality Assurance from Bidder side

The Bidder shall provide all the required labour, permanent equipment and materials, tools, safety equipment, transportation and test equipment for supplying, installing, adjusting and fully testing all the mechanical work shown on the approved drawings or included in the tender document or ordered by the EIC.

Standards

All mechanical equipment and the materials used shall comply with the relevant Indian Standards unless a more rigorous requirement is specifically stipulated. If no applicable Indian Standard is available for any item of equipment or materials, the specifications will be decided by EIC. In every situation the latest specifications, standards etc. shall apply unless otherwise stated.

All main items of electrical equipment such as switchgear and motor controllers, motor control centers, panels, starters etc. shall have an etched metal or laminated Bakelite name plate identifying these pieces of equipment and securely mounted on the equipment by screws.

Packing and Transport

The equipment shall be transported to site packed in wooden crates. They shall be wrapped with polythene sheets to prevent damage to the finish.

Materials and Workmanship

All equipment furnished under this or allied sections shall be new and guaranteed free from defects in materials, design and workmanship. If inadequate information is provided in the specifications, it shall be the Bidder's responsibility to ascertain the conditions and service under which the equipment is required to operate and to warrant accordingly that operation under such conditions shall be successful. All parts of the equipment shall be adequately proportioned to safely withstand all stresses that may occur or be induced in them during fabrication, erection and intermittent or continuous operation.

All equipment shall be designed, fabricated and assembled in accordance with the latest standards and workshop practice. Individual parts shall be manufactured to standard sizes and gauges so those spares, furnished at any time, can be installed in the field. Corresponding parts of duplicate units shall be fully interchangeable. Equipment shall not have been in service at any time prior to delivery, except as required for tests.

All materials used shall be appropriate for the service conditions. Iron castings shall be tough, close-grained grey iron free from blowholes, flaws or excessive shrinkage and shall comply with the requirements of IS 210. Except where otherwise specified structural and miscellaneous fabricated steel used in items of equipment shall conform to the relevant Indian Standards. All structural members shall be considered as subject to shock or vibratory loads.

Bidder shall assign a competent representative who shall supervise the electrical construction work from beginning to completion and final acceptance.

Cutting, Drilling and Welding

- The Bidder shall provide the required cutting, drilling and welding etc. that will be required for the mechanical/electrical construction work.
- Cutting and drilling of structural members shall not be permitted, except when approved by the Engineer. A core drill shall be used wherever it is necessary to drill through concrete or masonry.
- The Bidder shall provide the required welding for equipment supports as desired by Engineer.
- Junction Pull Boxes and Hand holes shall have covers stencilled with box number when shown on the drawings. Data shall be lettered in a conspicuous manner with a colour contrasting to finish.
- Switch plates in designed areas shall be suitably engraved with a legend showing function or areas when required by Codes or shown on the drawings.

Drives

To ensure vibration free operation all rotating components of each pumping unit shall be statically and dynamically balanced. The mass of the unit and its distribution shall be such that resonance at normal operating speeds is avoided. In any case, the amplitude of vibration as measured at any point on the pumping unit shall not exceed the limits set forth in the latest edition of the Indian Standards.

Upon completion of the electrical work, the Bidder shall remove all surplus materials, rubbish, and debris that accumulated during the construction work. The entire area shall be left neat and acceptable to the EIC.

Lubrication

Bidder shall ensure constant presence of lubricant on all wearing surfaces. Lubricant filling and draining openings shall be readily accessible. Easy means for checking the lubricant level shall be provided. Prior to testing and/or operation, the equipment shall receive the prescribed amount and type of lubricant as required by the equipment manufacturer.

Painting

Shop painting should conform to the standard requirements. Electric motors, gears, starters and other similar self-contained or enclosed components shall be shop primed and finished with high-grade, oil-resistant acrylic enamel or other coating. Surfaces that will be in accessible after assembly shall be painted or otherwise protected before assembly by a method that provides effective protection throughout the expected economic life of the equipment.

Unless otherwise required in the detailed equipment specification, surfaces to be painted at the plant site shall be shop-painted with one or more coats of a primer which will adequately protect the equipment until finishing coats are supplied at site.

Machined and polished metallic surfaces that are not to be painted shall be coated with an approved rust-preventive compound. Before applying paint, the surfaces to be painted shall be cleaned and shall be free from rust, dust, oil etc. The painting shall be with two coats of zinc rich /chrome primer and two coats of finish paint. Each coat shall not be less than 50 micron.

Electrical equipment, which shall be installed outdoors shall be provided with a proper cover and the protection provided shall conform to the latest IS codes for outdoor installations. Bidder shall provide the required painting for all unfinished surfaces of electrical materials, including supports.

All scratched or marred surfaces shall be refinished with touch-up paint to match the original finish.

Equipment Guarantee

Unless specified otherwise elsewhere, the Bidder shall furnish and replace at no cost to the Department any component of the equipment that is defective or shows undue wear within guaranteed period as per OEM from the date of stabilisation of ZLD system. In addition to performance guarantees, processes or systems shall comply with the requirements stipulated in the relevant sections of the specifications.

Liability of the Bidder

The Bidder shall obtain and pay for the required bonds, insurance's, licenses, permits and inspections and pay all taxes, fees and utility charges that shall be required for the mechanical/electrical works.

If during the period of erection, Bidder or his workmen damage willingly or accidentally any part of the building structure or materials without written permission of Engineer, the Bidder shall be completely responsible for the damages and he will have to make rectification /replacement at his own cost.

Incidental items not included in the tender drawing and specifications, that can legitimately and reasonably be inferred to belong to the electrical work shall be provided by the Bidder at no additional cost to the Department. The decision of the Engineer in this matter shall be final.

All equipment and materials shall be of latest design, and standard products of established manufacturers.

The equipment approval at the factory only allows the manufacturer to ship the equipment to the project site. The Bidder shall be responsible for the proper installation and satisfactory start-up operation of the equipment in accordance with the manufacturer's requirement and to the satisfaction of the Engineer.

Inspection of the equipment at the factory by the Engineer will be made after the manufacturer has performed satisfactory checks, adjustment tests and operations.

Bidder shall make arrangement of all power required during the construction period and tests performed during erection of equipment.

The Bidder shall be absolutely and solely responsible for damages due to accidents, injuries or losses, occurring to any person and property by his sub- Bidders, agents or employees involved on his behalf in the execution of the work

Pumps:

Pump Casing

The pumps casing should be of cast iron as per IS 210 Gr FG 260 with 2 to 3 % Ni. The internal surfaces should be free of rough spots. The casing should have Centre line discharge. The finishing of the outer surface should be uniform and smooth.

Impeller

The material of impellers should be of Stainless Steel grade CF8M, of single/double vane, non-clog Closed/semi-open design.

Pump Shaft

The pump shaft should be robust and shall be of AISI 410 of AISI 420. The design of shaft shall be dry type and it should not come in contact with pumped liquid.

Pump Bearings

Pump bearings should be of the anti-friction type. The bearings should be able to take normal axial thrust loads due to unbalanced hydraulic loads on the impellers plus the weight of all rotating parts of the pump. Pump bearings shall be designed with a minimum life of 40,000 hours. The bearings should be grease lubricated for longer life and shall be maintenance free.

Guide Rail Assembly

The assembly should have CI pedestal, however the fasteners and foundation nuts and bolts should be of stainless steel with twin guidewire/ rail holder etc. The pedestal and bracket should provide automatic coupling between pump delivery and discharge pipe.

Mechanical Seals

Double mechanical seal should be provided to prevent pumped liquid entering into the motor winding. The seals should be situated in the oil chamber to ensure proper lubrication. The sensor will be used for tripping the pump and also for alarm. The face combination of mechanical seals should be Silicon Carbide Vs Silicon Carbide for both sides

Moisture Sensor

Moisture sensor or seal monitor should be provided in the Motor Chamber to detect the failure of the mechanical seal. The sensor should trip the pump motor in the event of ingress of moisture into the oil chamber.

Lifting Chain

Each pump should be provided with SS 304 lifting chain of adequate strength. One end of the chain shall be attached to the pump and the other end fixed near the upper bracket for guide wire/rail assembly by means of SS 304 Shackle. The chain shall have SS 304 rings fixed at an interval of about 1 m for engaging the hook of the manual hoist. A SS 304 Chain of sufficient length shall be provided to hold the ring of shackles and another end shall be tied to the platform being accessible to the operator.

Fasteners

All pump fasteners should be in stainless steel SS 304.

Foundation Nuts & Bolts

All foundation Nuts & Bolts should be in stainless steel SS 316.

Protective Coating

The pumps should be epoxy coated.

Pump Balance

All rotating parts shall be accurately machined and shall be in rotational balance. Excessive vibration shall be sufficient cause for rejection of the equipment. The mass of the unit and its distribution shall be such that resonance at normal operating speeds is avoided. In any case the amplitude of vibration as measured at any point on the pumping unit shall not exceed the limits set forth in the latest edition of Indian Standards. At the operating speed, the ratio of relative speed to the critical speed of the unit or components thereof, shall be less than 0.8 or more than 1.3.

Submersible Cable

Each pump shall be provided with submersible cables of equal length for power as well as control so that the pump position can be interchanged with each other. The cable shall be terminated in a weatherproof junction box, which should be located outside the main pump sump. Cable between junction box & control panel can be non-submersible type. Power cables should be selected so as to carry at least 1.5 times the full load current at existing Power Factor of 0.8.

Spare Parts

Each installed pump should be supplied with one impeller duly machined, one set of mechanical seals, one set of wear rings (if applicable), and one set of O-rings and gasket, bearing set, set of fasteners.

Performance Tests

Shop Test
Each assembled pump shall be shop tested by the manufacturer to determine the following characteristic within the operating range as specified in the schedule.

- Head Capacity Curve
- Brake Horsepower Curve
- Efficiency Curve
- Balancing (Impeller only)
- e Total Power consumed.

All tests shall be conducted in accordance with the requirements of the latest Indian/ ISO 9906 grade-2 Standards. In the event of any pump failing to meet the specified test requirements, it shall be rejected. Each pump performance shall be documented by obtaining concurrent readings showing motor voltage and amperage, pump suction head and pump discharge head. Such readings shall be documented for at least five pumping conditions. One test shall be at the shut off head. These tests shall be carried out through reputed and authorized agencies with the involvement of CMC officials. After it has been demonstrated to the satisfaction of the Engineer that the pumping equipment complies with these specifications the Engineer shall be furnished with the Manufacturer's Test Certificates for

the following.
Hydraulic test on casing

- Routine test certificates on motor including HV test, Megger test, slip test, temp. rise test.
- Material test certificates certifying the grades of the materials used.

Field Test

General operational check shall be carried out after installation and before commissioning.

Submersible Motor:

General

The motor should be an integral part of the pump. The enclosure for motor shall be IP-68. Each phase of the motors shall be provided with thermistor or Bimetallic Electromechanical Temperature Detectors. The motor winding shall be suitable for Star – Delta Starter. The motor should be designed for minimum 10 starts per hour, irrespective whether it is star-delta start or otherwise. The rating of the motor shall be designed for 20% extra power margin at duty point & 15% at the lowest head.

Scope

This specification covers the design and manufacture of squirrel cage induction motors required for wastewater treatment plant. Contents of this specification are integral part of the contract documents. For other details refer specifications for motors (wherever applicable). The motor shall operate satisfactorily at all operating levels in Sludge Sump.

References

Unless they are at variance with the clauses of this specification, the squirrel cage induction motors and their components shall comply with the applicable Indian Standards listed below. Where Indian Standards do not exist, the relevant British or German (VDE) Standards shall apply.

IS 325 Three phase induction motors
IS 1231 Dimensions of three phase, foot mounted induction motors
IS 2223 Dimensions of flange mounted AC induction motors
IS 2253 Types of construction of mounting arrangement of rotating electrical machine
IS 4691 Degrees of protection provided by enclosures for rotating electrical machinery
IS 4889 Methods of determination of efficiency of electrical machines
IS 4722 Rotating electrical machines
IS 4029 Guide for testing 3 phase induction motors

Operating Conditions

Ambient Conditions
Motors shall be suitable for operating satisfactorily in humid and corrosive atmospheres

found in sewage treatment plants. If not scientifically mentioned therein, a maximum ambient temperature of 40 0C and an altitude not exceeding 300 meters above mean sea level, shall be taken into consideration.

Frequency and Voltage Fluctuations
Motors will be required for continuous, satisfactory operation at rated output under the following conditions:

- At rated frequency with voltage variations of ± 10% of nominal value.
- At rated voltage with frequency variations of ± 5% of nominal value.
- *With a simultaneous and combined variation in frequency and voltage of ± 10% from the nominal values.*

Starting

Unless otherwise specified motors shall be designed for Star Delta starting across full line voltage. Motors shall be designed for re-start under full load after a momentary lack of voltage, with the possibility of the restored supply voltage being 100% out of phase with respect to the motor residual voltage. The minimum starting torque should be 140% of Full Load Torque, with minimum torque during running up shall be 100% of Full Load Torque and minimum starting torque shall be 200% of Full Load Torque. The submersible pump motors shall be designed for minimum 10 starts per hour.

Direction of Rotation

The motors shall be suitable for operating in both directions of rotation. The direction of rotation is defined as that looking towards the motor from the non-driving end.

Noise

The noise level shall be within the permissible limit as specified in the Indian Standard.

Performance

Starting Current

For squirrel cage motors working in the voltage range of 360 V - 420 V the starting current shall be limited to 7 times the full load current.

Torque Characteristics

For motors working in the voltage range of 360 V - 420 V, the minimum starting torque shall be 140% for full load torque, with minimum torque during running up 100% FLT and minimum starting torque 200% FLT.

General Requirements and Construction Details

The motor should be dry, squirrel cage type, suitable for 3 phase 415V supply, continuous duty with Class H insulation. Winding of the motor should be impregnated by resin in order to achieve required thermal withstanding capacity. Motor should have integral cable port and cable entry should be sealed. The cable must be leak-tight in respect of liquids and firmly attached to the terminal block. The motor should be designed for non-overloading characteristics. There should be thermal protection against overheating of motor winding. Motor should be sealed against entry of liquid being pumped by using two mechanical seals. The lower seal provided should have silicon carbide Vs silicon carbide face combination. Pump design should ensure that seal does not come directly in contact with liquid being pumped as well as cooling/lubrication by oil is provided. Moisture sensor of the tripping unit should be located inside the oil chamber.

Windings

All motors shall be provided with Class H insulation. The windings shall be so treated as to resist the action of corrosive agents as may be present in the atmosphere of sewage treatment plant and that tend to dissolve the insulation.

Windings shall be adequately braced to prevent any relative movement during operating conditions and in this respect, particular attention is drawn to the stator windings of Star – Delta squirrel cage motors. Adequate insulation shall be provided between coils of different phases, which lie together.

Star/ delta starting is required, as shown on drawings, the motors windings shall be fully insulated for delta connection.

The rotor shall be balanced to provide a low vibration level and a long life for the bearings.

Shaft Extension

Motors shall be provided with a single extended shaft with key way and key as per requirements.

Lifting Hooks

All motors shall be provided with lifting arrangement of adequate capacity.

Terminals, Terminal Boxes and Cable Entries

The ends of the windings shall be brought out into a terminal box. The terminals shall be of adequate size. The terminal box shall be housed in the motor housing itself. The cable entries should be sealed to prevent water seepage into the terminal box/ motor winding.

Phase Marking

Appropriate phase markings as per **IS 325, 1978** shall be provided inside the terminal box. The markings shall be non-removable and indelible.

Motor Casing

The motor enclosure shall be IP 68. The housing shall be of C.I. air-filled and water-tight. The housing shall be coated with epoxy after applying primer coating.

Bearing and Lubrication

Motors shall have grease-lubricated ball or roller bearings. In all cases, the bearing shall be chosen to provide a minimum operating life of 40,000 working hours. Bearing shall be adequate to absorb axial thrust. The bearing shall be maintenance free with grease fill for life.

Special Tools and Spanners

Each rating and frame size of motor shall be provided with 2 sets of any special tools required for dismantling and maintenance of the motor.

Name Plates

A nameplate as required under IS 325 shall be provided on each motor.

Test and Test Certificates

The motor shall be tested in accordance with ISO 9906/Class-2 / **IS 325 and IS 4029**. Eight copies of the test report should be submitted for approval.

Fasteners

All fasteners shall be SS 316/A4

Instrumentation

Float switches

In each pump sump, 1 ultrasonic level switch with transmitter is to be provided for automatic start/stop of the pumps. Also low level and high level signal is to be transmitted to the Main Electrical Panel Room.

Screw Pumps

These pumps shall be used for pumping sludge. The pumps shall be designed to operate satisfactorily without detrimental surges, vibration, noise, or dynamic imbalance. Over the required head range, the head-capacity curve of the pump shall have a continuously rising head characteristic with decreasing capacity over the whole range of total head. The pump shall have the maximum efficiency at the specified duty point. The unit shall be designed to operate safely at the maximum speed attainable in the reverse direction of rotation due to sewage returning thro the pump at times when power supply of the motor is interrupted. The first critical speed of the pump set shall be at least 30% above the operating speed.

The pumps shall run smooth without undue noise and vibration. The velocity of vibration shall be within 4.5 mm/sec. The noise level shall be limited to 85 dBA at a distance of 1.50 m.

All rotating parts shall be statically and dynamically balanced as per ISO standards.

A stationary coupling guard shall be provided for the coupling conforming to all relevant safety codes and regulations. Guards shall be designed for easy installation and removal.

They shall be complete with necessary support accessories and fastener.

The pumping unit shall be provided with a common base plate. The base plate shall be of sufficient size and rigidity to maintain the pump and motor in proper alignment and position.

The pump design shall be as per IS 6595 and pump performance shall be as per IS 9137

The power rating of the pump motor shall be the larger of following

- 115 % of power required by the pump at the duty point
- 110 % of maximum power required by the pump from zero discharge to the runoff point total head.

Progressive Cavity Pumps comprising a stator manufactured from a resilient material and a helically ground rotor shall be considered for pumping domestic/industrial sewage, sludge having abrasive and corrosive particles/solids.

SNo	Component	Material
1	Pump Housing	CI IS 210 Grade220 or 260
2	Rotor	SS AISI 410(HCP)
3	Shaft	SS AISI 410(HCP)
4	Stator	Nitrite black
5	Type of drive	V belt & Pulleys
6	Base plate	MS fabricated
7	Seal type	Gland packing

Design

Drive torque shall be transmitted through two universal Cardan joints with 24 months warrantee instead of Pin Bush Joint.

Dry-running protection device

For pump installed in negative suction condition the Pumps shall be fitted with individual dry-running protection to initiate pump trip. Dry running Protection by ‘under-current’ monitoring or ‘pipeline-intrusive’ device shall not be used.

Parameters of Pump

Capacity - As per Bidder
Head - As per bidder
Mechanical efficiency - 50% to 70%
Volumetric Efficiency - above 65%
Pump Speed - Rubbing velocity (VGM) and it should be within the level of 2.5 m/sec.

S.No.	Flow rate Upto (m^3/hr)	Soft & Compressible solid (in mm)
1	1	16 mm
2	2	20 mm

3	3	24 mm
4	6	24 mm
5	12	28 mm
6	>12	40 mm

Performance Test - As per VDMA 24284 Gr.II, Class II
Mechanical balancing - Not applicable for Single screw Pumps
Field Test - Not applicable

Air Blowers (Sludge Sump)

The blowers shall be provided in Sludge Sump. The blowers shall be capable of developing the required total pressure at the rated capacity for continuous operation. The blowers shall be Twin / Tri lobe type.

The blowers shall be provided with suction air filter, silencer, dead weight pressure relief valve and pressure gauge and the air delivered shall be clean, dry and oil free. The blower noise level and velocity of vibration shall be within 85 dB(A) and less than 4.5mm/s at a distance of 1.50 m respectively. The blower shall be driven by squirrel cage induction motor

The speed of the blowers shall be below 1000 rpm. The power rating of motor shall be at least 10% above the maximum power requirement by the blower. The blowers shall be mounted at a level necessary to avoid back flow or siphoning of sewage into the blower. The accessories shall be complete with common base plate for blower and motor, suction and discharge connection, non-return valve, safety valve, pulley and V- belt guard, eye bolts etc.

- Material of construction:
- Casing: C I conforming to IS: 210 Gr FG 260
- Rotor: Alloy steel
- Shaft: Carbon steel C40/EN 24/19
- Timing gear: Cast alloy steel
- Pulley and gear side plates and cover: CI conforming to IS 210 Gr FG 260
- Parameter:
- Type Twin / Tri lobe
- Discharge pressure To suit process requirement
- Power transmission Direct drive
- Cooling Air cooled
- Code BS 1571

Tests

S. No.	Test	Specs
1	Hydrostatic tests	Twice the maximum working pressure
2	Performance test	As per BS : 1571
3	Strip test	Clearances with tolerance limit
4	Mechanical balancing	ISO 1940 Gr. 6.3 or better
5	Visual Inspection	Before painting

Auto Valves

Valve Actuators

All actuators shall be motorized type and local controls shall be protected by a lockable cover.

Each actuator shall be adequately sized to suit the application and be continuously rated to suit the modulating control required. The gearbox shall be oil or grease filled, and. capable of installation in any position. All operating spindles, gears and head stocks shall be provided with adequate points for lubrication.

The valve actuator shall be capable of producing not less than 1½ times the required valve torque considering valve spindle jamming and shall be suitable for at least 5 continuous operation.

The actuator starters shall be integrally housed with the actuator in robustly constructed and totally enclosed weatherproof housing. The motor starter shall be capable of starting the motor under the most severe conditions. The entire electrical system shall be tropicalised.

The starter housing shall be fitted with contacts and terminals for power supply, remote control and remote positional indication, and shall also be fitted with internal heaters so as to provide protection against damage due to condensation. Heaters shall be suitable for single phase operation. The heaters shall be switched “ON” when the starters are “OFF” and shall be switched “OFF” when the starters are “ON”.

Each actuator shall be equipped as follows:

- AC electric motor with engage/disengage clutch mechanism of the dry type.
- Reduction gear unit (with thrust bearing if required)
- Torque switch mechanism
- Limit switch mechanism
- Geared hand wheel for manual operation of valve.
- Valve position indicator – open/closed
- Auto-Manual lever with suitable locking arrangement
- Valve position transmitter
- Reversing contactor starter complete with overload relays of suitable range and adequately rated control fuses
- Actuator with integral starter shall have selection between local/remote operation
- Local control switch/push buttons
- 415 V/110 V AC control transformer
- A white lamp for supervision of main supply to be provided locally.
- A potential free contact shall be provided to annunciate over-load trip/main supply failure on remote panel
- Provision for local as well as remote operation

Special Features

- Two (2) nos. interposing relays for matching the control voltage of remote commands.

- The motor shall be specially designed for valve operation, combining low inertia with a high torque and with linear characteristics.
- All motor actuators shall be provided with visible local valve position indicators mounted on the actuator assembly itself.
- The torque switch shall function to stop the motor on closing or opening of the valve, on actuation by the torque when the valve disc is restricted in its attempt to open or close. A minimum of two (2) torque switches, one for closing direction and one for opening direction shall be provided.
- The non-adjustable limit switches shall stop the motor and give indication when the disc has attained the fully open or close position. Provision shall be made for indication of stuck or jammed valve.
- All wiring connections from the various switches shall be brought out on to separate terminal box mounted on the valve, having liberal space for wiring and making connection.
- The terminal box shall be suitable for outdoor use and shall be weather-proof and dust tight.

2. Electric Hoists

The construction of the hoist, its components, the design, testing and commissioning shall conform to IS 3832. All lubrication points shall also be easily accessible without the need for any dismantling of other equipment or accessories. The hoist must be equipped with adequate safety devices. The hoist shall be designed, supplied, installed and tested in conforming to the relevant Indian standards.

Construction

Frame

The frame is fabricated from steel sections and is of very robust construction. The traveling trolley frame shall be made of rolled steel conforming to IS:2062. The side plates of trolley frame shall extend beyond wheel flanges, thus providing bumper protection for wheels. The two side plates shall be connected by means of an equalising pin.

Rope Drum

Rope drum is of fabricated mild steel plate or seamless pipe and machined & grooved at working surface accurately to receive the wire rope in single layer. The Drum is supported on anti-friction ball / roller bearings.

Rope Guide

A sturdy, specially designed rope guide is provided to guide wire rope in correct grooves while fitting and lowering.

Gear box

Totally enclosed, oil bath lubricated gearbox houses the gears machined out of steel and teethed on precision hobbing machines.

Wire Rope

Extra flexible wire rope of best plough steel is used to provide a minimum FOS as per ISS: 3938. The rated capacity of the rope should be 4-5 time the maximum load to be lifted.

Cross Travel Trolley

The trolley wheel is provided by a separate motor and a separate totally enclosed greased packed / oil bath lubricated gearbox. The runner wheels are mounted on ball bearings and are adjustable for various sizes of hoists.

Bottom Block

Rope Sheaves of forge / fabricated steel are provided. The load hook that is of forged steel and tested as per IS 3815, is supported on a Thrust bearing so that the load may swivel freely.

Main Electrical Panels

Electrical Panels would be provided for feeding and controlling the various electrical loads.

General Specifications

Material specifications are given below and Price Schedule for each equipment given in the description against each item. It shall be the responsibility of the bidder to match the rating to the various equipments. Under no circumstances will the rating of the Electrical Equipment be less than that specified in bill of material for each equipment. The Control Panels would be fabricated from 14SWG CRCA sheet, cubical type, floor mounting and free standing, suitable for indoor installation with a separate base rolled channel of 40 x 75 x 9 mm section. All gland plates shall be manufactured to 3.15 mm thickness. Adequate bus bar supports should be provided for better fault withstanding.
The Panel will be made dust and vermin proof by providing good quality gaskets on doors, removable covers, gland plate etc. It will have a compartmental design, where in the incoming and outgoing feeders, bus bars etc will be mounted in separate compartments having its own front door. The Panel will be made extensible type; the main switch of each feeder will be inter-locked with its front door so that the door can not be opened in the closed position of the switch. All the live parts inside the panel would be covered with perforated sheet from the rear and with fiberglass / acrylic from the front as per the degree of protection specified.

The Panel will be completely wired internally with brought out terminal blocks for external wiring. Due to heavy corrosive atmosphere in the surroundings, the sheet metal work of Panel will be Powder coated of 60 Micron after going through 7-tank treatment with shade of RAL-7032 OF IS-5. The construction method would conform to Indian Standards. The Panel height would not exceed 2450mm and operating height will be limited to 2000 mm from finished floor to the top of the cabinet. Cabinet doors will be equipped with concealed or detachable type hinges and with flush or semi-flush., spring catch type, flush cylinder locks.

All joints and connections will be made by galvanized or cadmium plated high tensile strength bolts, nuts and washers between feeder compartments between bus bar chamber and feeder compartments & vertical partition between feeder compartments and cable alleys would be provided in order to prevent short circuiting of Power and/or control terminals due to accidental dropping of maintenance tools.

Access from front and top only will be limited to buses and cables. All other equipment will be mounted on the front side and will be accessible from the front through he hinged doors, Selector Switches, Ammeters, Voltmeters, and indicating Lamps, Push Buttons etc will be mounted on doors. Opening of Bus Bar Chamber will be permitted with special tools only. Compartments door will be interlocked against opening when the Air Circuit Breaker is in ‘ON’ Position. However it will be possible to bypass this interlock for inspection purpose. Opening for natural ventilation will be provided and will have screen of perforated sheet. All unpainted steel pats will be cadmium plated to prevent rust corrosion. If these parts are moving elements, then they will be greased. Suitable lifting lugs will be provided which will not leave any openings when removed separate Air Vent Boxes at least 2 Nos. will be provided on top of the panel for proper heat dissipation. Name Plates will be provided for each piece of equipments such as lamps, push buttons, switches, ACB’s, measuring instruments etc. mounted on the panel. Special warning plates will be provided on all removable covers or doors giving access to cable or brushes, identification tag will be provided inside the panel for switches, fuses etc. Engraved nameplates will be preferable of 3-ply (red-white-red or black-white-black) lamicoid sheets. Size of the ‘Letter’ will be 5 mm height. ‘Screws’ and not adhesives will fasten nameplates. Sizes of ‘Letter’ of the main nameplates will not be less than 20 mm in height. The Manufacturer will furnish the test certificates of the components where ever applicable.

Moulded Case Circuit Breaker (MCCB)

The MCCB (Moulded Case Circuit Breaker) will conform to the latest IEC947-2 & IEC 947-3 1989. The Service Short Circuit Breaking Capacity (Ics at 415V AC) would be as specified at the required level.

The MCCB will be Current Limiting type and comprise Of Quick Make – Break switching mechanism, preferably Quick Break Contact system, are extinguishing device and the Tripping unit, contained in a compact, high strength, heat resistant, flame retardant, insulating moulded case with high withstand capability against thermal & mechanical stresses. All MCCBs will be capable of defined overload adjustment. All MCCB’s rated 400A and above will have adjustable Magnetic Setting. The Trip command will over ride all other commands. The MCCB will employ maintenance free double break contact system to minimize the let thru’ energies and capable of achievements Discrimination up to the full short circuit capacity of the downstream MCCB.

The manufacturer will provide all the technical information and I-t Characteristic curves. The MCCB shall have distinct Line / Load connections.

The handle position will give positive indication of ‘ON’, ‘OFF’ or ‘Tripped’ thus qualifying to Disconnection as per the IEC947-3 indicating the true position of all the contacts. In case of 4 Pole MCCB, the neutral will be fully rated and capable of suffering protection. The MCCB will have protection against Overload, Short Circuit minimum breaking capacity of MCCB will be 16KA ICS=100% ICU

Volt and Ampere Meter with Selector Switch

96 mm square, Voltmeters (0-500V) and Ampere Meters of suitable range of high quality industrial 'A' grade conforming to latest relevant IS specifications. The Voltmeter and Ammeter should be of Panel type. Selector Switch shall be rotary type.

Indicating Lamps

Two Indicating Lamps green and red coloured will be oil and dust proof, LED type bulb rating about 230V for showing 'Pump Off' and Pump Running' respectively.

Starter

For Motors upto 10HP Air Break Direct on line starter would be provided. For motor above 10HP upto 50HP Star Delta starter shall be provided. For motors above 50 HP, Soft starters shall be provided.

Contactors

The contactors should comply with the latest IEC947-4 and the corresponding IS13947-4 standards. They will have CPRI test Certificates. It would be manufactured by a company having got ISO9001 approval. The contactor would be rated for AC3 duty at 415V and 50HZ. The Contactors would be fast closing and fast opening type. The making and breaking capacity values of the contactors would be as follows (as per IEC947-4) :-

For AC3 Duty

Making Capacity more than 10 Ie
Breaking Capacity more than 8 Ie

For AC4 Duty

Making Capacity more than 12 Ie
Breaking Capacity more than 10 Ie

The Contactors would be capable of frequent switching and should operate without de rating at 55 degree C for AC3 applications. Above 185Amp Coil Access should be available from front.

The rated operational voltage of the contactor should be 690V and rated insulation voltage will be 690-1000V. The rated impulse voltage of the contactor would be 8KV.

The contactor will have 1 NO+1 NC inbuilt Auxiliary Contact Block. The Contactor would be modular in design and would be suitable for the addition of auxiliary contacts and other electrical auxiliaries without any compromise on the performance or the operations of the contactors. The Contactors from 4 to 400 KW will be designed to accept the respective auxiliary contact block range.

There will safety clearance distance on the front of the contactor. In case of screw or lug terminals, the terminals will be delivered in closed position resulting in safety during installation time. All Contactors will be having terminal marking as per standards.All Technical data should be laser printed on the Contactor

The thermal over load relay if used will be direct/separate mounting over the contactor without any specific connections.

For Capacitor use, the Contactor would be suitable for Capacitor with damping Resistance having unlimited in rush current handling capacity.

Over Load Relay

The overload relay would comply with the latest IEC947-4 and the corresponding IS13947- 4 standard. They will be having CPRI certification. They will be manufactured in an organization in accordance with the requirements of ISO 9001 standard.

The Relay would be direct contactor mounting type and should have the provision to be mounted separately also. The Over load Relay would be ambient compensated type and would be operable up to 55oC. It will be designed for utilization category AC3. the Relay will be tripping as per the specified tripping curves given in the technical data. The overload Relay would have build in phase loss protection as per IEC947-4. The Over load Relay would be capable to withstand up rated currents and inrush currents. The overload relay would have the possibility to select manual / auto reset at site.

In case of screw clamp terminals or connectors they will be delivered in closed position resulting in safety in wiring time. The rated operational voltage will be greater than or equal to 690V. The rated impulse should be 6KV. All over load relays would have been subjected to variable ambient conditions.

The Selection of the overload relay would be such that up to 200 A thermal bimetal over load relay would be used and beyond ratings of 200A only CT operated overload relay would be used.

The Relays will have to assure protection of the connected equipment in case of overload and partial single phase as per the characteristics.

Correct operation of over load relay contacts will be checked by pressing the test button on the relay. A trip indicator will indicate the relay status. Reset following tripping would be automatic or manual. This is selected by the user by toggle switch on relay. For ratings greater than 45 KW reset will be manual & auto both.

The Over Load Relay will have potential free contact for indication / alarm purpose.
In combination with a contactor and a short circuit protective device the resulting motor starter will be Type 1 or Type 2 co-ordinated conforming to IEC 947-4-1. Co-ordination will be in accordance with tables tested and certified by the manufacturer of the respective switchgear.

Air Circuit Breaker

The ACB will conform to IEC 947-2 1989. The Service Short Circuit Breaking Capacity will as specified and equal to the Short circuit Withstand values. The ACB will be provided for controlling the incoming supply feeder or as required and specified in schedule. Shall be available in 3 or 4 Pole with left aligned mechanism, fixed or draw out, manually or electrically operated versions as specified. ACB will be capable of providing short circuit, over load and earth fault protection (30 – 40 –50 %), Zone Selective Interlocking, thermal memory thru microprocessor based control unit sensing the true RMS values to ensure accurate protection as per standards.

All the circuit-breakers shall be available in fixed and withdrawable three-pole or four-pole versions. Each series of circuit-breakers shall offer terminals made of silver-plated copper bars, with the same dimensions, regardless of the rated currents of the circuit-breakers. The fixed parts for withdrawable circuit-breakers shall be common to each model, regardless of the rated current and breaking capacity of the relative moving parts, The availability of various types of terminals shall make it possible to build wall-mounted switchgear, or switchgear to be accessed from behind with rear connections. For special installation needs, the circuit-breakers shall be capable to be fitted with various combinations of top and bottom terminals. Dedicated terminal conversion kits shall allow horizontal terminals to be changed to vertical or front ones and vice versa
All electrical closing of breaker would be with Electrical motor wound stored energy spring closing Mechanical indicator to provide ON/OFF status of ACB.

For all ACB's the Operating handle would be provided for charging the spring in continuous action. The spring will be released with ON/OFF Push Button command in one operation at the correct speed independent of operator speed. A direct Mechanical coupling would indicate the ACB in ON to OFF position thus qualifying to disconnection as per the IS/IEC indicating the true position of all the contact. One Set of NO/NC potential free contacts to be provided for operation on building Management System. All accessories like shunt, under voltage releases shall be fitted to the ACB to ensure the interlocking arrangements.

Safety Features

The safety shutter prevents inadvertent contact with isolating contacts when breaker is withdrawn from the Cradle.

It should not be possible to interchange wot circuit breakers of two different thermal ratings. There would be a provision of positive earth connection between fixed and moving portion of the ACB either through connector plug or sliding solid earth mechanism. Earthing bolts must be provided on the cradle or body of fixed ACB. Arc Chute covers wherever necessary.

The incoming panel accommodating ACB will be provided with indicating lamps for ON-OFF positions, voltmeter and ammeter of size not less than 96mm selector switches, fuses for potential circuit and current transformers.

The cradle of the ACB shall be welded structure to ensure better mechanical strength to take care of vibration & shocks at the time of fault in the circuit during abnormal conditions.

Protections

The Electromagnetic and thermal release or Microprocessor based unit with zone selective interlocking, thermal memory would be provided on circuit breaker for short circuit, over current and earth fault protection.

Specific indication should be provided for over current and earth fault operation.
Protection Release would be CT operated and direct acting on the trip bar.
Under Voltage relays would be provided.

Minimum 6 No and 6 Nc Auxiliary contacts will be provided on each breaker.
Rated insulation voltage is 1000Volt AC.

Danger Plate

A Danger Plate of suitable size would be fixed on the front side of the Pump Controller.

Bus-bar

The bus bar shall be of electrolytic grade (E91E) Aluminium as per IS specifications. The current carrying capacity should not be less than 0.8 A/mm2. Neutral bus bar should be rated for 50% capacity. the bus bar shall be duly insulated with heat shrinkable colour coded sleeves in case of links and droppers. However the main bus should be powder coated with black paint after proper pretreatment of the Aluminium. The Vendor should have a in-house conductivity test facility & primary current shall be conducted for temp. rise test.
The bus bar should be duly supported on fibre glass based finger type / pyramid type supports with minimum glass contents 25mm.

Single Phase Preventer

S.P.P. should be current sensing suitable for checking the Negative Sequence current having built-in time delay relay up to 40 Millisecond, so that this may not trip while starting at NO load , shall be provided. Rating of CT's, if required, may also be indicated.

Shop Tests required for Control Panel

The design of the Control Panels shall be type tested as per IS. 8623 and shall comprise the following:

- Verification of short time current withstands and peak current withstand of main and vertical bus-bars.
- Through fault withstand on power draw-out contacts with HRC fused in series.
- Through faults withstand of control draw-out contract with HRC fuses in series.
- Temperature rise tests on main bus bars, vertical risers, power and control contacts.

Routine tests shall be conducted on each panel as per ISA. 8623 and shall comprise the following:

- Inspection of panel including inspection of wiring and electrical operational tests where necessary.

- Insulation resistance test.
- High voltage test of bus bars, power and control wiring.
- Any other tests and checks not mentioned above but relevant to the panel.

Automation and Control

PLC based automation system with application software to control all pumps, valves, blowers, VFD, decanting mechanism, limit switches and probes as per bidder's design including I/Os with 20 % spares, power supplies, UPS, etc. complete.

- HMI Panel to comprise of up-to-date standard PC with monitor, printer, mouse, internet connection, RS-view, RS-links (gateway version), entire process and operator software with dynamic flow charts, pictures, screens, alarms, historical trends, reports etc.
- SCADA based Automation system to monitor continuously in each tank the followings:

(a) Filling volume

(b) Discharge quantity

(c) DO-level

(d) Temperature

(e) Oxygen Uptake Rate

(f) Blower speeds

The components of Automation are

1	PLC-Cum-Control Panel	1 No
2	Online 2 KVA UPS with 1/2 Hours Battery Back-up	1 No
3	PC with SCADA, Printer & Desk	1 No

CABLING

Scope

This specification covers design, manufacture, testing and supply of Medium Voltage PVC Cables and High Voltage XLPE Cables.

Standards

The cables shall conform to latest edition of the relevant Indian Standard Specifications with amendment upto the date of issue of Enquiry, particularly the following Standards: -

IS 1554	**:**	PVC insulated (heavy duty) electric cables for working voltages upto and (Part 1) including 1100 Volts
IS 1554	**:**	PVC insulated (heavy duty) electric cables for working voltages from 3.3kV (Part 2) upto& including 11kV
IS 7098	**:**	Cross – linked polyethylene insulated PVC sheathed cables for working (Part 1) voltage upto and including 1100 V.
IS 7098	**:**	Cross – linked polyethylene insulated PVC sheathed cables for working (Part 2) voltage from 3.3kV upto and including 33 kV
IS 7098	**:**	Cross – linked polyethylene insulated thermoplastic sheathed cables

		for (Part 3) working voltages from 66 kV upto and including 220 kV
IS 8130	**:**	Conductors for insulated electric cables and flexible cords
IS 5831	**:**	PVC insulation and sheath of electric cables
IS 3975	**:**	Mild Steel wires, formed wires and tapes for armouring of cables
IS 2633	**:**	Methods for testing uniformity of coating of zinc coated articles
IS 3961	**:**	Recommended current ratings for cables PVC insulated and PVC (Part 2) sheathed heavy duty cables
IS 10418	**:**	Drums for Electric Cables

1. This specification covers wires and cables for general construction.

2. Provide new wire and cable manufactured within one year prior to installation. The wires & cables shall be ISI marked and fulfil the standards mentioned here .The manufacturers name, conductor size, insulation type, volt rating shall be as per IS standards.

3. Where not otherwise specified or indicated, wire sizes are referenced to a capacity of 98 percent conductivity copper conductors. Do not install wire and cable having conductors of other metal unless approval for any such changes is obtained in writing.

- Provide stranded conductors for 16 mm^2 and larger, and solid conductors for 10 mm^2 and smaller. Stranded conductors in wire size smaller than 16 mm2 may be used where subject to vibration or frequent flexing, and shall be used for control systems wiring.

- The conductors are made from annealed high conductivity copper. The conductor for control cables shall be copper. Normally Copper conductors, upto size 10 sqmm are solid, circular in cross section, and sizes above 10 sq. mm. are stranded. In case of single core and twin core cables, they are circular in cross section while for 3 core and 4 core cables conductors of cross section 50 sq. mm and above are normally sector shaped.
- “Power Cables shall be provided as per following specifications: “1100V, XLPE insulated, PVC inner & outer sheathed, GI armoured, Aluminium conductor cables to be considered for power cables. Minimum power-cable size shall be 3C x 4 sq mm.”
- Control Cables shall be provided as per following specifications: “XLPE insulated, PVC inner & outer sheathed, GI armoured, solid copper conductor cables to be considered. Minimum control cable size shall be 1.5 sq mm.”

Insulation

The conductors shall be insulated with the high quality PVC based compound.
as per I.S. specifications.

Inner Sheath

For all cables having two or more cores a common covering (inner sheath) is applied over the laid up cores either by extruded sheath of non-vulcanised rubber compound or wrapping of plastic tapes. Single core cables do not have inner sheath.

Armouring

Armouring is applied over the inner sheath. In case of cables where diameter over the inner sheath does not exceed 13 mm the armour consists of galvanised round steel wires; above this size, normally the armour is of galvanised flat steel wires (strips).

Outer Sheath

Over the armouring, or in case of un-armoured cables, over the inner sheath (for single core cables over the insulation), a tough outer sheath of PVC is extruded. This is always black in colour, for best resistance to outdoor exposure.

The manufacturer's name and trade mark alongwith the year/year code of manufacture are embossed on the outer sheath; additionally in the case of HT cables the voltage grade is also embossed, and the voltage grade along with the year/year code of manufacture. The embossing script that repeats in such a way that every meter of the cable bears the same.

Type Designation

Type designations of cables is based on the following alphabet nomenclature:

C - Copper conductors - when first letter of type designation.
Y- When at first or second or last place in type designation, it stands for PVC insulation.
R- Round steel wire armouring.

F - Flat steel wire (strip) armouring. Number of cores, Conductors cross section, Voltage grade are written in the usual manner. Cable shall be IS marked.

LT Cable

Cable shall comply with **IS 1554** part I, cables shall be 650/1100 voltage grade. Joint in the cables shall be permitted only if the length of the cable is more than standard drum size.

Execution

- Unless otherwise indicated or specified do not install Aluminium conductors of less than 4 Sqmm. For control conductors protected by 15 ampere or lower, 2.5 Sqmm copper conductors shall be installed.
- Colour code power wire and cable for feeder and branch circuits is as follows, unless otherwise required by local codes or the electrical utility company.
  Phase 440V/230V
  A Red
  B Yellow
  C Blue
  Neutral Black
  Ground Green

Splices and Termination

Termination

Provide brass or copper indent type connectors or cables lugs crimping/solder type at both ends of the cable. Aluminium or ferrous metal connectors are prohibited. Dowell's make conductivity grease to be used while using crimping type cable lugs/sockets. All motors shall be connected using copper or brass ring-torque terminals, brass bolts and nuts. The cable lugs/connectors shall fit the conductor to which it shall be connected. The compression tool shall be equipped with a ratchet attachment, which shall assure proper crimping pressure on the connectors.

Connections shall be made tight and insulated with PVC electrical tape of colour as per I.S. Provide a compression type cable glands at each end to the cable. Glands shall be of nickel-plated brass, with PVC shrouds over it. Before applying a PVC shroud, all bare metal shall be wrapped with pressure-sensitive adhesive PVC tape.

Double compression H type nickel plated brass cable glands with PVC shroud over it shall be used for termination of cable at flame proof junction boxes or flame proof P.B. station instead of single compression type cable gland.

Saddle and Clips

Saddles and clips shall be PVC covered or of G.I. Fixing screws shall be round head brass. Where bolts are used nuts shall be of brass, square pressed type.

Jointing Sleeves

Jointing sleeves shall be of brass with standard terminations. Solder type cable connectors/cable sleeves shall be used to join the cable/conductors. Non corrosive flux only shall be used.

Joints in Cables

Joints in cables shall be kept to a minimum and conductors shall be joined using solder ferrules or Siemens make jointing compound. Joints shall be enclosed within standard adaptable boxes. Siemens make tropolin type or equivalent shall be used. For preference straight through joints shall be enclosed within brass jointing sleeves where joints are enclosed in other than brass sleeves and are buried in the ground, bitumen base filling compound shall be used to completely fill and seal the joint box after the cover is secured. Where joints are enclosed in brass sleeves and are buried in the ground, the ends of the sleeves shall be plugged with plastic filling compound before the glands are screwed into the sleeves.

Jointing shall be done by using Siemens make cable jointing kits taking due care as specified by Siemens.

Identification of Conductors

Colour of the sleeves complying with I.S. shall be used to identify all conductors at terminations and joint boxes.

Test

Prior to shipment, cable manufacturer shall test and inspect each length of cable in accordance with I.S. in presence of Engineer or any other authorised personnel.

Openings, Chassis and Sleeves

Products

Sleeves for General Use galvanised steel pipe

Execution

- Provide openings, chases, cutting, patching, sleeves and other products, necessary to permit the electrical raceways and cables to pass through the structure.
- Establish locations for openings, chases and sleeves sufficiently in advance of construction to avoid cutting and patching. Perform any required cutting and patching for electrical work and obtain approval for cutting prior to work being done.
- Repair damages to finished work and surfaces caused by cutting, to the satisfaction of the Engineer.
- Install sleeves wherever raceways of any type pass through walls or floors.

Earthing

- Unless otherwise indicated, ground each single or poly-phase system neutral conductor at source.
- Unless otherwise indicated earth, ground exposed non-current carrying metal components of electrical equipment, cable trays, raceway system, cable grounding conductors armour or shielding and enclosures shall be earthed.
- Maintain continuity of system and equipment grounds throughout the electrical installation. Provide grounds, bushings and jumpers where normal metallic ground paths are interrupted.
- Grounding shall comply with the Engineer drawings and specifications, and with the requirements of State and local Code enforcement bodies.
- Alternate grounding methods in accordance with good accepted practice for this type of work which cover conditions not indicated on the approved drawings or described in these specifications and which meet with the approval of the Engineer shall be used in order to secure a good substantial and permanent grounding system. Under no conditions shall the maximum ground resistance exceed five ohms when measured in accordance with recommended standards.

Products

- Provide ground conductors and jumpers of copper/ GI wire size as required by relevant code.
- Provide GI pipe electrode 40 mm minimum diameter and 3400 mm minimum length.

- Earthing for motor above 40 HP- 40 x 6mm Copper strip, push button station / Auxiliary item 12 SWG Copper wire to be used.
- For motor 40 HP and below-25 x 3mm Copper strip, push button station/ Auxiliary item 12 SWG Copper wire to be used.
- Number of Earth pits shall be selected to keep overall earthing resistance of 1 ohm.

Execution

- Provide ground grids with prior approval of Engineer
- Provide all interconnections, risers, cable, fittings and welding for grounding substations, transformers and other equipment. Bonding jumpers shall be equal in cross section to the corresponding ground connectors and attached by solderless lugs, compression connections, or clamps providing bonding jumpers around all high voltage junction boxes.
- Minimum size ground conductor shall be 10 SWG-GI conductor, the conductor shall be securely bonded to the conduit at each end.
- Ground the enclosures of electrical equipment with separate grounding conductor. Connect to the nearest suitable ground point of the electrical ground system. Ground all metal non-current carrying parts of electrical equipment, cable tray, raceways, and bus supports.
- Ground all motors by running two separate equipment ground conductors and connected to grid. At the motors connect the ground wire solidly to the frame with lugs.
- Provide a ground conductor from 110 and 240 volt ground terminals to associated outlet boxes.

Grounding

- Install ground conductors in the earth at least 450 mm. below grade.
- The earth pits shall be provided as per I.S. 3043 with GI pipe of 40 mm dia and 3400 mm length and top of the pit shall be covered with chequered plate.
- Drill and tap equipment frames and attach ground connections with bronze cap screws.
- Underground taps or splices shall be completed with cadweld connectors.
- All conduits shall be rigid metallic galvanised. Where PVC or non- metallic conduit is substituted underground, provide an additional equipment ground wire and increase conduit size as required.
- All equipment except lighting fixture and those rated above 230 V shall be grounded by two separate connections as per I.S. 3043. For equipment rated 230 V below can be provided with one ground connection.
- A ring main grounding system shall be followed. The main ring shall be GI flat of 50 mm x 6 mm size covered with hessian tape and bitumen at the joints. The submain ground connections to panel boards, M.C.C. etc. shall be 25 mm x 6 mm GI flat.

- All joint to the ring main shall be welded and painted with bitumen. All connections at ground bus and at equipment shall be bolted type.
- Grounding conductor shall be run alongwith Power / Control / Lighting cable.
- All equipment intended to be live shall have an effective ground connection in accordance with Indian Electricity Rules and I.S. 3043.
- Suitable bond shall be provided between cable tray section and also conduit to make them electrically continuous and shall be connected to Earthing System at two points.
- All 20 A receptacles, junction boxes, light fixtures shall be earthed suitably by 14 gauge copper wire.
- Size of earthing conductor to be used for earthing of various equipment shall be as per I.S. 3043.

Agitator

The agitator equipment shall be provided along with independent supports. The drive motor shall not exceed rpm of 1,500 and directly coupled with the gearbox. It shall be wired for 415 volts, 50 cycles, and three-phase service and shall be totally enclosed, fan cooled, rated for severe chemical duty with a minimum service factor of 1: 1.5. The rotary speed of the impeller shall not exceed 100 rpm.

The drive motor output shaft and the impeller rotary shaft shall be connected by a direct coupling using such couplings as “Lovejoy” type to avoid cumbersome erections and de-erections. The drive assembly for each agitator shall consist of a suitable drive motor, directly coupled to a helical gearbox. The Gear reducer shall be of heavy duty, high efficiency type with a rugged housing. It shall have a minimum service factor of 2.0 and suitable for 24 hours continuous service. The gear reducer shall have oil bath lubrication and dry well construction on the vertical out put shaft to prevent leakage of the lubricant. The casing of the gear reducer shall be of CI. The gears shall be hardened and ground for precision.

The impellers of the each agitator will consist of a single, axial flow design. The inclined SS304 blades shall be bolted to the centre hub. The impeller assembly will be securely keyed to the shaft. Each impeller shaft shall be solid SS304 shaft of suitable diameter designed to resist the applied radial and axial thrust loads. Reinforced flanges at both ends will be used to attach the impeller at the bottom and to the rigid drive coupling at the top. All fasteners used in the assembly will be of SS304. The rotating shaft is best designed as a tubular structure for better torque resistance.

All fasteners and anchor bolts shall be of such metallurgy that they are compatible with the stipulated duty conditions shall be used.

Dosing Pumps

There shall be two pumps of which one shall be working and the other standby at any time. Dosing pumps shall be of the duplex type diaphragm type hydraulically operated. These shall permit manual override and variable flow control at both sides of the chosen median duty point for the duty already stated herein. These shall be able to handle a flow variation of plus 25 % of the required flow. The construction shall be totally enclosed and corrosion proof. The liquid end shall be in SS 316.

Parameters

Capacity of each pump: To suit each requirement
Material of construction of wetted parts: AISI SS 304

INSTRUMENTATION

FLOW MEASURING SYSTEM

Flow measuring system shall consist of flow sensor/ transducers, flow computer and flow transmitter.

Flow transducers shall be rugged in construction and shall be suitable for continuous operation. Flow transducers shall have waterproof construction and shall be suitable for installation in underground/ above ground pipeline.

To avoid the effects of disturbances in the velocity profile, a straight and uninterrupted run, upstream as well as downstream from the location of the flow sensor shall be provided in accordance with the requirements of the flow meter manufacturer.

The flow transmitter shall be suitable for field or panel mounting and shall accept an input from the flow sensor. It shall process the input signal and provide 4-20 mA dc output proportional to flow rate. The flow range shall be adjustable.

A zero span adjustment facility shall be provided for flow transmitter and indicator.
Flow measurement shall not be affected by physical properties of sewage viz., temperature, pressure, viscosity, density etc., within given limits. Bidder shall provide compensating electronic circuits if required. The overall accuracy of flow measuring systems shall be at least ±1.0% of the measured value unless otherwise stated.

Electromagnetic Flow meter

Full bore electromagnetic flow meter shall consist of flow sensors (i.e. flow tube), transmitter and remote flow indicator cum integrator.

The flow meter shall have flanged connection and shall be inserted in the sludge line.

The flow computer/ transmitter shall be microprocessor based and shall have diagnosis facility.

Remote flow indicator cum integrator shall be provided on the control panel.

To ensure full electromagnetic compatibility the flow tube flanges and transmitter housing shall be connected earth

Open Channel Flow Meter

Open channel flow measuring system shall consist of level transducer, flow computer and flow transmitter. The level of the fluid in the flume shall be measured by the ultrasonic level transducer. The level measured shall be used along with the physical characteristics of the flume to compute the flow rate.

The level transducer shall be suitable for flange or bracket mounting as required and shall be environmentally protected as per IP65. It shall have ambient temperature compensation and adjustable datum setting facilities.

The design and application of ultrasonic level meter shall take into account the channel construction, the material size, shape, environment, process fluid or material, the presence of foam granules, size etc.

The installation shall avoid any degradation of performance from spurious reflections, absorption, sound velocity variations, sensor detection area, temperature fluctuation, specific gravity changes and condensation. For application where spurious reflections are unavoidable the control unit shall be provided with facilities for spurious reflection rejection. The structure required for supporting the level sensor, platform, railings etc. shall be in the Bidder's scope.

LEVEL MEASURING SYSTEM

Ultrasonic Level Meters

Ultrasonic level measuring devices applied for liquid level measurement shall comprise a transducer, control unit and remote indicator. The transducer shall be suitable for flange or bracket mounting as required and shall be environmentally protected to IP 65. The design and application of ultrasonic level meters shall take into account the vessel or channel construction, the material, size, shape, environment, process fluid or material, the presence of foam granules, size etc. The installation shall avoid any degradation of performance from spurious reflections, absorption, sound velocity variations, sensor detection area, temperature fluctuations, specific gravity changes and condensation. For applications where spurious reflections are unavoidable the control unit shall be provided with facilities for spurious reflection rejection. If turbulence exists, shielding, stilling tubes or other measures shall be provided to avoid effects on the measurement.

Conductivity Level Switches

The electrodes used for conductivity level switches shall be stainless steel. Single electrode systems (one electrode per holder) shall be used (except where their use is impractical) with insulated electrodes such that only the tip of each electrode is exposed to the liquid at the operating level.
Relay or control units operating with level electrodes shall have adjustable sensitivity. Electrodes for use in fluids of low or variable conductivity shall be fitted with conductivity discs.

Where relay or control units are not mounted in control panel, they shall be provided with surface mounting enclosures with a degree of protection to IP-54 for indoor locations or IP 65 for outdoor location.

Ultrasonic Differential Level Measuring System

The ultrasonic type differential level measuring system shall consist of ultrasonic type level sensors on upstream and downstream of screens, differential level computer / transmitter and indicator.

The flow computer / transmitter shall be microprocessor based and shall have facility for programming (i.e. adjustment of set points).

The ultrasonic transducer shall be suitable for flange or bracket mounting as required and shall be environmentally protected as per IP-65. It shall have ambient temperature compensation and adjustable datum setting facilities.

PRESSURE GAUGES

Pressure gauges shall comply with BS 1780. Snubber shall be provided where the gauge is subjected to pressure pulsations and / or vibrations. The internal parts of pressure guage shall be of stainless steel material. In chlorine applications the diaphragm shall be silver or tantalum for other fluids an appropriate diaphragm material shall be used. The pressure gauges shall be provided with diaphragm seal arrangement.

The minimum diameter for round pressure gauges shall be 150 mm unless specified otherwise or where the gauge forms part of a standard item of equipment. The accuracy of pressure gauges shall be ±1% over the operating range. The zero and span of pressure gauges shall not change by more than ±0.1% of the span per °C changes in ambient temperature.

SURGE PROTECTION DEVICES

Surge protection devices (SPDs) shall be suitable for with standing the surge arising out of high energy static discharge / lighting strikes and protect the instrument to which it is connected against damage. SPDs shall provide protection through the use of quick acting semi conductors like Tranzorb, zener diodes, varistors and an automatic disconnect and reset circuit. SPDs shall be passive and shall require negligible power for operation. During the occurrence of a surge it shall clamp on the allowable voltage and pass the excess voltage to the ground. The SPD shall be self resetting to minimize the down time of the measurement loop.

SPDs shall be provided to protect devices transmitting and receiving analogue and digital signals derived from field devices located outdoors.

The surge protection device shall be rated for surge rating of 10kA.

CABINETS FOR FIELD INSTRUMENTS

Wall mounted cabinets shall be provided for enclosing transducer unit and associated accessories which are mounted outside the main control panel. The cabinet shall be of die-cast aluminum, field provided not less than IP-55 protection and shall be lockable. The cabinet shall have facilities for earthing. A steel plate shall be provided inside the cabinet for mounting instrument and accessories.

ALARM SYSTEM

Alarms shall be initiated by the opening or closing of volt-free contacts which shall remain unchanged throughout the periods in which the alarm conditions exit. Alarm Circuits shall be cable of conversion from open-healthy to open-alarm or vice versa by a simple modification after installation requiring no additional parts or special equipment.

Each alarm shall initiate the operation of both visual and audible devices.
Audible devices in the same room or area shall have distinguishable sounds and adjustable sound levels.

MATRIX TYPE ALARM ANNUNCIATORS

The alarm annunciator shall be microprocessor based, modular, split type unit with alarm windows mounted on the front door and electronic modules inside the panel. The weather protection class for alarm annunciator shall be IP-54 of IS 13947, Part-I.
Each alarm shall initiate a visible and audible indication of the specified condition. Unless otherwise specified, alarm indicators shall be grouped together in annunciator units each having at least 20% spare ways. Alarm indicator lamps (Cluster LED type) and shall have transparent screens engraved with appropriate legends. The legend area of each indication shall not exceed 40mm high and 75mm wide.

When any alarm condition occurs, a condition device common to an alarm annunciator system shall sound and the appropriate indicator shall flash on an off. The flashing rate shall not be less than 2 Hz and shall not exceed 5 Hz. On pressing an accept pushbutton, the audible device shall be silenced and the flashing light shall become steady. The alarm indicator shall remain illuminated until the alarm condition ceases and a reset pushbutton has been operated.

The operation or acceptance of one alarm shall not inhibit the operation of the audible device or the flashing of the appropriate alarm indicator if a further alarm condition occurs. At unmanned locations alarms operated on two or more annunciators shall require acceptance at each annuciator

Alarms shall be accepted automatically and the appropriate audible device silenced after an adjustable period of 1 to 5 minutes.

An integral 'test' pushbutton shall be provided to illuminate each lamp in the appropriate group and to operate the audible device but shall not cause a spurious alarm condition on any other annunciator.

Alarm circuitry shall be arranged so that spurious or transient alarm states persisting for less than 0.5 seconds do not initiate any action.

Alarm annunciator / indicator legends or labels shall be arranged with three lines of text as follows:

- Topline Location
- Middle Line Parameter
- Bottom Line Status

DIRECT DIGITAL CONTROLLERS (DDC)

Design and Construction Requirements:

Standalone DDC panels shall be microprocessor-based, multi-tasking, multi-user, real-time digital control processors. Each standalone DDC panel shall consist of modular hardware with plug-in enclosed processors, communication controllers, power supplies, and input/output modules with connectivity to the Network Controller through a RS485 or Ethernet communication bus.

The DDC's should be application specific and should be located as near as possible to the controlled equipment reducing cabling runs. The DDC's should be able to control the equipment connected to it on a standalone mode so that in case of failure of the first tier network the DDC's will be able to perform the minimum control functions assigned to it. The DDC's should have a inbuilt display on its facia with keypad to access all the information being monitored by the DDC.

Programming:

All the DDCs should be equipped with electrically erasable PROMs and the control software for the DDC can be downloaded through the central operator workstation. It should additionally provide a serial port for downloading and reconfiguring of software through a laptop locally. The control logic for the DDCs should be programmed through a user-friendly graphic programming language with control algorithms like PID loops, ladder logic, sequencers etc inbuilt into the software.

Input/output point types:

Each DDC panel shall support the following types of point inputs and outputs:
Analog inputs shall monitor the following analog signals:

- 4-20 mA Sensors
- 0-10 VDC Sensors
- 1000ohm RTDs

Binary inputs shall monitor dry contact closures. Input shall provide filtering to eliminate false signals resulting from input "bouncing."

Counter inputs shall monitor dry contact pulses with an input resolution of one HZ minimum.
Analog outputs shall provide the following control outputs:

- 4.20 mA – Sink or Source
- 0-10 VDC

Binary outputs shall provide SPDT output contacts rated for 2 amps at 24 VAC and they shall not activate main contactors of starter thus avoiding burdening of relays.

TESTING / INSPECTION

Tests on cables

Check details are in accordance with the specifications. Check for physical damage, Continuity Check, meggar test for insulation Connections. No dark visible marks of armouring onto external surface.

Tests on electrical installation

Check all closing, tripping, supervision and interlocking of control devices. Check operation of all alarm circuits. Check CT polarities, give primary & secondary injection. Carry out relay calibration

Test on complete control system

On completion, the functioning of the complete system shall be tested to demonstrate its correct operation in accordance with the Specification.

For control system testing, the Bidder may provide temporary means to simulate operating conditions, but the system will not be finally accepted until correct operation has been demonstrated to the satisfaction of the Engineer when all the pumps are operating.

The system shall be shown to operate correctly whatever the selection of duty and standby equipment may be. Conditions to be tested shall include:

- Normal automatic operation.
- Normal manual operation
- Emergency manual operation

Commissioning Tests

Correct operation of controllers shall be verified by observing that the final control element moves in the proper direction to correct the process variable as compared to the set point. All logic sequences shall be verified to operate in accordance with the specifications.

All defects and malfunctions disclosed by test shall be corrected immediately. New parts and materials shall be used as required and approved and tests shall be repeated.

A report certifying completion of validation of each instrument system indicating calibration values, verification that the system performs as per requirements and any provisional settings made to devices shall be provided. A format for commissioning checklist to be provided for approval before performing the commissioning tests.

Final Operational Testing and Acceptance

Upon completion of instrument calibration and system validation, all systems shall be tested under process conditions.

The testing shall include, but not limited to all specified operational modes, taking process variables to their limits (simulated or process) to verify all alarms, failures, interlocks and operational interlocks between systems and/ or mechanical equipment.
Any defects or malfunctions shall be immediately corrected using approved methods and materials and the tests shall then be repeated.

Upon completion of final operational testing, a report shall be submitted, indicating that the total control system provided meets all the functional requirements specified herein. This report shall be made in the format approved by the Engineer. The Engineer shall certify this report and it shall constitute final acceptance of the control system.

FIRE EXTINGUISHERS

The Bidder shall provide 3 Kg CO2 fire extinguishers of suitable capacity and numbers for the treatment plant at the following locations after consultation with the Employer's representative. These shall be provided as adhoc at the start itself and replaced fully up to date before handing over of the work.

FIRST AID KITS

The first aid kit shall consists of all materials, medicines necessary for treatment of cuts, wounds, burns etc., These shall be provided as adhoc at the start itself and replaced fully up to date before handing over of the work

EXHAUST FANS

The fans shall be as per IS 2312 and the blades shall of mild steel dynamically balanced to avoid noise and vibration. The blade and its carriers shall be securely fastened to avoid loosening in operation and shall have a SS AISI guard as a grill inside and a 10 sq mm mesh screen to safeguard birds from getting sucked in. The duty of the fans shall be calculated to ensure 3 to 10 air changes per hour in the command area depending on requirement.

Materials of Construction
Casing M S as per IS 2062
Impeller Cast Aluminium
Test As per IS 2312

SCOPE OF SPECIFICATION:

This specification covers the design, material specification, manufacture, testing, inspection, delivery to site and installation & commissioning of lighting fittings and their associated accessories.

CODES AND STANDARDS:

The lighting fittings and their associated accessories such as lamps/ tubes, reflectors, housings, ballasts, etc. shall comply with the latest applicable standards as specified. Where no standards are available, the supply items shall be backed by test results, shall be of good quality and workmanship & any supply items which are bought out by the Bidder shall be procured from approved manufacturers acceptable to the Engineer.

PRODUCTS

Lighting Fittings - General Requirements

i) Fittings shall be designed for continuous trouble free operation under atmospheric conditions as specified (in Sections B & C of project information) without reduction in lamp life or without deterioration of materials and internal wiring. Outdoor fittings shall be weather-proof and rain-proof type.

ii) The fittings shall be designed so as to facilitate easy maintenance, including cleaning, replacement of lamps / starters etc.

iii) Connections between different components shall be made in such a way that they will not work loose by small vibration.

iv) For each type of lighting fitting the Bidder shall supply the utilization factor to indicate the proportion of the light emitted by the bare lamps which falls on the working plane.

v) All fittings shall be supplied complete with lamps suitable for operation on a supply voltage and the variation in supply voltage.

vi) The fittings and accessories shall be designed to have low temperature rise. The temperature rise above the ambient temperature shall be as indicated in the relevant standards.

vii) All mercury vapour, metal halide lamp and sodium vapour lamp fittings shall be complete with accessories like lamps, ballasts, power factor improvement capacitors, starters wherever applicable, etc. These shall be mounted as far as possible in the fitting assembly only. If these cannot be accommodated inside, then a separate metal enclosed box shall be included to accommodate the accessories and in addition with a fuse and a terminal block suitable for loop-in, loop-out connections. Outdoor type fittings shall be provided with outdoor type weather-proof box.

viii) All fluorescent lamp fittings shall be complete with all accessories like ballasts, power factor improvement capacitors, lamps, starters and capacitors for correction of stroboscopic effect.

ix) Each fitting shall have a terminal block suitable for loop-in, loop-out and T-off connection by 250/440V, 1 core , PVC insulated Cu conductor cable upto 4 sq.mm in size unless otherwise specified. In hazardous areas, the termination at the fittings shall be suitable for 1100V, PVC, armored cables of sizes specified and terminals shall be of stud or clamp type. The internal wiring should be completed by the MANUFACTURER by means of stranded copper wire and terminated on the terminal block.

x) The mounting facility and conduit knock-outs for the fixtures shall be as specified.

xi) All hardware used in the luminaire shall be suitably plated or anodized and passivated for use in chemical industrial and power plants.

Earthing

i) Each lighting fitting shall be provided with an earthing terminal suitable for connection to the earthing conductor.

ii) All metal or metal enclosed parts of the housing shall be bounded and connected to the earthing terminal so as to ensure satisfactory earthing continuity throughout the fixture.

Painting / Finish

i) All surfaces of the fittings shall be thoroughly cleaned and degreased. The fittings shall be free from scale, rust, sharp edges and burrs.

ii) When enamel finish is specified, it shall have a minimum thickness of 2 mils for outside surface and 1.5 mills for inside surface. The finish shall be non-porous and free from blemishes, blisters and fading.

iii) The housing shall be stove-enameled / epoxy stove-enameled-Vitreous enameled or anodized as indicated on flame-proof fittings is prohibited.

iv) The surface shall be scratch resistant and shall show no sign of cracking or flaking when bent through 90o over " dia mandrel.

v) The finish of the fittings shall be such that no bright spots are produced either by direct light source or by reflection.

Street Lighting Fittings

i) Street lighting fittings shall be suitable for mercury vapour lamps, fluorescent tubes or sodium vapour lamps and shall be of the cut off, semi-cut off or non-cut-off type as specified.

ii) The fittings shall be of the tope entry/ side entry /post top/ suspension type as specified.

i) The means for attaching the fittings shall be designed to sit the weight of the fitting and shall ensure that the strength of the connection is adequate to withstand a wind speed of 150 Km/h equivalent to the following wind loads on the projected surface of the fitting in relation to its mounting height: -

Mounting Height Wind Load

- Less than 8 m - 15 N/m2
- 8 to 16 m - 20 N/m2
- Above 16 m - 24 N/m2

ii) The size of threads, length of threads, socket bores of various types of fittings mentioned in 8.2 above shall comply with relevant standards specified.

v) The fittings shall be designed such that the glare value is controlled below an acceptable level. The light distribution patterns of cut-off, semi-cut off and non-cut-off fittings shall be as per relevant standards specified.

vi) The required control gear such as ballast and capacitor shall be provided integral with the fitting. The housing shall be of cast Aluminium stove-enameled and provide with anodized, mirror or polished Aluminium reflectors. The covers shall be of transparent acrylic sheet and neoprene gasket shall be provided for sealing the unit for outside atmosphere.

Lamp/Starter Holders

i) Lamp holders shall comply with relevant standards. They shall have low contact resistance, shall be resistant to wear and shall be suitable for operation at the specified temperature without deterioration in insulation value. They shall hold the lamps in position under normal condition of shock and vibration met with in normal installation and use.

ii) Lamp holders for the fluorescent lamps shall be of the spring loaded bi-pin rotor type. Live parts of the lamp holder shall not be exposed during insertion or removal of the lamp or after the lamp has been taken out. The lamp holder contacts shall provide adequate pressure on the lamp cap pins when the lamp is in working position.

iii) Lamp holders for incandescent and mercury vapour lamps shall be of bayonet type upto 100W and Edison Screw type for higher Wattage lamps.

iv) Starter holders for fluorescent lamps shall conform to the standards specified. All material used in the construction of the holder shall be suitable for tropical use.

v) The starter holders shall be so designed that they are mechanically robust and free from any operational difficulties. They shall be capable of withstanding the shocks met within normal transit, installation and use.

Ballasts

i) The ballasts shall be designed, manufactured and supplied in accordance with the relevant standards. The ballasts shall be designed to have a long service life and low power loss.

ii) Ballasts shall be mounted using self locking, anti-vibration fixings and shall be easy to remove without demounting the fittings. They shall be in dusting, non-combustible enclosures.

iii) The ballasts shall be of the inductive, heavy duty type, filled with thermosetting, insulating, moisture repellent polyester compound filled under pressure or vacuum. Ballasts shall be provided with tappings to set the voltage within the range specified. End connections and taps shall be brought out in a suitable terminal block, rigidly fixed to the ballast enclosure. The ballast wiring shall be of copper wire. They shall be free from hum. Ballasts which produce humming sound shall be replaced free of cost by the BIDDER.

iv) Separate ballast for each lamp shall be provided in case of multi-lamp fittings, except in the case of 2 x 20 watts fittings.

Starters

i) Starters shall have bimetal electrodes and high mechanical strength. starters shall be replaceable without disturbing the reflector or lamps and without the use of any tool. Starters shall have brass contacts and radio interference capacitor.

ii) The starters shall generally conform to the relevant standards.

Capacitors

i) The capacitors shall have a constant value of capacitance and shall be connected across the supply of individual lamp circuits.

ii) The capacitors shall be suitable for operation at supply voltage and shall have a value of capacitance so as to correct the power factor of its corresponding lamp circuit to the extent of 0.95 lag or better.

iii) The capacitors shall be hermetically sealed preferably in a metal enclosure to prevent seepage of impregnant and ingress of moisture.

Lamps

i) The fluorescent lamps shall be `Day-light colour' type unless otherwise specified and shall be provided with features to avoid blackening of lamp ends.

ii) Mercury or sodium vapour lamps shall be of high pressure, colour corrected type.

iii) The constructional features of gas discharge lamps for special applications as stated or for instant start fluorescent lamps if specified, shall be clearly brought out in the bid.

iv) The lamps shall be capable of withstanding small vibrations and the connections at lead in wires and filaments/ electrodes shall not break under such circumstances.

v) Lamps / tubes shall conform to relevant standards and shall be suitable for supply voltage and frequency specified.

Spare Parts

i) Unit prices of the items shall be quoted together with catalogue numbers.

ii) The unit prices shall not however be limited to the above items. The BIDDER may recommend additional spare items and quote the unit prices of the respective items.

Tests and Test Reports

Type tests, acceptance tests and routine tests for the lighting fittings and accessories covered by this specification shall be carried out as per the relevant standard for the respective fittings and their accessories.

The Manufacturer’s type and routine test certificates shall be submitted for tests conducted as per relevant standards for the fittings and accessories. The tenderer shall submit with his proposal copies of available test certificates of the fittings offered.

SPECIAL REQUIREMENT

General

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.

For supervision, Bidder must depute qualified electrical engineer with sufficient experience for similar type of Work.

The Bidder shall employ only experience and licensed electrical / wiremen for the Work. Only licensed electrical Bidder are allowed to Work.

When the electrical installation is complete, the same shall be tested as per I.S. code, i.e. Regulations in front of Engineer and result are to be submitted in four sets.

1The 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.

The foundation for panel board grouting of frames in wall etc is required to be carried out by the agency.

Brochure and Data

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.

Scale

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.

Approval

The engineers approval of such drawings, schedule, brochures, etc. will be an approval of general details and arrangements only and shall not relieve 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.

Storage

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.

Cutting & Patching

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.

Protection

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.

Testing & Commissioning

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

Guarantee

The Bidder shall furnish guarantee on all equipment and appliances. This shall include guarantee against defects in workmanship or material in any part or accessory. If any defects are found, the Bidder at no additional cost shall replace the defective part or Work.

SECTION – IV

CONDITIONS OF CONTRACT

SECTION IV

CONDITIONS OF CONTRACT

A. General

1. Definitions

1.1 Capital initials are used to identify defined terms.

Adjudicator is an independent person appointed by the Employer to whom any dispute during the progress of the work may be referred to by either party decision for enquiry, inspection and detailed report.

Arbitrator is the person/s appointed under the Arbitration and Conciliation act, 1996 for resolution of disputes out of or in connection with this contract.

Price Schedule means the priced and completed **Financial Bid** forming part of the Bid.

Compensation Events are those defined in Clause 43 hereunder.

The **Completion Date** is the date of completion of the Works as certified by the Engineer

The **Contract** means, the documents forming the Bid and acceptance thereof and the formal agreement executed between the competent authority on behalf of the Chief Scientist/Team Leader, CSEZ Project Office, WAPCOS Limited and the Bidder together with the documents referred to therein including these conditions, the specifications, designs, drawings and instructions issued from time to time by the Engineer in charge and all these documents taken together shall be deemed to form one contract and shall be complementary to one another.

The **Contract Data** defines the documents and other information which comprise the Contract.

The **Bidder** means the individual or firm or company whether incorporated or not, whose Bid to carry out this work has been accepted by the employer and shall include legal personnel, representatives of such individuals or persons composing of such firm or company or unincorporated company or successors or such firm or company as the case may be and permitted assignees of such individuals or firm or company.

The **Bidder's Bid** is the completed Bid document submitted by the Bidder to the Employer.

The **Contract Price** is the price stated in the Letter of Acceptance and thereafter as adjusted in accordance with the provisions of the Contract.

Days are calendar days; **months** are calendar months.

A **Defect** is any part of the Works not completed in accordance with the Contract.

The **Defects Liability Period** is the period named in the Contract Data and calculated from the Completion Date.

Department means WAPCOS Limited and CSEZA

Employer means the Bid inviting or accepting authority

Engineer means the officer indicated by designation of the post and division who is responsible for supervision of execution of the work and administering the contract on behalf of the employer.

Equipment is the Bidder's machinery and vehicles brought temporarily to the Site to construct the Works.

Government means Government of India unless or otherwise specified.

The **Initial Contract Price** is the Contract Price listed in the Employer's Letter of Acceptance.

The **Intended Completion Date** is the date on which it is intended that the Bidder shall complete the Works. The Intended Completion Date is specified in the Contract Data. The Intended Completion Date may be revised only by the Engineer by issuing an extension of time.

Item Rate contract system means the system where the Bidder has to quote his rate for each and every item of work specified in the BOQ furnished by the Employer and total amount for each item and the grand total for all the items in the Bid.

Joint Venture means an ad-hoc association of firms that pool the resources and skills to undertake a large or complex contract in the role of “Bidder” with all firms (partners in the JV) being legally liable, jointly and severely for execution of the contract in the event of the partner’s withdrawal

Materials are all supplies, including consumables, used by the Bidder for incorporation in the Works.

Plant is any integral part of the Works which is to have a mechanical, electrical, electronic or chemical or biological function.

The **Site** shall mean the land 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.

Site Investigation Reports are those which were included in the Bid documents and are factual interpretative reports about the surface and sub-surface conditions at the site.

Specification means, relevant Standard specification applicable on particular work and as indicated by the appropriate Standard Specification numbers in the contract. The same shall include the following among others:

Indian Standard Specifications

BIS Bureau of Indian Standard

IRC Indian Road Congress

MORTH Ministry of Road Transport and Highways

NBC National Building Code

CPWD Central Public Works Department

MoEF/CPCB/KSPCB Guidelines and Subsequent amendments

Other Specifications

AASHTO: American Association of State Highways and Transport Office

ASTM: American Society of Testing Materials

BSS: British Standard Specification

The **Start Date** is given in the Contract Data. It is the date when the Bidder shall commence execution of the works. It does not necessarily coincide with any of the Site Possession Dates.

A **Sub-Bidder** is a person or corporate body who has a Contract with the Bidder to carry out a part of the work in the Contract which includes work on the Site.

Technical Personnel or those employed / proposed to be employed by the Bidder at the project site and who had participated in or in possession of a valid Degree / Diploma Certificate in the required field through a programme run under the auspices of a University or State Technical Board.

Temporary Works are works designed, constructed, installed, and removed by the Bidder which are needed for construction or installation of the Works.

A **Variation** is an instruction given by the Engineer which varies the Works.

The **Works** are what the Contract requires the Bidder to construct, install, test, commission, maintain and turn over to the Employer, as defined in the Contract Data.

2. Interpretation

2.1 In interpreting these Conditions of Contract, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance for purpose of interpretation. Words have their normal meaning under the language of the Contract unless specifically defined. The Engineer will provide instructions clarifying queries about the Conditions of Contract.

2.2 If sectional completion is specified in the Contract Data, references in the Conditions of Contract to the Works, the Completion Date, and the Intended Completion Date apply to any Section of the Works (other than references to the Completion Date and Intended Completion date for the whole of the Works).

2.1.1 The documents forming the Contract shall be interpreted in the following order of priority and a copy of complete set will be issued to the Bidder and it is the responsibility of the Bidder to keep a copy of the same at the site till the completion of the work.

1. Agreement
2. Special Conditions of Contract, if any
3. Conditions of Contract
4. Contract Data
5. Financial Bid
6. Specifications
7. Any other document forming part of the agreement.

3. Language and Law

3.1 The language of the Contract and the law governing the Contract are stated in the Contract Data.

4. Engineer's Decisions

4.1 Except where otherwise specifically stated, the Engineer will decide contractual obligations between the Employer and the Bidder in the role representing the employer.

5. Delegation

5.1 The Engineer may delegate any of his duties and responsibilities to other officers under his control after notifying the Bidder and may cancel any delegation after notifying the Bidder.

6. Communications

6.1 Communications between parties which are referred to in the conditions are effective only when in writing. Communication of any notice under the contract will be complete when it is delivered by hand by obtaining acknowledgments or sent by Regd. Post or Speed Post, Courier Service etc to the address of the Bidder as given in the Bid or to any change of address given in writing subsequently by the Bidder, by obtaining receipt of postal authorities for having posted the notice.

7. Subcontracting

7.1 The Bidder may sub-contract with the approval of the Engineer but may not assign contract without the approval of the Employer in writing. Sub-contracting does not alter the Bidders' obligation.

7.2 The Bidder shall not be required to obtain any consent from the employer for:

a) the sub-contracting of any part of the Works for which the Sub-Bidder is named in the contract;

b) the provision of labour; and

c) the purchase of materials which are in accordance with the standards specified in the Contract.

Beyond this if the Bidder proposes sub-contracting any part of the work during execution of works, because of some unforeseen circumstances to enable him to complete the work as per terms of the contract, the Engineer will consider the following before according approval:

- The Bidder shall not sub-contract the whole of the Works.

- The Bidder shall not sub-contract any part of the Work without prior consent of the Engineer. Any such consent shall not relieve the Bidder from any liability or obligations under the contract and he shall be responsible for the acts, defaults and neglects of any sub-Bidder, his agents or workmen as fully as if they were the acts, defaults or neglects of the Bidder, his agents or workmen.

- The Engineer should satisfy himself whether (a) the circumstances warrant such sub-contracting; and (b) the sub-Bidders so proposed for the Work possess the experience, qualifications and equipment necessary for the job proposed to be entrusted to them in proportion to the quantum of work to be sub-contracted.

- If payments are proposed to be made directly to that sub-Bidder, this should be subject to specific authorization by the prime Bidder so that this arrangement does not alter the Bidder's liability or obligations under the contract.

Note under Clause 7

1 *All Bidders are expected to indicate clearly in the Bid, if they propose sub-contracting elements of the works amounting to more than 20 percent of the Bid Price. For each such proposal the qualification and the experience of the identified sub-Bidder in the relevant field should be furnished along with the Bid to enable the employer to satisfy himself about their qualifications before agreeing for such sub-contracting and include it in the contract. In view of the above, normally no additional sub-contracting should arise during execution of the contract.*

2 *However (a) sub-contracting for certain specialized elements of the work is not unusual and acceptable for carrying out the works more effectively; but vertical splitting of the works for subcontracting is not acceptable. (b) In any case, proposal for sub-contracting in addition to what was specified in Bid and stated in contract agreement will not be acceptable if the value of such additional sub-contracting exceeds 25% of value of work which was to be executed by the Bidder without sub-contracting*

3. *Assignment of the contract may be acceptable only under exceptional circumstances such as insolvencies / liquidation or merger of companies etc.*

8. Other Bidders

8.1 The Bidder shall cooperate and share the site with other Bidders, public authorities, utilities, and the Employer between the dates given in the Schedule of Other Bidders. The Bidder shall as referred to in the Contract Data, also provide facilities and services for them as described in the Schedule. The employer may modify the schedule of other Bidders and shall notify to the Bidder of any such modification.

9. Personnel

9.1 The Bidder shall employ the key personnel named in the Schedule of Key Personnel as referred to in the Contract Data to carry out the functions stated in the Schedule or other personnel approved by the Engineer. The Bidder should see that one of the key technical staff so employed shall always be present at the site of the work during working hours personally checking all the items of the work and paying extra attention to such works as may demand special attention. (e.g.) Reinforced cement concrete, Pipe Jointing, Asphalt Concreting works etc. The Employer will approve any proposed replacement of key personnel only if their qualifications, abilities and relevant experience are substantially equal to or better than those of the personnel listed in the Schedule.

9.2 If the Bidder fails to employ key technical personnel as given in the contract data or the technical personnel fail to perform their duties, as per clause 9.1 above, action will be taken to effect recovery for non-employment /failure in performing their duties at the rates specified in the contract data.

9.3 If the Engineer asks the Bidder to remove a person who is a member of the Bidder's staff or his work force stating the reasons the Bidder shall ensure that the person leaves the Site within seven days and has no further connection with the work in the Contract.

10. Employer's and Bidder's Risks

10.1 The Employer carries the risks which this Contract states are Employer's risks, and the Bidder carries the risks which this Contract states are Bidder's risks.

11. Employer's Risks

11.1 The Employer is responsible for the excepted risks which are (a) in so far as they directly affect the execution of the Works i.e. risks of war, hostilities, invasion, act of foreign enemies, rebellion, revolution, insurrection or military or usurped power, civil war, riot commotion or disorder (unless restricted to the Bidder's employees), and contamination from any nuclear fuel or nuclear waste or radioactive toxic explosive, or (b) a cause due solely to the design of the Works, other than the Bidder's design.

12. Bidder's Risks

12.1 All risks of loss of or damage to physical property and of personal injury and death which arise during and in consequence of the performance of the Contract are the responsibility of the Bidder.

13. Insurance

13.1 The Bidder shall provide, in the joint names of the Employer and the Bidder, insurance cover from the Start Date to the end of the Defects Liability Period, in the amounts and deductibles stated in the Contract Data for the following events which are due to the Bidder's risks:

(a) loss of or damage to the Works, Plant and Materials;

(b) loss of or damage to Equipment;

(c) loss of or damage of property (except the Works, Plant, Materials and Equipment) in connection with the Contract including third party claims; and

(d) personal injury or death including third party claims.

13.2 Policies and certificates for insurance shall be delivered by the Bidder to the Engineer for the Engineer's approval before the Start Date.

13.3 If the Bidder does not provide any of the policies and certificates required, the Employer may affect the insurance which the Bidder should have provided and recover the premiums, the Employer has paid, from payments otherwise due to the Bidder or, if no payment is due, the payment of the premiums shall be a debt due.

13.4 Alterations to the terms of an insurance shall not be made without the approval of the Engineer.

13.5 Both parties shall comply with any condition of the insurance policies.

14. Site Investigation Reports

14.1 The Bidder, in preparing the Bid, shall rely on any site Investigation Reports referred to in the Contract Data, supplemented by any information available to the Bid including information gathered by him by site visits as per ITB.

15. Queries about the Contract Data

15.1 The Engineer/Employer will clarify queries on the Contract Data.

16. Bidder to Construct the Works

16.1.1 The Bidder shall construct and install the Works in accordance with the Specification and Drawings, and as per instructions of Engineer.

16.2 The Bidder shall take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation.

16.3 During continuance of the contract, the Bidder and his sub-Bidders, Key personnel and any subordinates of the Bidder. shall abide at all times by all existing enactments on environmental protection and rules made there under, regulations, notifications and bye-laws of the State or Central Government, or local authorities and any other law, bye-law, regulations that may be passed or notification that may be issued in this respect in future by the State or Central Government or the local authority (Also see salient details of the major laws in protecting environment in other conditions of contract.)

17. Completion Date

17.1 The Bidder may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the program submitted by the Bidder, as updated with the approval of the Engineer, and complete them by the Intended Completion Date.

18. Approval by the Engineer/ Employer

18.1 The Bidder shall submit Specifications and Drawings showing the proposed Temporary Works to the Engineer / Employer, who is to approve them if they comply with the Specifications and Drawings.

18.2 The Bidder shall be responsible for design of Temporary Works.

18.3 The Engineer's / Employer’s approval shall not alter the Bidder's responsibility for design of the Temporary Works.

18.4 The Bidder shall obtain approval of third parties to the design of the Temporary Works where required.

18.5 All Drawings prepared by the Bidder for the execution of the temporary or permanent Works, are subject to prior approval by the Engineer / Employer before their use.

19. Safety

19.1 The Bidder shall be responsible for the safety of all activities on the Site.

20. Discoveries

20.1 Anything of historical or other interest or of significant value unexpectedly discovered on the Site is the property of the Employer. The Bidder is to notify the Engineer of such discoveries and carry out the Engineer's instructions for dealing with them.

21. Possession of the Site

21.1 The Employer shall give possession of all parts of the Site to the Bidder, as specified in the Contract Data. If possession of a part is not given by the date stated in the Contract Data, the Employer is deemed to have delayed the start of the relevant activities and this will be Compensation Event.

22. Access to the Site

22.1 The Bidder shall allow the Engineer and any person authorized by the Engineer access to the Site, to any place where work in connection with the Contract is being carried out or is intended to be carried out and to any place where materials or plant are being manufactured / fabricated / assembled for the works.

23. Instructions

23.1 The Bidder shall carry out all instructions of the Engineer which comply with the applicable laws where the Site is located.

24. Disputes

24.1 If the Bidder believes that a decision taken by the Engineer was either outside the authority given to the Engineer by the Contract or that the decision was wrongly taken, the decision shall be referred to the Adjudicator within 14 days of the notification of the Engineer's decision.

25. Procedure for resolution of Disputes

25.1 The Adjudicator shall give a detailed decision in accordance with the terms of contract in writing within 28 days of receipt of a notification of a dispute.

25.2 The Adjudicator shall be paid daily at the rate specified in the Contract Data together with reimbursable expenses of the types specified in the Contract Data and the cost shall be divided equally between the Employer and the Bidder, whatever decision is reached by the Adjudicator. Either party may convey to the other their intention to go in for arbitration within 28 days of the Adjudicator’s written decision. If neither party informs the other within the above 28 days, the Adjudicator's decision will be final and binding.

25.3 In case of Dispute on this adjudicator decision such disputes or difference shall be settled in accordance with the Arbitration and Conciliation Act, 1996. The arbitral tribunal shall consist of 3 arbitrators one each to be appointed by the Employer and the Bidder. The third Arbitrator shall be chosen by the two Arbitrators so appointed by the Parties and shall act as Presiding Arbitrator. In case of failure of the two Arbitrators appointed by the parties to reach upon a consensus within a period of 30 days from the appointment of the arbitrator appointed subsequently, the Presiding Arbitrator shall be appointed by the Chairman of the Institution of Engineers (India).

25.4 In the case of a dispute with a Foreign Bidder, the dispute shall be settled in accordance with provisions of UNCITRAL (United Nations Commission on International Trade Law) Arbitration Rules. The Arbitral Tribunal shall consist of three Arbitrators one each to be appointed by the Employer and the Bidder. The third Arbitrator shall be chosen by the two Arbitrators so appointed by the Parties, and shall act as presiding Arbitrator. In case of failure of the two Arbitrators appointed by the parties to reach upon a consensus within a period of 30 days from the appointment of the Arbitrator appointed subsequently, the Presiding Arbitrator shall be appointed by the Chairman of the Institution of Engineers (India).

25.5 If one of the parties fails to appoint its Arbitrator in pursuance of sub-clause (a) and (b) above, within 30 days after receipt of the notice of the appointment of its arbitrator by the other party, then the Chairman of the Institution of Engineers (India) both in cases of the Foreign supplier as well as Indian supplier, shall appoint the arbitrator. A certified copy of the order of the Chairman of the Institution of Engineers (India) making such an appointment shall be furnished to each of the parties.

25.6 Arbitration proceedings shall be held at Cochin, Kerala, India, and the language of the arbitration proceedings and that of all documents and communications between the parties shall be English.

25.7 The decision of the majority of arbitrators shall be final and binding upon both parties. The fees and expenses of the Arbitrators as determined by the arbitrators in consultation with both the parties shall be shared equally by the Employer and the Bidder. However, the expenses incurred by each party in connection with the preparation, presentation etc. of its case prior to, during and after the arbitration proceedings shall be borne by each party itself.

25.8 The Bidder shall within 3 months (Three) of the date of completion of work specify the disputes, claims and the amount involved and write to the Engineer /Employer accordingly, failing which it will be deemed that the Bidder will not take recourse to arbitration.

26. Replacement of Adjudicator

26.1 Should the Adjudicator resign or die, or is not fulfilling his functions in accordance with the provisions of the Contract, a new Adjudicator will be appointed by the Employer.

B. Time Control

27. Program

27.1 Within the time stated in the Contract Data the Bidder shall submit to the Engineer for approval a Program including Environmental Management Plan showing the general methods, arrangements, order, and timing for all the activities in the Works along with monthly cash flow forecast.

27.2 An update of the Program shall be a program showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work including any changes to the sequence of the activities.

27.3 The Bidder shall submit to the Engineer, for approval, an updated Program at intervals no longer than the period stated in the Contract Data. If the Bidder does not submit an updated Program within this period, the Engineer may withhold the amount stated in the Contract Data from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program has been submitted.

27.4 The Engineer's approval of the Program shall not alter the Bidder's obligations. The Bidder may revise the Program and submit it to the Engineer again at any time. A revised Program is to show the effect of Variations and Compensation Events.

28. Extension of the Intended Completion Date

28.1 The Engineer shall extend the Intended Completion Date if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date without the Bidder taking steps to accelerate the remaining work and which would cause the Bidder to incur additional cost.

28.2 The Engineer shall decide whether and by how much extend the Intended Completion Date within 21 days of the Bidder asking the Engineer for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information. If the Bidder has failed to give early warning of a delay or has failed to co-operate in dealing with the delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.

29. Delays Ordered by the Engineer

29.1 The Engineer may instruct the Bidder to delay the start or progress of any activity within the Works.

29.2 An order book shall be kept at the site of the work under the safe custody of the Supervisor or equivalent officer in charge of the works authorized by the Engineer. As far as possible all order regarding the work are to be entered in this book then and there duly signed by the Engineer and also by the Bidder or his authorized representative. In important site orders the Employer shall also countersign the entries. The order book shall always be kept at the site and shall not be removed from the site without the permission of the Engineer.

30. Management Meetings

30.1 Either the Engineer or the Bidder may require the other to attend a management meeting. The business of a management meeting shall be to review the plans for remaining work with reference to the construction methodology and site order book and to deal with matters raised in accordance with the early warning procedure.

30.2 The Engineer shall record the business of management meetings and is to provide copies of his record to those attending the meeting and to the Employer. The responsibility of the parties for actions to be taken is to be decided by the Engineer either at the management meeting or after the management meeting and stated in writing to all who attended the meeting.

31. Early Warning

31.1 The Bidder is to warn the Engineer at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work, increase the Contract Price or delay the execution of works with reasonable ground. The Engineer may require the Bidder to provide an estimate of the expected effect of the future event or circumstance on the Contract Price and Completion Date. The estimate is to be provided by the Bidder as soon as reasonably possible.

31.2 The Bidder shall cooperate with the Engineer in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Engineer with positive intention.

C. Quality Control

32. Identifying Defects

32.1 The Engineer shall check the Bidder's work and notify the Bidder of any Defects that are found. Such checking shall not affect the Bidder's responsibilities. The Engineer may instruct the Bidder to search for a Defect and to uncover and test any work that the Engineer considers may have a Defect and Bidder will do that.

33. Tests

33.1 If the Engineer instructs the Bidder to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Bidder shall pay for the test and any samples. If there is no Defect the test shall be a Compensation Event.

33.2 The Bidders shall produce test certificates obtained from any one of the recognized Institutions for cement and steel brought to site. As and when required by the department the cement and steel brought to site shall be tested by the department and only when the test results conform to the highest specifications they will be allowed to be used in the work.

33.3 If the Bidder desires to install his own quality control Laboratory he may do so after getting the approval from the Engineer by furnishing the detailed drawings of the laboratory and lists of equipment proposed to be installed etc. The Engineer or his representative shall have the right to visit the laboratory at any time without any restriction and also during the conducting of tests.

34. Correction of Defects

34.1 The Engineer shall give notice to the Bidder of any Defects immediately relating to his contractual obligations and anyway before the end of the Defects Liability Period, which begins at Completion of trial run and is defined in the Contract Data. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

34.2 Every time notice of a Defect is given, the Bidder shall correct the notified Defect within the length of time specified by the Engineer's notice.

35. Uncorrected Defects

35.1 If the Bidder has not corrected a Defect within the time specified in the Engineer's notice, the Engineer will assess the cost of having the Defect corrected, and this amount will be deducted from the Bills payable to the Bidder.

Note: Where in certain cases, the technical specifications provide for acceptance of works within specified tolerance limits at reduced rates, Engineer will certify payments to Bidder accordingly.

D. Cost Control

36. Price Schedule

36.1 The Price Schedule shall contain items for the construction, installation, testing, and commissioning work to be done by the Bidder.

36.2 The Price Schedule will be used to facilitate the interim payments to the Bidder. The Bidder will be paid for the quantity of the work done at the rate in the Price Schedule for each item after considering the quality control measures outlined.

37. Changes in the Quantities

37.1 An order book shall be kept at the site of the work. All orders regarding the work are to be entered in this book. All entries shall be signed by the Engineer in charge and by the Bidder or by his representative. Only based on the entries therein the extension of time and variations in quantities shall be assessed.

37.2 The activity schedule shall be amended by the Bidder to accommodate changes of program or method of working made at the Bidders' own discretion. Prices in the activity schedule shall not be altered when the Bidder makes such changes to the activity schedule.

38. Changes in original proposal

38.1 All changes in original proposal during execution shall be included in updated Programs produced by the Bidder.

39. Variations / Deviations

39.1 The Engineer-in-Charge shall have power (i) to make any alterations in, omissions from, additions to or substitutions for, the original specifications, drawings, designs and instructions that may appear to him to be necessary during the progress of the work, (ii) to omit/change part of the works for any reason, whatsoever, and the Bidder shall be bound to carry out the works in accordance with any instructions given to him in writing signed by the Engineer-in-Charge and such alterations, omissions, additions, or substitutions shall form part of the contract as if originally provided therein and any altered, additions or substituted works which the Bidder may be directed to do in the manner specified above as part of the work, shall be carried out by the Bidder on the same conditions in all respects including price on which he agreed to do the main work.

39.2 If the Bidder does not agree with the decision of the Engineer-in-Charge, he should refer to the Adjudicator for further decision and under no circumstances the Bidder shall suspend the work on the plea of non-settlement of the falling under this Clause.

40. Cash flow forecast

40.1 When the program or activity schedule is updated, the Bidder is to provide the Engineer with an updated cash flow forecast.

41. Payment Certificates

41.1 The Bidder himself shall record the detailed measurements in the appropriate format and shall submit to the Engineer monthly statements of the estimated value of the work completed in the appropriate format less the cumulative amount certified previously.

41.2 The Engineer shall check the Bidder's monthly statement and measurements within 14 days and certify the amount to be paid to the Bidder after taking into account any credit or debit for the month in question in respect of the works in the relevant amounts and under conditions set forth.

41.3 The value of work executed shall be determined by the Engineer.

41.4 The value of work executed shall comprise the value of the quantities of the items in the Price Schedule completed.

41.5 The value of work executed shall include the valuation of Variations and Compensation Events.

41.6 The Engineer may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.

42. Payments

42.1 Payments shall be adjusted for deductions for advance payments, retention, other recoveries in terms of the contract and taxes at source, as applicable under the law. The Employer shall pay the Bidder the amounts certified by the Engineer within 45 days of the date of each certificate.

42.2 If an amount certified is increased in a later certificate or as a result of an award by the Adjudicator, the Bidder shall be paid for such variation.

42.3 For items of the Works in the BOQ for which no rate or price has been entered in will not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.

42.4 Retention money at the rate mentioned in contract data will be deducted from each running bill till the completion of whole work.

43. Compensation Events

43.1 The following are Compensation Events unless they are caused by the Bidder:

(a) The Employer does not give access to a part of the Site by the Site Possession Date stated in the Contract Data.

(b) The Employer modifies the schedule of other Bidders in a way which affects the work of the Bidder under the contract.

(c) The Engineer orders a delay or does not issue drawings, specifications or instructions required for execution of works on time.

(d) The Engineer instructs the Bidder to uncover or to carry out additional tests upon work which is then found to have no Defects.

(e) The Engineer unreasonably does not approve for a subcontract to be let.

(f) Ground conditions are substantially more adverse than could reasonably have been assumed before issuance of Letter of Acceptance from the information issued to Bidders (including the Site Investigation Reports), from information available publicly and from a visual inspection of the Site.

(g) The Engineer gives an instruction for dealing with an unforeseen condition, caused by the Employer, or additional work required for safety or other reasons.

(h) Other Bidders, public authorities, utilities or the Employer does not work within the dates and other constraints stated in the Contract, and they cause delay or extra cost to the Bidder.

(i) The advance payment is delayed.

(j) The effect on the Bidder of any of the Employer’s Risks.

(k) The Engineer unreasonably delays issuing a Certificate of Completion.

(l) Other Compensation Events listed in the Contract Data or mentioned in the Contract.

43.2 If a Compensation Event would cause additional cost or would prevent the work being completed before the Intended Completion Date, the Contract Price shall be increased and/or the Intended Completion Date is extended. The Engineer shall decide whether and by how much the Contract Price shall be increased and whether and by how much the Intended Completion Date shall be extended.

43.3 As soon as information demonstrating the effect of each Compensation Event upon the Bidder's forecast cost has been provided by the Bidder, it is to be assessed by the Engineer and the Contract Price shall be adjusted accordingly. If the Bidder's forecast is deemed unreasonable, the Engineer shall adjust the Contract Price based on Engineer’s own forecast. The Engineer will assume that the Bidder will react positively and promptly to the event.

43.4 The Bidder shall not be entitled to compensation to the extent that the Employer's interests are adversely affected by the Bidder not having given early warning or not having cooperated with the Engineer.

44. Tax

44.1 The rates quoted by the Bidder shall be without GST.

45. Currencies

45.1 All payments shall be made in Indian Rupees.

46. Price Adjustment

46.1 No claim on account of any escalation on whatsoever ground shall be entertained at any stage of works. All RATES QUOTED shall be firm and fixed for entire contract period as well as extended period for completion of the works. No Price Adjustment shall be applicable on this contract.

47. Retention

47.1 The Employer shall retain from each payment due to the Bidder until Completion of the whole of the Works.

47.2 On Completion of the whole of the Works half the total amount retained is repaid to the Bidder and half when the Defects Liability Period has passed and the Engineer has certified that all Defects notified by the Engineer to the Bidder before the end of this period have been corrected.

47.3 On completion of the whole work, the Bidder may substitute retention money with an irrevocable bank guarantee.

47.4 The employer shall also adjust the retention money for the amounts due upon termination .

47.5 **The proportion of payments retained (retention money) shall be 5 % from each bill (except advance payment, if any) in addition to all the security deposits. The retention money shall be released after successful completion of commissioning and trial run, along with the release of final payment for the same.**

47.6 During the defect liability period, Bidder will carry out repair and rectification works as specified by engineer or as observed by the Bidder, within reasonable time limit so as not to allow further damage. In case Bidder fail to do so within stipulated time, without any reasonable reason, the employer will got this work done at risk and cost of the Bidder. Cost incurred will be deducted from the retention money and Bidder is bond to accept it.

48. Liquidated Damages

48.1 The Bidder shall pay liquidated damages to the Employer at the rate per day stated in the Contract Data for each day that the Completion Date is later than the Intended Completion Date (for the whole of the works or the milestone as stated in the contract data). The total amount of liquidated damages shall not exceed the amount defined in the Contract Data. The Employer may deduct liquidated damages from payments due to the Bidder.

48.2 Time is the essence of the contract and payment or deduction of liquidated damages shall not relieve the Bidder from his obligation to complete the work as per agreed construction program and milestones or from any other of the Bidder's obligations and liabilities under the contract."

48.3 If the Intended Completion Date is extended after liquidated damages have been paid, the Engineer shall correct any overpayment of liquidated damages by the Bidder by adjusting the next payment certificate.

49. Release of Advance Payment

49.1 The Employer shall make advance payment to the Bidder, against an irrevocable and unconditional Bank Guarantee in the form prescribed in Annexure D.

49.2 The Bidder is to use the advance payment only to pay for Equipment, Plant and Mobilization expenses required specifically for execution of the Works. The Bidder shall demonstrate that advance payment has been used in this way by supplying copies of invoices or other documents to the Engineer.

50. Additional Security Deposit

The Bidder shall submit an Additional Security Deposit for unbalanced items . The additional security for unbalanced items shall be valid until a date of 45 days from the date of issue of the certificate of completion.

51. Cost of Repairs

Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Correction periods shall be remedied by the Bidder at the Bidder's cost if the loss or damage arises from the Bidder's actions or omissions.

52. Penalty Clause

Any deviation from the assured recovery as proposed by the bidder for the RO system shall invite penalty at the rate of 200% over and above the actual cost involved in the treatment of the difference in the assured and actual quantities.

Also, in case of deviation from the assured recovery from the RO system, it shall be the complete responsibility of the bidder to ensure proper treatment of the proportional reject volumes generated by the RMS alongwith proper disposal including undertaking sufficient capacity augmentation of the RMS, if so required without any additional cost to the Employer.

E. Finishing the Contract

52 Completion

The Bidder shall request the Engineer to issue a Certificate of Completion of the Works and the Engineer will do so upon deciding that the Work is completed.

53. Taking Over

The Employer shall take over the Site and the Works within seven days of the Engineer issuing a certificate of Completion.

54. Final Account

The Bidder shall supply to the Engineer a detailed account of the total amount that the Bidder considers payable under the Contract before the end of the Defects Liability Period. The Engineer shall issue a Defect Liability Certificate and certify any final payment that is due to the Bidder within 60 days of receiving the Bidder's account if it is correct and complete. If it is not, the Engineer shall issue within 60 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Engineer shall decide on the amount payable to the Bidder and issue a payment certificate, within 60 days of receiving the Bidder’s revised account.

55. O&M Manuals & “As Built” drawings

55.1 “As Built” Drawings and O&M manuals shall be provided by the Bidder by the dates stated in the Contract Data.

55.2 If the Bidder does not supply the Drawings and/or manuals by the dates stated in the Contract Data, or they do not receive the Engineer’s approval, the Engineer shall withhold the amount stated in the Contract Data from payments due to the Bidder.

56. Termination

56.1 The Employer or the Bidder may terminate the Contract by serving 30 days notice if the other party causes a fundamental breach of the Contract.

56.2 Fundamental breaches of Contract include, but shall not be limited to the following:

(a) the Bidder stops work for 45 days when no stoppage of work is shown on the current program and the stoppage has not been authorized by the EIC (Engineer in Charge);

(b) the EIC instructs the Bidder to delay the progress of the Works and the instruction is not withdrawn within 45 days;

(c) the Employer or the Bidder is made bankrupt or goes into liquidation other than for a reconstruction or amalgamation;

(d) the EIC gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Bidder fails to correct it within a reasonable period of time determined by the EIC;

(e) the Bidder does not maintain a security which is required;

(f) the Bidder has delayed the completion of works by the number of days for which the maximum amount of liquidated damages can be paid as defined in the Contract data; and

(g) if the Bidder, in the judgment of the Employer has engaged in corrupt or fraudulent practices as defined in CC Clause 61 in competing for or in executing the Contract.

(i) The Bidder has contravened Clause 7 of CC read with OCC& Clause 9 of CC

(j) The Bidder does not adhere to the agreed construction program and also fails to take satisfactory remedial action as per agreements reached in the management meetings for a period of 60 days.

(k) The Bidder fails to carry out of the instructions of Engineer within a reasonable time determined by the Engineer .

56.3 When a breach of contract is noticed the engineer in charge shall decide whether the breach is fundamental or not and take appropriate action to remedy the situation by issue of suitable notice to the Bidder and report the fact to the employer.

56.4 Notwithstanding the above, the Employer may terminate the Contract for convenience.

52.5 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.

56.6 In case of termination of contract for any reasons, no claims for compensation for expected loss or profit for the balance work not executed will be admissible.

57. Payment upon Termination

57.1 If the Contract is terminated because of a fundamental breach of Contract by the Bidder, the Engineer shall issue a certificate for the value of the work done less advance payments received up to the date of the issue of the certificate, less other recoveries due in terms of the contract, less taxes due to be deducted at source as per applicable law and less the percentage to apply to the work not completed as indicated in the Contract Data. Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Bidder the difference shall be a debt payable to the Employer.

57.2 If the Contract is terminated at the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Engineer shall issue a certificate for the value of the work done, the reasonable cost of removal of Equipment, displacement of the Bidder's personnel employed solely on the Works, and the Bidder's costs of protecting and securing the Works and less advance payments received up to the date of the certificate, less other recoveries due in terms of the contract and less taxes due to be deducted at source as per applicable law.

58. Property

All materials on the site, plant, equipment, temporary works and works are deemed to be the property of the Employer, if the Contract is terminated because of a Bidder’s default.

59. Release from Performance

59.1 If the Contract is frustrated by the outbreak of war or by any other event entirely outside the control of either the Employer or the Bidder, the Engineer shall certify that the Contract has been frustrated. The Bidder shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterwards to which commitment was made.

59.2 In the event of death or insanity or insolvency or imprisonment of the Bidder or where the Bidder being a partnership or firm becomes dissolved or being a Corporation goes to liquidation voluntary or otherwise the contract may at the option of the employer be terminated by notice in writing posted at the site of works and communicated to the latest address of the Bidder by registered post and all accepted and acceptable works shall forthwith be measured up and paid for at the rates provided in the contract schedule where such apply or otherwise by the most recent schedule of rate of the jurisdiction approved by the competent authority to the person or persons entitled to receive and give a discharge for payment.

60. Revenue Recovery Act

Whenever any amount has to be paid by the Bidder in view of termination of contract and by virtue of clause 56.1 above any amount that may be due or may become due from the Bidder after recovering from the bills for this work is liable to recover from any other contracts awarded to the Bidder and also through the provision of Revenue Recovery Act after issue of notice.

61 Fraud and Corruption

61.1 The Employer requires that Bidders observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy, the Employer defines, for the purposes of this provision, the terms set forth below as follows:

(i) "corrupt practice" means the offering, giving, receiving or soliciting directly or indirectly anything of value to influence the action of a public official in the procurement process or in contract execution;

(ii) "fraudulent practice" means a misrepresentation or omission of facts in order to influence a procurement process or the execution of a contract.

(iii) "collusive practice" means a scheme or arrangement between two or more bidders, with or without the knowledge of the Employer, designed to establish at artificial, non-competitive levels to deprive the employer of the benefit of free and open competition and

(iv) "coercive practice" means harming or threatening to harm directly or indirectly, persons or their property to influence their participation in the procurement process or affect the execution of the contract.

(a) will reject a proposal for award if it determines that the Bidders recommended for award has directly or through an agent, engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the contract in question;

(b) will declare a firm ineligible, either indefinitely or for a stated period of time, to be awarded any contract if he at any time determines that the firm directly or through an agent engaged in corrupt, fraudulent, collusive or coercive practices in competing for, or in executing any contract.

F. Other Conditions of Contract

Water for Works

62. The Bidder shall be provided a water connection and thereafter shall make his own arrangements for water as required for use on the work and shall meet all charges therefore.

Materials

63. The Bidder has to procure at his cost all the materials required for the work, get the approval of the Engineer, test them wherever necessary as advised by the Engineer etc as outlined below :- The Bidder shall, at his own expense and without delay, supply to the Engineer well in advance samples of materials to be used on the work and get them approved so that the work can be proceeded without delay. All such materials to be procured by the Bidder shall be in conformity with the specification laid down or referred to in the contract. The Bidder shall, if requested by the Engineer furnish proof/ certificate to the effect that the materials comply with the required standard specifications within 30 days of receipt of samples or within such further period as the Engineer may require intimation to the Bidder in writing as to whether the samples are approved or not If samples are not approved, fresh samples complying with the specifications as laid down in the contract shall be produced and got approved. When certain samples are required to be tested in accordance with the specifications, the approval shall be issued by the Engineer on receipt of test results. The Bidder shall at his risk and cost submit the samples of materials to be tested or analyzed and shall not make use of or incorporate in the work any materials represented by the samples until the required tests or analysis have been made and the materials finally approved by the Engineer. The Bidder shall not be eligible for any claim or compensation either arising out of any delay in the work or due to any corrective measures required to be taken on account of and as a result of testing of materials. The Bidder shall at his risk and cost, make all arrangements and shall provide all facilities to the Engineer or his authorized subordinate for collecting, and preparing the required number of samples for such tests at such time and to such place or places as found necessary and bear all charges and cost of testing unless specifically provided for otherwise elsewhere in the contract specifications. The Bidder shall provide all cooperation to the Engineer or his authorized subordinate in the aspect without making any extra claim. The materials brought to site if in the opinion of the Engineer are not in accordance with the specifications and unfit for use on the works then the Bidder shall remove the same from the site within the period specified by the Engineer. If the Bidder fails to comply with such orders then the Engineer shall be at liberty to remove the same at the expense of the Bidder, and the Bidder have no right to claim any loss or damage due to the above materials.

Iron & Steel Works

64. All iron work or steel work of every kind , except those to be embedded in cement concrete shall immediately be on arrival at site be properly scraped wire brushed and provided with a red lead paint without claiming any extra.

65. Labour

The Bidder shall, unless otherwise provided in the Contract, make his own arrangements for the engagement of all staff and labour, local or other, and for their payment, housing, feeding and transport.

The Bidder shall, if required by the Engineer, deliver to the Engineer a return in detail, in such form and at such intervals as the Engineer may prescribe, showing the staff and the numbers of the several classes of labour from time to time employed by the Bidder on the Site and such other information as the Engineer may require.

66. Compliance with Labour Regulations

During continuance of the contract, the Bidder and his sub-Bidders shall abide at all times by all existing labour enactments and rules made there under, regulations, notifications and bye laws of the State or Central Government or local authority and any other labour law --(including rules), regulations, bye laws that may be passed or notification that may be issued under any labour law in future either by the State or the Central Government or the local authority. Salient features of some of the major labour laws that are applicable to construction industry are given below. The Bidder shall keep the Employer indemnified in case any action is taken against the Employer by the competent authority on account of contravention of any of the provisions of any Act or rules made there under, regulations or notifications including amendments. If the Employer 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/bye laws/Acts/Rules/regulations including amendments, if any, on the part of the Bidder, the Engineer/Employer shall have the right to deduct any money due to the Bidder including his amount of performance security. The Employer/Engineer shall also have right to recover from the Bidder any sum required or estimated to be required for making good the loss or damage suffered by the Employer. The employees of the Bidder and the Sub-Bidder in no case shall be treated as the employees of the Employer at any point of time.

67. Salient Features of Some Major Labour Laws Applicable To Establishments Engaged In Building And Other Construction Work.

a) Workmen Compensation Act 1923: The Act provides for compensation in case of injury by accident arising out of and during the course of employment.

b) Payment of Gratuity Act 1972: Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years of service or more or on death the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.

c) Employees P.F. and Miscellaneous Provision Act 1952: The Act Provides for monthly contributions by the employer plus workers. The benefits payable under the Act are :

(i) Pension or family pension on retirement or death, as the case may be.
(ii) Deposit linked insurance on the death in harness of the worker.
(iii) Payment of P.F. accumulation on retirement/death etc.

d) Contract Labour (Regulation & Abolition) Act 1970: The Act provides for certain welfare measures to be provided by the Bidder to contract labour and in case the Bidder fails to provide, the same are required to be provided, by the Principal Employer by Law. The Principal Employer is required to take Certificate of Registration and the Bidder is required to take license from the designated Officer. The Act is applicable to the establishments or Bidder of Principal Employer if they employ 20 or more contract labour.

e) Minimum Wages Act 1948: The Employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employments.

f) Payment of Wages Act 1936: It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.

g) Industrial Disputes Act 1947: The Act lays down the machinery and procedure for resolution of Industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

k) Child Labour (Prohibition & Regulation) Act 1986: The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of Child Labour is prohibited in Building and Construction Industry.

n) Inter-State Migrant workmen's (Regulation of Employment & Conditions of Service) Act 1979: The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The Inter-State migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, travelling expenses from home up to the establishment and back, etc.

o) The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act 1996 and the Cess Act of 1996: All the establishments who carry on any building or other construction work and employs 10 or more workers are covered under this Act. All such establishments are required to pay cess at the rate not exceeding 2% of the cost of construction as may be modified by the Government. The Employer of the establishment is required to provide safety measures at the Building or construction work and other welfare measures, such as Canteens, First-Aid facilities, Ambulance, Housing accommodations for workers near the work place etc. The Employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.

p) Factories Act 1948: The Act lays down the procedure for approval at plans before setting up a factory, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing 10 persons or more with aid of power or 20 or more persons without the aid of power engaged in manufacturing process.

68. Protection of Environment:

Salient features of some of the major laws that are applicable are given below:

The Water (Prevention and Control of Pollution) Act, 1974:

This provides for the prevention and control of water pollution, maintaining and restoring of wholesomeness of water. 'Pollution' means such contamination of water or such alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may, or is likely to, create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants or of aquatic organisms.

The Air (Prevention and Control of Pollution) Act, 1981:

This provides for prevention, control and abatement of air pollution. ‘Air Pollution’ means the presence in the atmosphere of any ‘air pollutant’, which means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment.

The Environment (Protection) Act, 1986:

This provides for the protection and improvement of environment and for matters connected therewith, and the prevention of hazards to human beings, other living creatures, plants and property. ‘Environment’ includes water, air and land and the inter-relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property.

The Public Liability Insurance Act, 1991:

This provides for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling hazardous substances and for matters connected herewith or incidental thereto. Hazardous substance means any substance or preparation which is defined as hazardous substance under the Environment (Protection) Act 1986, and exceeding such quantity as may be specified by notification by the Central Government.

CONTRACT DATA

Items marked "N/A" do not apply in this Contract.

1) The following documents are also part of the Contract:

- The Schedule of Other Bidders
- The Schedule of Key Personnel
- The Methodology and Program of Construction & Environmental Management Plan
- The Schedule of Key and Critical equipment to be deployed on the work as per agreed program of construction
- Site Investigation reports

2) The Employer/Owner is

Name: Development Commissioner and Chairperson,
Cochin Special Economic Zone (CSEZ)
Address: CSEZ Administrative Building,
Kakkanad, Cochin, Kerala – 682 037

3) The Owner's Engineer is: WAPCOS Limited

4) The name and identification number of the Contract is:

"Design, Engineering, Supply, Installation, Testing & Commissioning of 1.5 MLD Capacity RO Plant, RMS along with trial run of 2 months on turnkey basis for ZLD System for CETP and O&M for additional 60 months in CSEZ, Kakkanad, Cochin, Kerala"

5) The Start Date shall be the date of issue of notice to proceed with the work.

6) The Intended period for construction of whole Works is 06 months with the following milestones

7) After completion of construction of the Plant, the ZLD system with RO and RMS will be put on Trial Run for 2 months. After successful completion of the Trial Period, the Bidder will carry out O&M Works for 5 Years. Contract for O&M shall be on annual basis, extendable every year subject to satisfactory performance of the system with respect to compliance with discharge standards of CPCB/KSPCB and reuse norms of process/manufacturing units.

8) The Bidder shall submit a detailed Program including Environmental Management Plan for the Works (in such form and detail as the engineer shall reasonably prescribe) within 7 days of delivery of the Letter of Acceptance.

9) The Site Possession Dates shall be:

Within 15 days from the date of signing the contract agreement

10) The Defects Liability Period is 2 years (24 months) from the date of end of trial run period.

11) **Insurance**

Minimum Cover for Insurance		
i.	Works and Plant and Materials	Equal to the quoted construction cost
ii.	Loss or damage to Equipment	Equal to the cost of the Equipment
iii.	Other Property including third party claims	Shall arrange insurance against any damages, loss or injury which may occur to any property or to any person.
iv.	Personal injury or death insurance: a) for other people;	INR 20.00 Lakhs
v.	b) for Bidder's Employees	INR 20.00 Lakhs

For and on behalf of WAPCOS LIMITED

(Sd/-)
General Manager,
WAPCOS Limited,
CSEZ Project Office

SECTION – V

ANNEXURES

SECTION– V

ANNEXURES

Annexure –I.

FORMAT FOR GUARANTEE BONDS / AFFIDAVIT FOR WORK

The agreement made this ____________________ day of __________ two thousand and __________ between __________ S/o ____________________ (hereinafter called the GUARANTOR of the one part) and the WAPCOS LIMITED (hereinafter called the WAPCOS of the other part).

WHEREAS THIS agreement is supplementary to a contract. (Herein after called the Contract) dated _________ and made between the GUARANTOR OF THE ONE PART AND the WAPCOS of the other part, whereby the contractor interalia, under look to render the work in the said contract recited structurally stable workmanship and use of sound materials.

AND WHEREAS THE GUARANTOR agreed to give a guarantee to the effect that the said work will remain structurally stable and guarantee against faulty workmanship, finishing, manufacturing defects of materials and leakages etc.

NOW THE GUARANTOR hereby guarantee that work executed by him will remain structurally stable, after the expiry of maintenance period prescribed in the contract for the minimum life of ten years, to be reckoned from the date after the expiry of maintenance period prescribed in the contract.

The decision of the Engineer-in-charge with regard to nature and cause of defects shall be final. During the period of guarantee the guarantor shall make good all defects to the satisfaction of the Engineer in charge calling upon him to rectify the defects, failing which the work shall be got done by the WAPCOS by some other contractor at the guarantor's cost and risk. The decision of the Engineer in charge as to the cost payable by the Guarantor shall be final and binding.

That if the guarantor fails to make good all the defects, commits breach thereunder then the guarantor will indemnify the Principal and his successor against all loss, damage cost expense or otherwise which may be incurred by him by reason of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and / or damage and / or cost incurred by the WAPCOS the decision of the Engineer-in-charge will be final and binding on the parties.

IN WITHNES WHEREOF those presents have been executed by the obligator ________________ and __________________________ by for and on behalf of the WAPCOS LIMITED on the day, month and year first above written.

Signed sealed and delivered by OBLIGATOR in presence of:
1. ______________________
2. ______________________

SIGNED FOR AND ON BEHALF OF THE WAPCOS LIMITED BY____________ _________________ in the presence of:
1. ______________________
2. ______________________

Annexure –II

FORMAT FOR GUARANTEE BOND FOR THE WORK

The agreement made this ___________________ day of __________ two thousand and __________ between __________ S/o ___________________ (hereinafter called the GUARANTOR of the one part) and the WAPCOS Limited (hereinafter called the WAPCOS of the other part).

WHEREAS THIS agreement is supplementary to a contract. (Herein after called the Contract) dated _________ and made between the GUARANTOR OF THE ONE PART AND the WAPCOS of the other part, whereby the contractor interalia, undertook to render the structures in the said contract the work in the said contract recited completely water and leak proof.
THE GUARANTOR hereby guarantee that the water proofing treatment given by him will render the structures completely leak proof and the minimum life of such water proofing treatment shall be ten years to be reckoned from the date after the expiry of maintenance period prescribed in the contract.

Provided that the guarantor will not be responsible for leakage caused by earthquake or structural defects.

The decision of the Engineer in charge with regard to cause of leakage shall be final.
During the period of guarantee the guarantor shall make good all defects and in case of any defects being found render the structure water proof to the satisfaction of the Engineer in charge at his cost and shall commence the work for such rectification within seven days from the date of issue of notice from the Engineer in charge calling upon him to rectify the defects, failing which the work shall be got done by the WAPCOS through some other contractor at the guarantor's cost and risk. The decision of the Engineer in charge as to the cost payable by the Guarantor shall be final and binding.

That if the guarantor fails to execute the water proofing, or commits breach thereunder then the guarantor will indemnify the Principal and his successor against all loss, damage, cost of expenses or otherwise which may be incurred by him by reason of any of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement . As to the amount of loss and / or cost incurred by the WAPCOS on the decision of the Engineer-in-charge will be final and binding on the parties.

IN WITHNES WHEREOF those presents have been executed by the obligator __________________ and _______________________________ by for and on behalf of the WAPCOS LIMITED on the day , month and year first above written.

Signed sealed and delivered by OBLIGATOR in presence of :.
1. _____________________
2. _____________________

SIGNED FOR AND ON BEHALF OF THE WAPCOS LIMITED BY______________ in the presence of :
1. _____________________
2. _____________________

BANK GUARANTEE FORMAT FOR EMD (Not Applicable)

WHEREAS, M/s ……………………………………….. having their Registered/Head Office at …………………………………………….. (hereinafter called "the Bidder") has submitted his Bid dated …………………… for the ……………………………………………… [hereinafter called "the Bid"] to M/s WAPCOS Limited (hereinafter called the Employer)

KNOW ALL PEOPLE by these presents that we ……………………………………………… (name of the Bank) having our head office at ……………………………………………… (hereinafter called "the Bank") are bound unto Employer in the sum of ……………………………………… for which payment well and truly to be made to the Employer, the Bank binds itself, its successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this ………………… day of ………………………… 2016.

THE CONDITIONS of this obligation are:

(1) If after Bid opening the Bidder withdraws his bid during the period of Bid validity specified;

OR

(2) If the Bidder having been notified of the acceptance of his bid by ……………………………… during the period of Bid Validity:

We undertake to pay to the ……………………………… up to the above amount upon receipt of his first written demand, without the Employer having to substantiate his demand, provided that in his demand the Bidder will note that the amount claimed by him is due to him owing to the occurrence of one or any of the above mentioned two conditions and specify the occurred condition or conditions.

This Guarantee will remain in force up to and including the date ……………………………… after the deadline for submission of Bids as is stated in the instructions to Bidders or as it may be extended by the ……………………………………… notice of which extension(s) to the Bank is hereby waived and notice to the bidder would constitute sufficient notice to the Bank. Any demand in respect of this guarantee should reach the Bank not later than the above date.

Notwithstanding anything contained herein

i) Liability under this guarantee shall not exceed ……………………………………………

ii) This bank guarantee shall be valid upto ………………………………………… and;

iii) Our liability to make payment shall arise and we are liable to pay the guaranteed amount or any part thereof under this guarantee only and only if you serve upon us a written claim or demand in terms of the guarantee on or before …………………………………… (indicate a period twelve months after the date of issue of Bank Gurantee).

DATE:
(Signature of Witness)

SIGNATURE:
SEAL

Annexure –III

FORM OF PERFORMANCE SECURITY

WAPCOS Limited,
76-C, Sector 18,
Gurgaon-122015.

In consideration of ____________________ (Employer's name) (hereinafter referred to as "the Employer") which expression shall, unless repugnant to the context or meaning thereof include its successors, administrators and assigns) having awarded to _____________________ (Contractor's name & address) (hereinafter referred to as "the Contractor " which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) a contract, by issue of Employer's Notification of Award No. _______________ dt. _____________ and the same having been unequivocally accepted by the Contractor, resulting into a contract valued at Rs. _____________(Rupees ______________only) for ________________(name of work) (hereinafter called " the contract") and the Contractor having agreed to provide a Contract Performance Guarantee for the faithful performance of the entire contract equivalent to Rs. _____________ (Rupees ______________________only) (10 % of the said value of the Contract to the Employer.

We, ____________________(name & address of bank) (hereinafter referred to as "the Bank" which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) do hereby guarantee and undertake to pay the Employer, on demand any or, all monies payable by the Contractor to the extent of Rs. _____________(Rupees __________________only) as aforesaid at any time upto ___________without any demur, reservation, contest , recourse or protest and/or without any reference to the Contractor. Any such demand made by the Employer on the bank shall be conclusive and binding notwithstanding any difference between the Employer and the Contractor or any dispute pending before any Court, Tribunal, Arbitrator or any other authority. The Bank undertakes not to revoke this guarantee during its currency without previous consent of the Employer and further agrees that the guarantee herein contained shall continue to be enforceable till the Employer discharges this guarantee.

We the said Bank 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 the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said contract have been fully paid and its claims satisfied or discharged or till the Employer certifies that the terms and conditions of the said Contract have been fully and properly carried out by the said Contractor and accordingly discharges the guarantee.

The Employer shall have the fullest liberty without affecting in any way the liability of the Bank under this guarantee, from, time to time to extend the time for performance of the Contract by the Contractor. The Employer shall have the fullest liberty without affecting this guarantee, to postpone from time to time the exercise of any powers vested in them or of any right which they might have against the Contractor and to exercise the same at any time in any manner and either to enforce or to forbear to enforce any covenants, contained or implied, in the Contract between the Employer and the Contractor or any other course or remedy or security available to the Employer. The bank shall not be released of its obligations under these presents by any exercise by the Employer of its liberty with reference to the matters aforesaid or any of them or by reason of any other act or forbearance or other acts of omission or commission on the part of the Employer or any other indulgence shown by the Employer or by any other matter or thing whatsoever which under law would but for this provision, have the effect of relieving the Bank. The guarantee shall not be affected by a change in the constitution of the bank or of the employer.

The bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance, without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

We The Said Bank do hereby declare that we have absolute and unconditional power to issue this guarantee in your favour under the Memorandum and Articles of Association or such other constitutional documents of the Bank and the undersigned have full power to execute this guarantee under the Power of Attorney/ Post Approval Authorization dated______________________ of the bank granted to him / us by the Bank. We the said bank do hereby declare and undertake that your claim under the guarantee shall not be affected by any deficiency or other defect in the powers of the bank or its officials and the guarantee shall be deemed to have been issued as if the bank and its officials have all the powers and authorization to give this guarantee on behalf of the bank.

We the said bank do hereby certify the genuineness and appropriateness of the Stamp paper and stamp value used for issuing the guarantee. We the said bank do hereby declare and undertake that your claim under the guarantee shall not be affected by any deficiency or other defect in the stamp paper or its stamp value.

We the said bank do hereby declare that our payments hereunder shall be made to you , free and clear of and without and deduction, reduction on account of any reasons including any and all present and future taxes, levies, charges of withholding whatsoever imposed or collected with respect thereto.

Notwithstanding anything contained hereinabove our liability under this guarantee is restricted to Rs. ______________(Rupees _____________________ only) and it shall remain in force upto and including ______________ and shall be extended from time to time for such period as may be desired by M/S WAPCOS Limited on whose behalf this bank guarantee has been given.

Notwithstanding anything contained herein

i) our liability under this guarantee shall not exceed Rs. ______________ (Rupees ________________ only) ;

ii) This bank guarantee shall be valid upto ______________; and

iii) our liability to make payment shall arise and we are liable to pay the guaranteed amount or any part thereof under this guarantee, only and only if you serve upon us a written claim or demand in terms of the guarantee on or before _________(**indicate a date twelve months after validity of guarantee**).

Dated this ________day of ________ at New Delhi.

For & on behalf of Tenderer

Annexure – IV

FORMAT FOR AFFIDAVIT

I / We have submitted a bank guarantee for the work (Name of work) Agreement No. ________________Dated _________________from __________________ (Name of the Bank with full address) to the WAPCOS Limited, New Delhi with a view to seek exemption from payment of performance guarantee in cash. This Bank guarantee expires on ____ I / We undertake to keep the validity of the bank guarantee intact by getting it extended from time to time at my / our own initiative upto a period of _______________________ months after the recorded date of completion of the work or as directed by the WAPCOS.

I / We also indemnify the WAPCOS against any losses arising out of non-encashment of the bank guarantee if any.

(Deponent)
Signature of Contractor

Note: The affidavit is to be given by the Executants before a first class Magistrate.

Annexure –V

FORM OF ADVANCE PAYMENT GUARANTEE

The General Manager,
WAPCOS Limited CSEZ Project Office
CSEZ Admin. Building, Kakkanad,
Cochin, Kerala--682037
Phone: +91-484-2413544

In consideration of WAPCOS LTD. (hereinafter referred to as "the Employer") which expression shall, unless repugnant to the context or meaning thereof include its successors, administrators and assigns) having awarded to ______________________(Contractor's name) with its Registered /Head Office at __________________(hereinafter referred to as "the Contractor " which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) a contract, by issue of Employer's Notification of Award No. ___________________dt. __________and the same having been unequivocally accepted by the Contractor, resulting into a contract valued at Rs._________(Rupees____only) for _______________ (hereinafter called " the contract") and the Employer having agreed to make an advance payment to the Contractor for performance of the above Contract amounting to Rs. _________________(Rupees ______________only) as an advance against bank guarantee to be furnished by the Contractor.

We, __________________(name & address of bank) having its Head Office at _____________(hereinafter referred to as "the Bank" which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) do hereby guarantee and undertake to pay the Employer immediately on demand any or, all monies payable by the Contractor to the extent of Rs. ______________ (Rupees ________________only) as aforesaid at any time upto ___________without any demur, reservation, contest , recourse or protest and/or without any reference to the Contractor. Any such demand made by the Employer on the bank shall be conclusive and binding notwithstanding any difference between the Employer and the Contractor or any dispute pending before any Court, Tribunal, Arbitrator or any other authority. We agree that the Guarantee herein contained shall be irrevocable and shall continue to be enforceable till the Employer discharges this guarantee. We further agree that no change in the constitution of the Bank or of the Employer shall affect this guarantee.

The Employer shall have the fullest liberty without affecting in any way the liability of the Bank under this guarantee, from time to time, to vary the advance or to extend the time for performance of the Contract by the Contractor. The Employer shall have the fullest liberty without affecting this guarantee, to postpone from time to time the exercise of any powers vested in them or of any right which they might have against the Contractor and to exercise the same at any time in any manner, and either to enforce or to forbear to enforce any covenants, contained or implied, in the Contract between the Employer and the Contractor or any other course or remedy or security available to the Employer. The bank shall not be released of its obligations under these presents by any exercise by the Employer of its liberty with reference to the matters aforesaid or any of them or by reason of any other act or forbearance or other acts of omission or commission on the part of the Employer or any other indulgence shown by the Employer or by any other matter or thing whatsoever which under law would but for this provision, have the effect of relieving the Bank.

The bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

We The Said Bank do hereby declare that we have absolute and unconditional power to issue this guarantee in your favour under the Memorandum and Articles of Association or such other constitutional documents of the Bank and the undersigned have full power to execute this guarantee under the Power of Attorney/ Post Approval Authorization dated______________________ of the bank granted to him / us by the Bank. We the said bank do hereby declare and undertake that your claim under the guarantee shall not be affected by any deficiency or other defect in the powers of the bank or its officials and the guarantee shall be deemed to have been issued as if the bank and its officials have all the powers and authorization to give this guarantee on behalf of the bank.
We the said bank does hereby certify the genuineness and appropriateness of the Stamp paper and stamp value used for issuing the guarantee. We the said bank does hereby declare and undertake that your claim under the guarantee shall not be affected by any deficiency or other defect in the stamp paper or its stamp value.

We the said bank do hereby declare that our payments hereunder shall be made to you , free and clear of and without and deduction, reduction on account of any reasons including any and all present and future taxes, levies, charges of withholding whatsoever imposed or collected with respect thereto.

Notwithstanding anything contained hereinabove our liability under this guarantee is limited to Rs._______________(Rupees _________________only) and it shall remain in force upto and including _________________and shall be extended from time to time for such period (not exceeding one year), as may be desired by M/S ______________on whose behalf this bank guarantee has been given.

Notwithstanding anything contained herein

ii) Our liability under this guarantee shall not exceed Rs.___________(Rupees _________________________only);

iii) This bank guarantee shall be valid upto _________________ and

iv) our liability to make payment shall arise and we are liable to pay the guaranteed amount or any part thereof under this guarantee, only and only if you serve upon us a written claim or demand in terms of the guarantee on or before **____________(indicate a date twelve months after the validity of the guarantee).**

Dated this ________day of _________at New Delhi.

WITNESS

______________________	______________________
(Signature)	(Signature)
______________________	______________________
(Name)	(Name)
______________________	______________________
(Official address)	(Designation with bank stamp)
______________________	Attorney as Power of Attorney
(Signature)	No.__________ dt._______
______________________	
(Name)	
______________________	

ANNEXURE – VI

FORM OF INTEGRITY PACT

To
The General Manager,
WAPCOS Limited CSEZ Project Office
CSEZ Admin. Building, Kakkanad,
Cochin, Kerala--682037
Phone: +91-484-2413544

Sub: Submission of Tender for the work of "Supply, Installation, Testing and Commissioning of Biological Plant, Membrane Bio Reactor (MBR), Reverse Osmosis Plant (RO) and accessories for 1 MLD Zero Liquid Discharge (ZLD) Plant at Cochin Special Economic Zone)"

Sir,

I/We acknowledge that WAPCOS is committed to follow the principles thereof as enumerated in the Integrity Agreement enclosed with the tender/bid document.

I/We agree that the Notice Inviting Tender (NIT) is an invitation to offer made on the condition that I/We will sign the enclosed integrity Agreement, which is an integral part of tender documents, failing which I/We will stand disqualified from the tendering process. I/We acknowledge that the Making of the Bid shall be regarded as an Unconditional and absolute Acceptance of this condition of the NIT.

I/We confirm acceptance and compliance with the Integrity Agreement in letter and spirit and further agree that execution of the said Integrity Agreement shall be separate and distinct from the main contract, which will come into existence when tender/bid is finally accepted by WAPCOS.

I/We acknowledge and accept the duration of the Integrity Agreement, which shall be in the line with Article 1 of the enclosed Integrity Agreement.

I/We acknowledge that in the event of my/our failure to sign and accept the Integrity Agreement, while submitting the tender/bid, WAPCOS shall have unqualified, absolute and unfettered right to disqualify the tenderer/bidder and reject the tender/bid is accordance with terms and conditions of the tender/bid.

Yours faithfully
(Duly authorized signatory of the Bidder)

To be signed by the bidder and same signatory competent / authorized to sign the relevant contract on behalf of WAPCOS

FORMAT FOR INTEGRITY PACT

This Integrity Agreement is made at .... on this .... day of .... 20......

BETWEEN

WAPCOS Limited, New Delhi (Hereinafter referred as the **'Principal/Owner',** which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns)

AND

....

(Name and Address of the Individual/firm/Company)
through .... (Hereinafter referred to as the
(Details of duly authorized signatory)

"Bidder/Contractor" and which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns)

Preamble
WHEREAS the Principal / Owner has floated the Tender (NIT No. ....) (hereinafter referred to as "Tender/Bid") and intends to award, under laid down organizational procedure, contract for.. (Name of work) hereinafter referred to as the "Contract".

AND WHEREAS the Principal/Owner values full compliance with all relevant laws of the land, rules, regulations, economic use of resources and of fairness/transparency in its relation with its Bidder(s) and Contractor(s).

AND WHEREAS to meet the purpose aforesaid both the parties have agreed to enter into this Integrity Agreement (hereinafter referred to as "Integrity Pact" or "Pact"), the terms and conditions of which shall also be read as integral part and parcel of the Tender/Bid documents and Contract between the parties.

NOW, THEREFORE, in consideration of mutual covenants contained in this Pact, the parties hereby agree as follows and this Pact witnesses as under:

Article 1: Commitment of the Principal/Owner

(1) The Principal/Owner commits itself to take all measures necessary to prevent corruption and to observe the following principles:

(a) No employee of the Principal/Owner, personally or through any of his/her family members, will in connection with the Tender, or the execution of the Contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

(b) The Principal/Owner will, during the Tender process, treat all Bidder(s) with equity and reason. The Principal/Owner will, in particular, before and during the Tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder(s) could obtain an advantage in relation to the Tender process or the Contract execution.

(c) The Principal/Owner shall endeavour to exclude from the Tender process any person, whose conduct in the past has been of biased nature.

(2) If the Principal/Owner obtains information on the conduct of any of its employees which is a criminal offence under the Indian Penal code (IPC)/Prevention of Corruption Act, 1988 (PC Act) or is in violation of the principles herein mentioned or if there be a substantive suspicion in this regard, the Principal/Owner will inform the Chief Vigilance Officer and in addition can also initiate disciplinary actions as per its internal laid down policies and procedures.

Article 2: Commitment of the Bidder(s)/Contractor(s)

(1) It is required that each Bidder/Contractor (including their respective officers, employees and agents) adhere to the highest ethical standards, and report to the WAPCOS all suspected acts of fraud or corruption or Coercion or Collusion of which it has knowledge or becomes aware, during the tendering process and throughout the negotiation or award of a contract.

(2) The Bidder(s)/Contractor(s) commits himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the Tender process and during the Contract execution:

(a) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm, offer, promise or give to any of the Principal/Owner’s employees involved in the Tender process or execution of the Contract or to any third person any material or other benefit which he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the Tender process or during the execution of the Contract.

(b) The Bidder(s)/Contractor(s) will not enter with other Bidder(s) into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to cartelize in the bidding process.

(c) The Bidder(s)/Contractor(s) will not commit any offence under the relevant IPC/PC Act. Further the Bidder(s)/ Contract(s) will not use improperly, (for the purpose of competition or personal gain), or pass on to others, any information or documents provided by the Principal/Owner as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

(d) The Bidder(s)/Contractor(s) of foreign origin shall disclose the names and addresses of agents/ representatives in India, if any. Similarly Bidder(s)/Contractor(s) of Indian Nationality shall disclose names and addresses of foreign agents/representatives, if any. Either the Indian agent on behalf of the foreign principal or the foreign principal directly could bid in a tender but not both. Further, in cases where an agent participate in a tender on behalf of one manufacturer, he shall not be allowed to quote on behalf of another manufacturer along with the first manufacturer in a subsequent/parallel tender for the same item.

(e) The Bidder(s)/Contractor(s) will, when presenting his bid, disclose any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the Contract.

(3) The Bidder(s)/Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

(4) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm indulge in fraudulent practice means a willful misrepresentation or omission of facts or submission of fake/forged documents in order to induce public official to act in reliance thereof, with the purpose of obtaining unjust advantage by or causing damage to justified interest of others and/or to influence the procurement process to the detriment of the WAPCOS interests.

(5) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm use Coercive Practices (means the act of obtaining something, compelling an action or influencing a decision through intimidation, threat or the use of force directly or indirectly, where potential or actual injury may befall upon a person, his/her reputation or property to influence their participation in the tendering process).

Article 3: Consequences of Breach

Without prejudice to any rights that may be available to the Principal/Owner under law or the Contract or its established policies and laid down procedures, the Principal/Owner shall have the following rights in case of breach of this Integrity Pact by the Bidder(s)/Contractor(s) and the Bidder/ Contractor accepts and undertakes to respect and uphold the Principal/Owner’s absolute right:

(1) If the Bidder(s)/Contractor(s), either before award or during execution of Contract has committed a transgression through a violation of Article 2 above or in any other form, such as to put his reliability or credibility in question, the Principal/Owner after giving 14 days’ notice to the contractor shall have powers to disqualify the Bidder(s)/Contractor(s) from the Tender process or terminate/determine the Contract, if already executed or exclude the Bidder/Contractor from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of transgression and determined by the Principal/Owner. Such exclusion may be forever or for a limited period as decided by the Principal/Owner.

(2) Forfeiture of EMD/Performance Guarantee/Security Deposit: If the Principal/Owner has disqualified the Bidder(s) from the Tender process prior to the award of the Contract or terminated/determined the Contract or has accrued the right to terminate/determine the Contract according to Article 3(1), the Principal/Owner apart from exercising any legal rights that may have accrued to the Principal/Owner, may in its considered opinion

forfeit the entire amount of Earnest Money Deposit, Performance Guarantee and Security Deposit of the Bidder/Contractor.

(3) Criminal Liability: If the Principal/Owner obtains knowledge of conduct of a Bidder or Contractor, or of an employee or a representative or an associate of a Bidder or Contractor which constitutes corruption within the meaning of IPC Act, or if the Principal/Owner has substantive suspicion in this regard, the Principal/Owner will inform the same to law enforcing agencies for further investigation.

Article 4: Previous Transgression

(1) The Bidder declares that no previous transgressions occurred in the last 5 years with any other Company in any country confirming to the anticorruption approach or with Central Government or State Government or any other Central/State Public Sector Enterprises in India that could justify his exclusion from the Tender process.

(2) If the Bidder makes incorrect statement on this subject, he can be disqualified from the Tender process or action can be taken for banning of business dealings/ holiday listing of the Bidder/Contractor as deemed fit by the Principal/ Owner.

(3) If the Bidder/Contractor can prove that he has resorted / recouped the damage caused by him and has installed a suitable corruption prevention system, the Principal/Owner may, at its own discretion, revoke the exclusion prematurely.

Article 5: Equal Treatment of all Bidders/Contractors/Subcontractors

(1) The Bidder(s)/Contractor(s) undertake(s) to demand from all subcontractors a commitment in conformity with this Integrity Pact. The Bidder/Contractor shall be responsible for any violation(s) of the principles laid down in this agreement/Pact by any of its Subcontractors/sub-vendors.

(2) The Principal/Owner will enter into Pacts on identical terms as this one with all Bidders and Contractors.

(3) The Principal/Owner will disqualify Bidders, who do not submit, the duly signed Pact between the Principal/Owner and the bidder, along with the Tender or violate its

provisions at any stage of the Tender process, from the Tender process.

Article 6- Duration of the Pact

This Pact begins when both the parties have legally signed it. It expires for the Contractor/Vendor 12 months after the completion of work under the contract or till the continuation of defect liability period, whichever is more and for all other bidders, till the Contract has been awarded.

If any claim is made/lodged during the time, the same shall be binding and continue to be valid despite the lapse of this Pacts as specified above, unless it is discharged/determined by the Competent Authority, WAPCOS

Article 7- Other Provisions

(1) This Pact is subject to Indian Law, place of performance and jurisdiction is the Head quarters of the Principal/Owner, who has floated the Tender.

(2) Changes and supplements need to be made in writing. Side agreements have not been made.

(3) If the Contractor is a partnership or a consortium, this Pact must be signed by all the partners or by one or more partner holding power of attorney signed by all partners and consortium members. In case of a Company, the Pact must be signed by a representative duly authorized by board resolution.

(4) Should one or several provisions of this Pact turn out to be invalid; the remainder of this Pact remains valid. In this case, the parties will strive to come to an agreement to their original intensions.

(5) It is agreed term and condition that any dispute or difference arising between the parties with regard to the terms of this Integrity Agreement / Pact, any action taken by the Owner/Principal in accordance with this Integrity Agreement/ Pact or interpretation thereof shall not be subject to arbitration.

Article 8- LEGAL AND PRIOR RIGHTS

All rights and remedies of the parties hereto shall be in addition to all the other legal rights and remedies belonging to such parties under the Contract and/or law and the same shall be deemed to be cumulative and not alternative to such legal rights and remedies aforesaid. For the sake of brevity, both the Parties agree that this Integrity Pact will have precedence over the Tender/Contact documents with regard any of the provisions covered under this Integrity Pact.

IN WITNESS WHEREOF the parties have signed and executed this Integrity Pact at the place and date first above mentioned in the presence of following witnesses:

....
(For and on behalf of Principal/Owner)

....
(For and on behalf of Bidder/Contractor)

WITNESSES:
1. ....
(signature, name and address)
2. ....
(signature, name and address)

Place:

Dated: :

ANNEXURE – VII

FORMAT OF RESUME OF PROPOSED PERSONNEL

The bidder shall provide all the information requested below:

Position		
Personnel information	Name	Date of birth
	Professional qualifications	
Present employment	Name of Employer	
	Address of Employer	
	Telephone	Contact (manager / personnel officer)
	Fax	E-mail
	Job title	Years with present Employer

Summarize professional experience in reverse chronological order. Indicate particular technical and managerial experience relevant to the project.

From	To	Company, Project , Position, and Relevant Technical and Management Experience

Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience, and I am available to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my disqualification or dismissal by the Client, and/or sanctions by the Bank.

{day/month/year}

Name of Personnel **Signature** **Date**

{day/month/year}

Name of authorized Representative of the Contractor **Signature** **Date**

ANNEXURE –VIII

SAFETY CODES

1. Suitable scaffolds should be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except such short period work as can be done safely from ladders. When a ladder is used, an extra mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well suitable footholds and hand-hold shall be provided on the ladder and the ladder shall be given an inclination not steeper than ¼ to 1(¼ horizontal and 1 vertical).

2. Scaffolding of staging more than 3.6 m (12ft.) above the ground or floor, swung or suspended from an overhead support or erected with stationary support shall have a guard rail properly attached or bolted, braced and otherwise secured at least 90 cm. (3ft.) high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such opening as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.

3. Working platforms, gangways and stairways should be so constructed that they should not sag unduly or unequally, and if the height of the platform or the gangway or the stairway is more than 3.6 m (12ft.) above ground level or floor level, they should be closely boarded, should have adequate width and should be suitably fastened as described in (2) above.

4. Every opening in the floor of a building or in a working platform shall be provided with suitable means to prevent the fall of person or materials by providing suitable fencing or railing whose minimum height shall be 90 cm. (3ft.).

5. Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9m. (30ft.) in length while the width between side rails in rung ladder shall in no case be less than 29 cm. (11½") for ladder up to and including 3 m. (10 ft.) in length. For longer ladders, this width should be increased at least ¼” for each additional 30 cm. (1 foot) of length. Uniform step spacing of not more than 30 cm shall be kept. Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites or work shall be so stacked or placed as to cause danger or inconvenience to any person or the public. The contractor shall provide all necessary fencing and lights to protect the public from accident and shall be bound to bear the expenses of defense of every suit, action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and cost which may be awarded in any such suit; action or proceedings to any such person or which may, with the consent of the contractor, be paid to compensate any claim by any such person

6. (a) Excavation and Trenching - All trenches 1.2 m. (4ft.) or more in depth, shall at all times be supplied with at least one ladder for each 30 m. (100 ft.) in length or fraction thereof, Ladder shall extend from bottom of the trench to at least 90 cm. (3ft.) above the surface of the ground. The side of the trenches which are 1.5 m. (5ft.) or more in depth shall be stepped back to give suitable slope or securely held by timber bracing,

so as to avoid the danger of sides collapsing. The excavated materials shall not be placed within 1.5 m. (5ft.) of the edges of the trench or half of the depth of the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances, undermining or undercutting shall be done.

(b) Safety Measures for digging bore holes:-

i. If the bore well is successful, it should be safely capped to avoid caving and collapse of the bore well. The failed and the abandoned ones should be completely refilled to avoid caving and collapse;

ii. During drilling, Sign boards should be erected near the site with the address of the drilling contractor and the Engineer in-charge of the work;

iii. Suitable fencing should be erected around the well during the drilling and after the installation of the rig on the point of drilling, flags shall be put 50m all-round the point of drilling to avoid entry of people;

iv. After drilling the bore well, a cement platform (0.50m x 0.50m x 1.20m) 0.60m above ground level and 0.60m below ground level should be constructed around the well casing;

v. After the completion of the bore well, the contractor should cap the bore well properly by welding steel plate, cover the bore well with the drilled wet soil and fix thorny shrubs over the soil. This should be done even while repairing the pump;

vi. After the bore well is drilled the entire site should be brought to the ground level.

7. Demolition - Before any demolition work is commenced and also during the progress of the work,

(i) All roads and open areas adjacent to the work site shall either be closed or suitably protected.

(ii) No electric cable or apparatus which is liable to be a source of danger or a cable or apparatus used by the operator shall remain electrically charged.

(iii) All practical steps shall be taken to prevent danger to persons employed from risk of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render it unsafe.

1. All necessary personal safety equipment as considered adequate by the Engineer-in-Charge should be kept available for the use of the person employed on the site and maintained in a condition suitable for immediate use, and the contractor should take adequate steps to ensure proper use of equipment by those concerned. The following safety equipment shall invariably be provided.

(i) Workers employed on mixing asphaltic materials, cement and lime mortars shall be provided with protective footwear and protective goggles.

(ii) Those engaged in white washing and mixing or stacking of cement bags or any material which is injurious to the eyes, shall be provided with protective goggles.

(iii) Those engaged in welding works shall be provided with welder's protective eye shields.

(iv) Stone breaker shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.

(v) When workers are employed in sewers and manholes, which are in active use, the contractors shall ensure that the manhole covers are opened and ventilated at least for an hour before the workers are allowed to get into the manholes, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to the public. In addition, the contractor shall ensure that the following safety measure are adhered to :-

(a) Entry for workers into the line shall not be allowed except under supervision of the JE or any other higher officer.

(b) At least 5 to 6 manholes upstream and downstream should be kept open for at least 2 to 3 hours before any man is allowed to enter into the manhole for working inside.

(c) Before entry, presence of Toxic gases should be tested by inserting wet lead acetate paper which changes colour in the presence of such gases and gives indication of their presence.

(d) Presence of Oxygen should be verified by lowering a detector lamp into the manhole. In case, no Oxygen is found inside the sewer line, workers should be sent only with Oxygen kit.

(e) Safety belt with rope should be provided to the workers. While working inside the manholes, such rope should be handled by two men standing outside to enable him to be pulled out during emergency.

(f) The area should be barricaded or cordoned of by suitable means to avoid mishaps of any kind. Proper warning signs should be displayed for the safety of the public whenever cleaning works are undertaken during night or day.

(g) No smoking or open flames shall be allowed near the blocked manhole being cleaned.

(h) The malba obtained on account of cleaning of blocked manholes and sewer lines should be immediately removed to avoid accidents on account of slippery nature of the malba.

(i) Workers should not be allowed to work inside the manhole continuously. He should be given rest intermittently. The Engineer-in-Charge may decide the time up to which a worker may be allowed to work continuously inside the manhole.

(j) Gas masks with Oxygen Cylinder should be kept at site for use in emergency.

(k) Air-blowers should be used for flow of fresh air through the manholes. Whenever called for, portable air blowers are recommended for ventilating the manholes. The Motors for these shall be vapour proof and of totally enclosed type. Non sparking gas engines also could be used but they should be placed at least 2 metres away from the opening and on the leeward side protected from wind so that they will not be a source of friction on any inflammable gas that might be present.

(l) The workers engaged for cleaning the manholes/sewers should be properly trained before allowing to work in the manhole.

(m) The workers shall be provided with Gumboots or non-sparking shoes bump helmets and gloves non sparking tools safety lights and gas masks and portable air blowers (when necessary). They must be supplied with barrier cream for anointing the limbs before working inside the sewer lines.

(n) Workmen descending a manhole shall try each ladder stop or rung carefully before putting his full weight on it to guard against insecure fastening due to corrosion of the rung fixed to manhole well.

(o) If a man has received a physical injury, he should be brought out of the sewer immediately and adequate medical aid should be provided to him.

(p) The extent to which these precautions are to be taken depend on individual situation but the decision of the Engineer-in-Charge regarding the steps to be taken in this regard in an individual case will be final.

(vi) The Contractor shall not employ men and women below the age of 18 years on the work of painting with products containing lead in any form. Wherever men above the age of 18 are employed on the work of lead painting, the following precaution should be taken:-

(a) No paint containing lead or lead products shall be used except in the form of paste or readymade paint.

(b) Suitable face masks should be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint is dry rubbed and scrapped.

(c) Overalls shall be supplied by the contractors to the workmen and adequate facilities shall be provided to enable the working painters to wash during and on the cessation of work.

2. The Contractor shall not employ women and men below the age of 18 on the work of painting with product containing lead in any form, wherever men above the age of 18 are employed on the work of lead painting, the following principles must be observed for such use :

(i) White lead, sulphate of lead or product containing these pigment, shall not be used in painting operation except in the form of pastes or paint ready for use.

(ii) Measures shall be taken, wherever required in order to prevent danger arising from the application of a paint in the form of spray.

(iii) Measures shall be taken, wherever practicable, to prevent danger arising out of from dust caused by dry rubbing down and scraping.

(iv) Adequate facilities shall be provided to enable working painters to wash during and on cessation of work.

(v) Overall shall be worn by working painters during the whole of working period.

(vi) Suitable arrangement shall be made to prevent clothing put off during working hours being spoiled by painting materials.

(vii) Cases of lead poisoning and suspected lead poisoning shall be notified and shall be subsequently verified by medical man.

(viii) WAPCOS may require, when necessary medical examination of workers.

(ix) Instructions with regard to special hygienic precautions to be taken in the painting trade shall be distributed to working painters.

3. When the work is done near any place where there is risk of drowning, all necessary equipment's should be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision, should be made for prompt first aid treatment of all injuries likely to be obtained during the course of the work.

4. Use of hoisting machines and tackle including their attachments, anchorage and supports shall conform to the following standards or conditions :-

(i) (a) These shall be of good mechanical construction, sound materials and adequate strength and free from patent defects and shall be kept repaired and in good working order.

(b) Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength, and free from patent defects.

(ii) Every crane driver or hoisting appliance operator, shall be properly qualified and no person under the age of 21 years should be in charge of any hoisting machine including any scaffolding winch or give signals to operator.

(iii) In case of every hoisting machine and of every chain ring hook, shackle swivel and pulley block used in hoisting or as means of suspension, the safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with the safe working load. In case of a hoisting machine having a variable safe working load each safe working load and the condition under which it is applicable shall be clearly indicated. No part of any machine or any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing.

(iv) In case of departmental machines, the safe working load shall be notified by the Electrical Engineer-in-Charge. As regards contractor’s machines the contractors shall notify the safe working load of the machine to the Engineer-in-Charge whenever he brings any machinery to site of work and get it verified by the Electrical Engineer concerned.

5. Motors, gearing, transmission, electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safeguards. Hoisting appliances should be provided with such means as will reduce to the minimum the risk of accidental descent of the load. Adequate precautions should be taken to reduce to the minimum the risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations which are already energized, insulating mats, wearing apparel, such as gloves, sleeves and boots as may be necessary should be provided. The worker should not wear any rings, watches and carry keys or other materials which are good conductors of electricity.

6. All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities should be provided at or near places of work.

7. These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent place at work spot. The person responsible for compliance of the safety code shall be named therein by the contractor.

8. To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangements made by the contractor shall be open to inspection by the Labour Officer or Engineer-in-Charge of the department or their representatives.

9. Notwithstanding the above clauses from (1) to (15), there is nothing in these to exempt the contractor from the operations of any other Act or Rule in force in the Republic of India.

For & on behalf of Tenderer

ANNEXURE – IX

MODEL RULES FOR THE PROTECTION OF HEALTH AND SANITARY ARRANGEMENTS FOR WORKERS EMPLOYED BY CONTRACTORS

1. APPLICATION

These rules shall apply to all buildings and construction works in which twenty or more workers are ordinarily employed or are proposed to be employed in any day during the period during which the contract work is in progress.

2. DEFINITION

Work place means a place where twenty or more workers are ordinarily employed in connection with construction work on any day during the period during which the contract work is in progress.

3. FIRST-AID FACILITIES

(i) At every work place, there shall be provided and maintained, so as to be easily accessible during working hours, first-aid boxes at the rate of not less than one box for 150 contract labour or part thereof ordinarily employed.

(ii) The first-aid box shall be distinctly marked with a red cross on white back ground and shall contain the following equipment:-

(a) For work places in which the number of contract labour employed does not exceed 50- Each first-aid box shall contain the following equipment’s :-

1. 6 small sterilized dressings.
2. 3 medium size sterilized dressings.
3. 3 large size sterilized dressings.
4. 3 large sterilized burn dressings.
5. 1 (30 ml.) bottle containing a two per cent alcoholic solution of iodine.
6. 1 (30 ml.) bottle containing Sal volatile having the dose and mode of administration indicated on the label.
7. 1 snakebite lancet.
8. 1 (30 gms.) bottle of potassium permanganate crystals.
9. 1 pair scissors.
10. 1 copy of the first-aid leaflet issued by the Director General, Factory Advice Service and Labour Institutes, Government of India.
11. 1 bottle containing 100 tablets (each of 5 gms.) of aspirin.
12. Ointment for burns.
13. A bottle of suitable surgical antiseptic solution

(b) For work places in which the number of contract labour exceed 50. Each first-aid box shall contain the following equipment’s.

1. 12 small sterilized dressings.
2. 6 medium size sterilized dressings.
3. 6 large size sterilized dressings.
4. 6 large size sterilized burn dressings.
5. 6 (15 gms.) packets sterilized cotton wool.
6. 6. 1 (60 ml.) bottle containing a two per cent alcoholic solution iodine.
7. 1 (60 ml.) bottle containing Sal volatile having the dose and mode of administration indicated on the label
8. 1 roll of adhesive plaster.
9. 1 snake bite lancet.

10. 1 (30 gms.) bottle of potassium permanganate crystals.
11. 1 pair scissors.
12. 1 copy of the first-aid leaflet issued by the Director General Factory Advice Service and Labour Institutes /Government of India.
13. A bottle containing 100 tablets (each of 5 gms.) of aspirin.
14. Ointment for burns.
15. A bottle of suitable surgical antiseptic solution.

(iii) Adequate arrangements shall be made for immediate recoupment of the equipment when necessary

(iv) Nothing except the prescribed contents shall be kept in the First-aid box.

(v) The first-aid box shall be kept in charge of a responsible person who shall always be readily available during the working hours of the work place.

(vi) A person in charge of the First-aid box shall be a person trained in First-aid treatment in the work places where the number of contract labour employed is 150 or more.

(vii) In work places where the number of contract labour employed is 500 or more and hospital facilities are not available within easy distance from the works. First-aid posts shall be established and run by a trained compounder. The compounder shall be on duty and shall be available at all hours when the workers are at work.

(viii) Where work places are situated in places which are not towns or cities, a suitable motor transport shall be kept readily available to carry injured person or person suddenly taken ill to the nearest hospital.

4. DRINKING WATER

(i) In every work place, there shall be provided and maintained at suitable places, easily accessible to labour, a sufficient supply of cold water fit for drinking.

(ii) Where drinking water is obtained from an intermittent public water supply, each work place shall be provided with storage where such drinking water shall be stored.

(iii) Every water supply or storage shall be at a distance of not less than 50 feet from any latrine drain or other source of pollution. Where water has to be drawn from an existing well which is within such proximity of latrine, drain or any other source of pollution, the well shall be properly chlorinated before water is drawn from it for drinking. All such wells shall be entirely closed in and be provided with a trap door which shall be dust and waterproof.

(iv) A reliable pump shall be fitted to each covered well, the trap door shall be kept locked and opened only for cleaning or inspection which shall be done at least once a month.

5. WASHING FACILITIES

(i) In every work place adequate and suitable facilities for washing shall be provided and maintained for the use of contract labour employed therein.

(ii) Separate and adequate cleaning facilities shall be provided for the use of male and female workers.

(iii) Such facilities shall be conveniently accessible and shall be kept in clean and hygienic condition.

6. LATRINES AND URINALS

(i) Latrines shall be provided in every work place on the following scale namely :-

(a) Where female are employed, there shall be at least one latrine for every 25 females.

(b) Where males are employed, there shall be at least one latrine for every 25 males.

Provided that, where the number of males or females exceeds 100, it shall be sufficient if there is one latrine for 25 males or females as the case may be upto the first 100, and one for every 50 thereafter.

(ii) Every latrine shall be under cover and so partitioned off as to secure privacy, and shall have a proper door and fastenings.

(iii) The inside walls shall be constructed of masonry or some suitable heat-resisting nonabsorbent materials and shall be cement washed inside and outside at least once a year, Latrines shall not be of a standard lower than borehole system.

(iv) (a) Where workers of both sexes are employed, there shall be displayed outside each block of latrine and urinal, a notice in the language understood by the majority of the workers "For Men only" or "For Women Only" as the case may be.

(b) The notice shall also bear the figure of a man or of a woman, as the case may be.

(v) There shall be at least one urinal for male workers up to 50 and one for female workers up to fifty employed at a time, provided that where the number of male or female workmen, as the case may be exceeds 500, it shall be sufficient if there is one urinal for every 50 males or females up to the first 500 and one for every 100 or part thereafter.

(vi) (a) The latrines and urinals shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times.

(b) Latrines and urinals other than those connected with a flush sewage system shall comply with the requirements of the Public Health Authorities.

(vii) Water shall be provided by means of tap or otherwise so as to be conveniently accessible in or near the latrines and urinals.

(viii) Disposal of excreta: - Unless otherwise arranged for by the local sanitary authority, arrangements for proper disposal of excreta by incineration at the work place shall be made by means of a suitable incinerator. Alternately, excreta may be disposed off by putting a layer of night soil at the bottom of a pucca tank prepared for the purpose and covering it with a 15 cm. layer of waste or refuse and then covering it with a layer of earth for a fortnight (when it will turn to manure).

(ix) The contractor shall at his own expense, carry out all instructions issued to him by the Engineer-in-Charge to effect proper disposal of night soil and other conservancy work in respect of the contractor's workmen or employees on the site. The contractor shall be responsible for payment of any charges which may be levied by Municipal or Cantonment Authority for execution of such on his behalf.

7. PROVISION OF SHELTER DURING REST

At every place there shall be provided, free of cost, four suitable sheds, two for meals and the other two for rest separately for the use of men and women labour. The height

of each shelter shall not be less than 3 meters (10 ft.) from the floor level to the lowest part of the roof. These shall be kept clean and the space provided shall be on the basis of 0.6 sq.m. (6 sft) per head.
Provided that the Engineer-in-Charge may permit subject to his satisfaction, a portion of the building under construction or other alternative accommodation to be used for the purpose.

8. CRECHES

(i) At every work place, at which 20 or more women worker are ordinarily employed, there shall be provided two rooms of reasonable dimensions for the use of their children under the age of six years. One room shall be used as a play room for the children and the other as their bedroom. The rooms shall be constructed with specifications as per clause 19H (ii) a,b & c.

(ii) The rooms shall be provided with suitable and sufficient openings for light and ventilation. There shall be adequate provision of sweepers to keep the places clean.

(iii) The contractor shall supply adequate number of toys and games in the play room and sufficient number of cots and beddings in the bed room.

(iv) The contractor shall provide one ayaa to look after the children in the crèche when the number of women workers does not exceed 50 and two when the number of women workers exceed 50.

(v) The use of the rooms earmarked as crèches shall be restricted to children, their attendants and mothers of the children.

9. CANTEENS

(i) In every work place where the work regarding the employment of contract labour is likely to continue for six months and where in contract labour numbering one hundred or more are ordinarily employed, an adequate canteen shall be provided by the contractor for the use of such contract labour.

(ii) The canteen shall be maintained by the contractor in an efficient manner.

(iii) The canteen shall consist of at least a dining hall, kitchen, storeroom, pantry and washing places separately for workers and utensils.

(iv) The canteen shall be sufficiently lighted at all times when any person has access to it.

(v) The floor shall be made of smooth and impervious materials and inside walls shall be lime washed or colour washed at least once in each year.

Provided that the inside walls of the kitchen shall be lime-washed every four months.

(vi) The premises of the canteen shall be maintained in a clean and sanitary condition.

(vii) Waste water shall be carried away in suitable covered drains and shall not be allowed to accumulate so as to cause a nuisance.

(viii) Suitable arrangements shall be made for the collection and disposal of garbage.

(ix) The dining hall shall accommodate at a time 30 per cent of the contract labour working at a time.

(x) The floor area of the dining hall, excluding the area occupied by the service counter and any furniture except tables and chairs shall not be less than one square meter (10 sft) per diner to be accommodated as prescribed in sub-Rule 9.

(xi) (a) A portion of the dining hall and service counter shall be partitioned off and reserved for women workers in proportion to their number.

(b) Washing places for women shall be separate and screened to secure privacy.

(xii) Sufficient tables stools, chair or benches shall be available for the number of diners to be accommodated as prescribed in sub-Rule 9.

(xiii) (a) 1. There shall be provided and maintained sufficient utensils crockery, furniture and any other equipment's necessary for the efficient running of the canteen.

2. The furniture utensils and other equipment shall be maintained in a clean and hygienic condition.

(b) 1.Suitable clean clothes for the employees serving in the canteen shall be provided and maintained.

2. A service counter, if provided, shall have top of smooth and impervious material.

3. Suitable facilities including an adequate supply of hot water shall be provided for the cleaning of utensils and equipment's.

(xiv) The food stuffs and other items to be served in the canteen shall be in conformity with the normal habits of the contract labour.

(xv) The charges for food stuffs, beverages and any other items served in the canteen shall be based on ‘No profit, No loss’ and shall be conspicuously displayed in the canteen.

(xvi) In arriving at the price of foodstuffs, and other article served in the canteen, the following items shall not be taken into consideration as expenditure namely:-

(a) The rent of land and building.

(b) The depreciation and maintenance charges for the building and equipment provided for the canteen.

(c) The cost of purchase, repairs and replacement of equipment including furniture, crockery, cutlery and utensils.

(d) The water charges and other charges incurred for lighting and ventilation

(e) The interest and amounts spent on the provision and maintenance of equipment provided for the canteen.

(xvii) The accounts pertaining to the canteen shall be audited once every 12 months by registered accountants and auditors.

10. ANTI-MALARIAL PRECAUTIONS

The contractor shall at his own expense, conform to all anti-malarial instructions given to him by the Engineer-in-Charge including the filling up of any borrow pits which may have been dug by him.

11. The above rules shall be incorporated in the contracts and in notice inviting tenders and shall form an integral part of the contracts.

12. AMENDMENTS

Government may, from time to time, add to or amend these rules and issue directions - it may consider necessary for the purpose of removing any difficulty which may arise in the administration thereof.

For & on behalf of Tenderer

SECTION – VI

FORMS

SECTION– VI

FORMS

LETTER OF TRANSMITTAL		
FORMAT FOR POWER OF ATTORNEY		
FORMAT FOR POWER OF ATTORNEY FOR LEAD MEMBER OF JOINT VENTURE		
FORM A	**:**	**FINANCIAL INFORMATION**
FORM B	**:**	**SOLVANCY CERTIFICATE**
FORM C	**:**	**STRUCTURE & ORGANISATION**
FORM D	**:**	**NO CONVICTION CERTIFICATE**
FORM E	**:**	**UNDERSTANDING THE PROJECT SITE**
FORM F	**:**	**NO DEVIATION CERTIFICATE**
FORM G		**INTEGRITY PACT**

LETTER OF TRANSMITTAL

From:

To
The General Manager,
WAPCOS Limited CSEZ Project Office
CSEZ Admin. Building, Kakkanad,
Cochin, Kerala--682037
Phone: +91-484-2413544

Subject: Submission of bids for the work of ""Supply, Installation, Testing and Commissioning of Biological Plant, Membrane Bio Reactor (MBR), Reverse Osmosis Plant (RO) and accessories for 1 MLD Zero Liquid Discharge (ZLD) Plant at Cochin Special Economic Zone)"

Sir,
Having examined the details given in press notice and bid document for the above work, I/we hereby submit the relevant information.

1. I/we hereby certify that all the statement made and information supplied in the enclosed forms A to H and accompanying statement are true and correct.
2. I/we have furnished all information and details necessary for eligibility and have no further pertinent information to supply.
3. I/we submit the following certificates in support of our suitability, technical knowledge and capability for having successfully completed the following eligible similar works:

Name of work	**Certificate from**

Certificate:
It is certified that the information given in the enclosed eligibility bid are correct. It is also certified that I/we shall be liable to be debarred, disqualified/ cancellation of enlistment in case any information furnished by me/us found to be incorrect.

Enclosures:

Seal of bidder

Date of submission:

Signature(s) of Bidder(s)

Format for Power of Attorney

Know all men by these presents, We………………………………………….. (name of the firm and address of the registered office) do hereby irrevocably constitute, nominate, appoint and authorise Mr/ Ms (name), …………………… son/daughter/wife of ……………………………… and presently residing at …………………., who is presently employed with us/ the Lead Member of our Joint Venture and holding the position of…………………………… , as our true and lawful attorney (hereinafter referred to as the "Attorney") 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 BID for the Project **………………………………………………**proposed or being developed by the ***** (the "Employer") including but not limited to signing and submission of all applications, BIDs and other documents and writings, participate in Pre-BID and other conferences and providing information/ responses to the Authority, representing us in all matters before the Authority, signing and execution of all contracts including the agreement and undertakings consequent to acceptance of our BID, and generally dealing with the Authority in all matters in connection with or relating to or arising out of our BID for the said Project and/ or upon award thereof to us and/or untill the entering into of the Contract with the Authority.

AND we hereby agree to ratify and confirm and do hereby ratify and confirm all acts, deeds and things done or caused to be done by our said Attorney 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 Attorney 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 …………. 2…..

For …………………………..
(Signature, name,
designation and address) of
person authorized by Board
Resolution
(in case of Firm/ Company)/
partner in case of partenership firm

Witness
1
2
Accepted
……………………………
(Signature) (Name, Title and Address of the Attorney)
Notarised
Accepted
....
(Signature, name, designation and address of the Attorney)

Format for Power of Attorney for Lead Member of Joint Venture

Whereas, …………………….., …………………….., and …………………….. (collectively the "Joint Venture") being Members of the Joint Venture are interested in bidding for the Project in accordance with the terms and conditions of the Tender and other BID documents including agreement in respect of the Project, and Whereas, it is necessary for the Members of the Joint Venture to designate one of them as the Lead Member with all necessary power and authority to do for and on behalf of the Joint Venture, all acts, deeds and things as may be necessary in connection with the Joint Venture's BID for the Project and its execution.

NOW THEREFORE KNOW ALL MEN BY THESE PRESENTS

We, …… having our registered office at ……., M/s. ….. having our registered office at …, M/s. … having our registered office at ….., and ….. having our registered office at ………, (hereinafter collectively referred to as the "Principals") do hereby irrevocably designate, nominate, constitute, appoint and authorize M/S ……. having its registered office at ………., being one of the Members of the Joint Venture, as the Lead Member and true and lawful attorney of the Joint Venture (hereinafter referred to as the "Attorney"). We hereby irrevocably authorize the Attorney (with power to sub-delegate) to conduct all business for and on behalf of the Joint Venture and any one of us during the bidding process and, in the event the Joint Venture is awarded the contract, during the execution of the Project and in this regard, to do on our behalf and on behalf of the Joint Venture, all or any of such acts, deeds or things as are necessary or required or incidental to the qualification of the Joint Venture and submission of its BID for the Project, including but not limited to signing and submission of all applications, BIDs and other documents and writings, participate in pre BID and other conferences, respond to queries, submit information/ documents, sign and execute contracts and undertakings consequent to acceptance of the BID of the Joint Venture and generally to represent the Joint Venture in all its dealings with the Authority, and/ or any other Government Agency or any person, in all matters in connection with or relating to or arising out of the Joint Venture's BID for the in all respect Project and/ or upon award thereof till the Contract is entered into with the Authority & Compelled.

AND hereby agree to ratify and confirm and do hereby ratify and confirm all acts, deeds and things done or caused to be done by our said Attorney 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 Attorney in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us/ Joint Venture.

IN WITNESS WHEREOF WE THE PRINCIPALS ABOVE NAMED HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS …………………. DAY OF ………. 2..…

For …………………….. (Signature)	For …………………….. (Signature)	For …………………….. (Signature)
(Name & Title)	(Name & Title)	(Name & Title)

FORM - A

FINANCIAL INFORMATION

1. Financial Analysis: Details to be furnished duly supported by figures in balance sheet/ profit & loss account for the last three years duly certified by the Chartered Accountant, as submitted by the applicant to the Income Tax Department (Copies to be attached).

Years	**Gross Annual turnover on construction works**	**Profit/Loss (After Tax)**
2015-2016		
2016-2017		
2017-2018		

II. Financial arrangements for carrying out the proposed work.
III. Solvency Certificate from Bankers of the bidder in the prescribed Form "B".

Signature of Chartered Accountant
(with Seal)

Signature of Bidder(s).
(with Seal)

FORM - B

FORM OF BANKERS' CERTIFICATE FROM A SCHEDULED BANK

This is to certify that to the best of our knowledge and information that M/s./ Sh……………………………………………………….having marginally noted address, a customer of our bank are/is respectable and can be treated as good for any engagement upto a limit of Rs…………………. (Rupees………………………… ……………………………………………………..).

This certificate is issued without any guarantee or responsibility on the bank or any of the officers.

(Signature)
For the Bank

NOTE:

1. Banker's certificates should be on letter head of the Bank, sealed in cover addressed to tendering authority.

2. In case of partnership firm, certificate should include names of all partners as recorded with the Bank.

FORM - C

STRUCTURE & ORGANISATION

S.No.	**Particulars**	**Details Submitted by Bidder**	
		Firm A (Lead Partner)	**Firm B**
1.	Name & address of the bidder		
2.	Telephone no./Telex no./Fax no.		
3.	Legal status of the bidder (attach copies of original document defining the legal status) (a) An Individual (b) A proprietary firm (c) A firm in partnership (d) A limited company or Corporation		
4.	Particulars of registration with various Government Bodies (attach attested photocopy)		
	Organization/Place of Registration 1. 2. 3.	Registration No.	
5.	Names and titles of Directors & Officers with designation to be concerned with this work.		
6.	Designation of individuals authorized to act for the organization		
7.	Has the bidder, or any constituent partner in case of partnership firm Limited Company/ Joint Venture, ever been convicted by the court of law? If so, give details.		
8.	In which field of Electrical Engineering construction the bidder has specialization and interest?		
9.	Any other information considered necessary but not included above.		

Signature of Bidder(s)

FORM - D

FORMAT FOR No-Conviction Certificate
[On the letterhead of the Organization]

Subject: No-Conviction Certificate for --- (Name of the work / project)

This is to certify that _________________________ (Name of the organization), having registered office at ________________________________ (Address of the registered office) has never been blacklisted or restricted to apply for any such activities by any Central / State Government Department or Court of law anywhere in the country.

This is also to certify that M/s _______________________ (Name of Organization), is not involved in any form of Corrupt and Fraudulent practices in past and will never be involved in future.
Yours faithfully,

Date: (Signature, name and designation of the Authorized signatory)

Place: **Name and seal of Bidder**

FORM - E

FORMAT FOR UDERSTANDING THE PROJECT SITE

(on Bidder Letter Head)

To

The General Manager,
WAPCOS Limited CSEZ Project Office
CSEZ Admin. Building, Kakkanad,
Cochin, Kerala--682037
Phone: +91-484-2413544

Subject: Undertaking of the Site Visit for "Supply, Installation, Testing and Commissioning of Biological Plant, Membrane Bio Reactor (MBR), Reverse Osmosis Plant (RO) and accessories for 1 MLD Zero Liquid Discharge (ZLD) Plant at Cochin Special Economic Zone)"

Sir,

I/we hereby certify that I/we have examined & inspected the site & its surrounding satisfactorily, where the project is to be executed as per the scope of works. I/ We are well aware about the following

- Location of the proposed building and its allied works.
- Site clearance and no cutting off the matured trees.
- Topography and contouring of the land where the project is to be executed to understand the cutting & filling during the construction and about depth of column/ foundation below the plinth beam.
- Nature of the ground & sub-soil of the site and accessibility to the site.
- Existing surrounding road level to finalize plinth beam level as per standard norms.
- Location of Existing Sewer line & Water pipe line network to connect the proposed building and allied works to make the building functional.
- Location of existing Electric Sub-Station to supply the electricity for the proposed building and allied works to make the building functional.

I / We hereby submit our BID considering above all facts gathered during site visit and each & every aspect have been considered in the Quoted cost of the project since it is Engineering, Procurement and Construction (EPC) Contract. I / We hereby confirm that no extra/additional cost shall be claimed on above aspects

Yours faithfully,

Date: (Signature, name and designation of the Authorized signatory)

Name and seal of Bidder

FORM-F

FORMAT FOR NO DEVIATION CERTIFICATE
[To be submitted on Bidder's Letter Head]

To
The General Manager,
WAPCOS Limited CSEZ Project Office
CSEZ Admin. Building, Kakkanad,
Cochin, Kerala--682037
Phone: +91-484-2413544

Subject: No Deviation Certificate for "Supply, Installation, Testing and Commissioning of Biological Plant, Membrane Bio Reactor (MBR), Reverse Osmosis Plant (RO) and accessories for 1 MLD Zero Liquid Discharge (ZLD) Plant at Cochin Special Economic Zone)"

Sir,

With reference to above this is to confirm that as per Tender conditions we have visited site before submission of our Offer and noted the job content and site condition etc. We also confirm that we have not changed/modified the above tender document and in case of observance of the same at any stage it shall be treated as null and void.

We hereby also confirm that we have not taken any deviation from Tender Clause together with other reference as enumerated in the above referred Notice Inviting Tender and we hereby convey our unconditional acceptance to all terms & conditions as stipulated in the Tender Document.

In the event of observance of any deviation in any part of our offer at a later date whether implicit or explicit, the deviations shall stand null and void.

Thanking you,

Yours faithfully,

Date: (Signature, name and designation of the Authorized signatory)

Place: **Name and seal of Bidder**

FORM-G

FORMAT FOR INTEGRITY PACT

To
The General Manager,
WAPCOS Limited CSEZ Project Office
CSEZ Admin. Building, Kakkanad,
Cochin, Kerala--682037
Phone: +91-484-2413544

Subject: Integrity Pact for "Supply, Installation, Testing and Commissioning of Biological Plant, Membrane Bio Reactor (MBR), Reverse Osmosis Plant (RO) and accessories for 1 MLD Zero Liquid Discharge (ZLD) Plant at Cochin Special Economic Zone)"

Sir,

I/We acknowledge that WAPCOS is committed to follow the principles thereof as enumerated in the Integrity Agreement enclosed with the tender/bid document.

I/We agree that the Notice Inviting Tender (NIT) is an invitation to offer made on the condition that I/We will sign the enclosed integrity Agreement, which is an integral part of tender documents, failing which I/We will stand disqualified from the tendering process.

I/We acknowledge that THE MAKING OF THE BID SHALL BE REGARDED AS AN UNCONDITIONAL AND ABSOLUTE ACCEPTANCE of this condition of the NIT.

I/We confirm acceptance and compliance with the Integrity Agreement in letter and spirit and further agree that execution of the said Integrity Agreement shall be separate and distinct from the main contract, which will come into existence when tender/bid is finally accepted by WAPCOS. I/We acknowledge and accept the duration of the Integrity Agreement, which shall be in the line with Article 1 of the enclosed Integrity Agreement.

I/We acknowledge that in the event of my/our failure to sign and accept the Integrity Agreement, while submitting the tender/bid, WAPCOS shall have unqualified, absolute and unfettered right to disqualify the tenderer/bidder and reject the tender/bid is accordance with terms and conditions of the tender/bid.

Yours faithfully,

Date: (Signature, name and designation of the Authorized signatory)

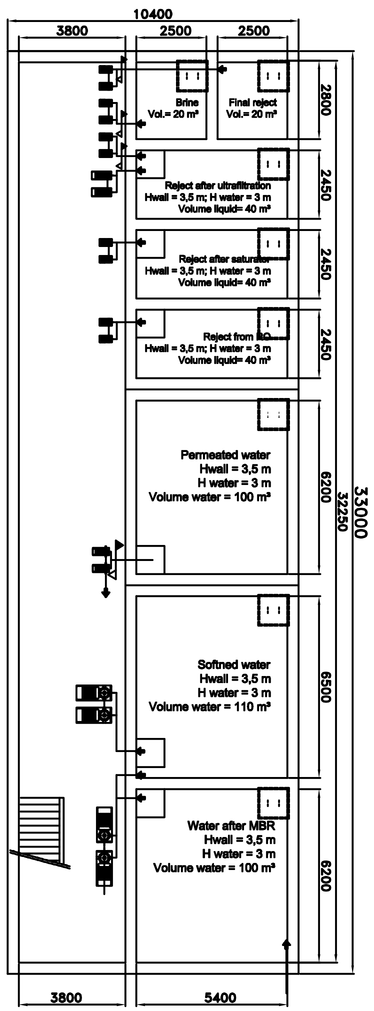
Place: **Name and seal of Bidder**

VOLUME – II

DRAWINGS

DRAWINGS

S No		Particular	Sheets
I.	:	General Layout	1
II.	:	Hydraulic Profile	2



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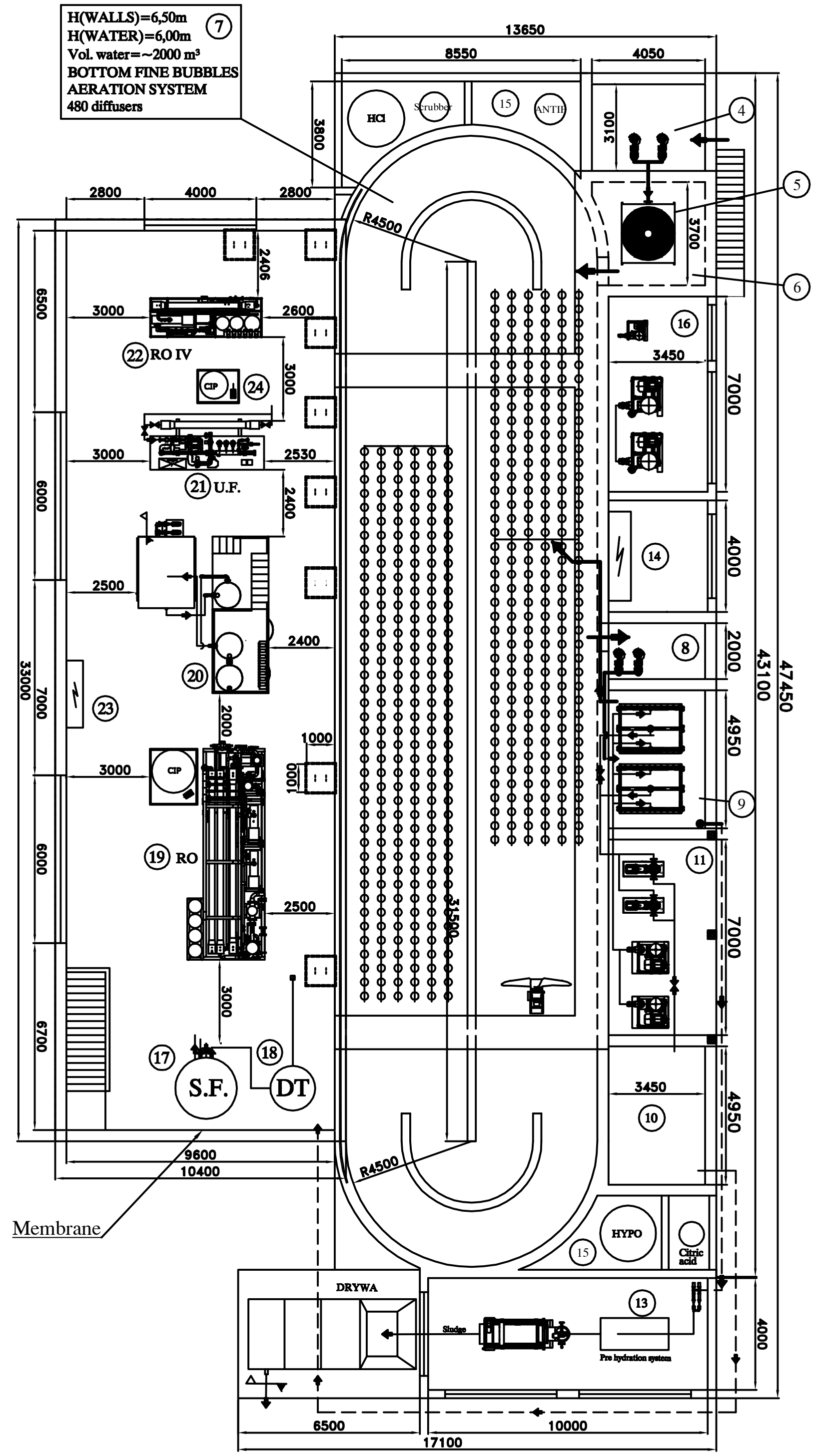
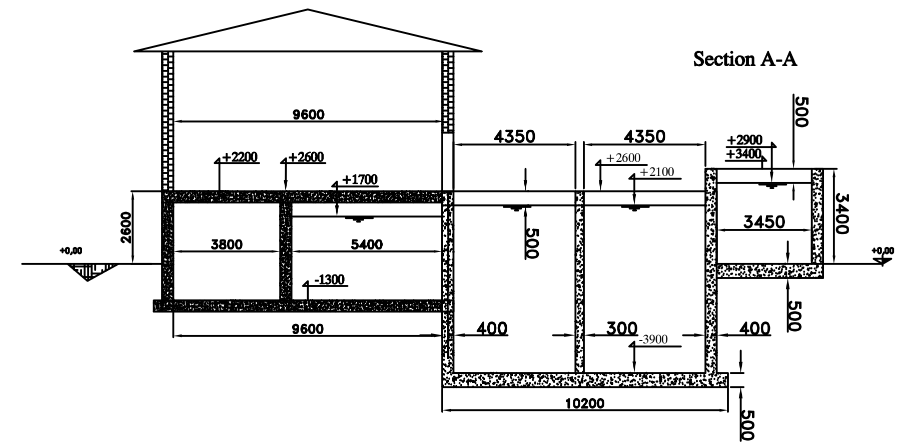




FOR TENDER PURPOSE

PROJECT		PROJECT NO.	
ZLD PLANT INSIDE CSEZ	WAPCOS LIM ITED		DRAWN
	CHECKED		DESIGNED
	APPROVED		APPROVED

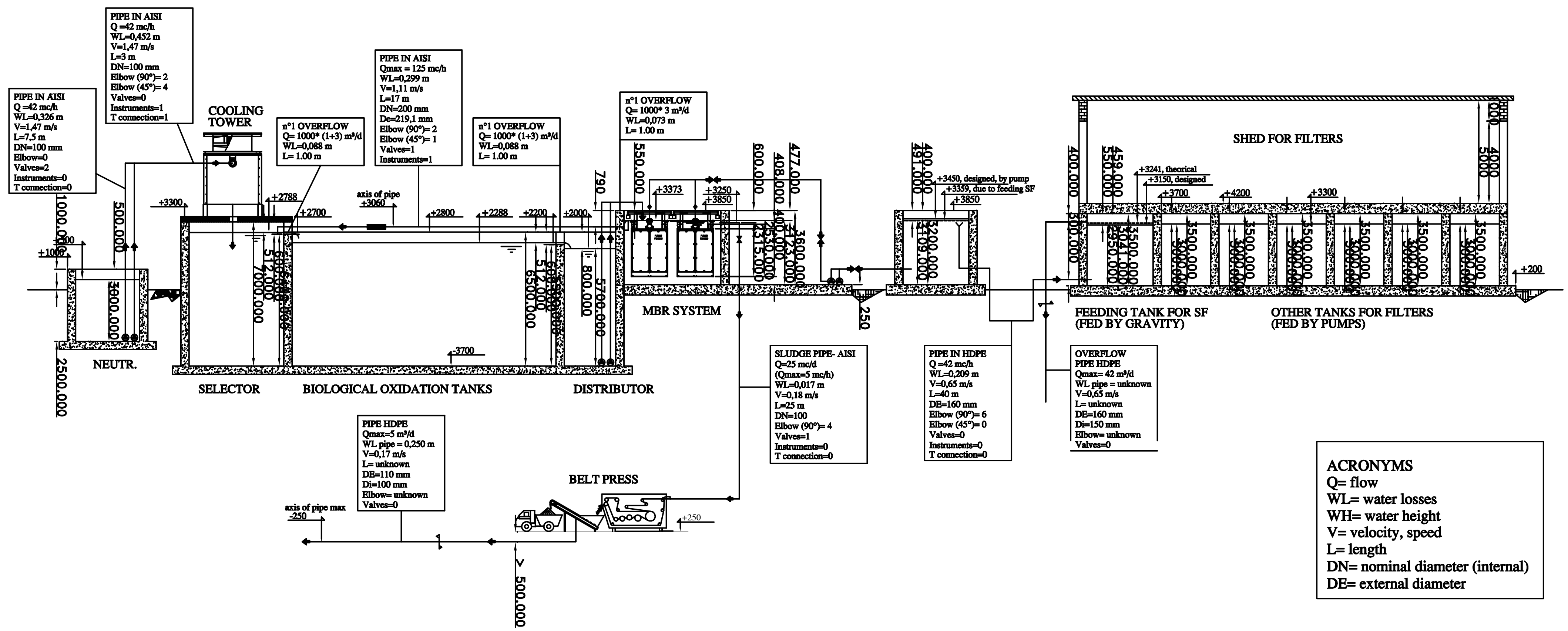
NO.	DESCRIPTION OF REVISIONS	DATE	BY
0			GRG

ZLD PLANT INSIDE CSEZ

SCALE AS SHOWN

TITLE:

FIGURE-1: GENERAL LAYOUT



FOR TENDER PURPOSE

PROJECT	WAPCOS LIM ITED	PROJECT NO.	
ZLD PLANT INSIDE CSEZ	CHECKED		DRAWN
	APPROVED		DESIGNED
			APPROVED

NO.	DESCRIPTION OF REVISIONS	DATE	BY
0			GRG

ZLD PLANT INSIDE CSEZ

SCALE: AS SHOWN

TITLE:

FIGURE-2: HYDRAULIC FLOW