TAMIL NADU WATER SUPPLY AND DRAINAGE BOARD

BID DOCUMENT

Name of work

Providing UGSS to Tindivanam Municipality in Villupuram District for implementation of Collection system and allied works - Execution period – 36 months, Trial run period – 6 months and maintenance of the scheme – 12 months.

Last date of submission : Upto 3.00 P.M. on 01.06.2020.

NAME OF THE SCHEME: **Providing UGSS to Tindivanam Municipality in Villupuram District for implementation of Collection system and allied works - Execution period – 36 months, Trial run period – 6 months and maintenance of the scheme – 12 months..**

LAST DATE OF SUBMISSION OF BID: Upto 3.00 PM on 01.06.2020

CHECK LIST TO BE ENCLOSED BY BIDDER (along with Bid Documents)

IFB No.02 / UGSS to Tindivanam Mpty / DO / CE / VLR / 2020 / Dt: 24.04.2020

The check list is only indicative and is to assist the bidder in satisfactorily enclosing all required major documents for Technical Qualification. The list is not exhaustive and the bidder should read all clauses of the bid document so as to enclose all documents as required:

A. BID SECURITY

i) Bid security for a value of **Rs.75.00 lakhs** to be furnished as in Bid document.

ii) Furnish the details of Bid Security as under

Sl. No.	Name of the Bidder	Amount and type of security	Issued By

B. ELIGIBILITY/QUALIFICATION CRITERIA

Sl. No	Description	Requirement as per Bid document Rs. in Crore	Particulars as furnished by the bidder	Page No. with Ref. no., if any, where the particulars are furnished by bidder.
	Financial Turnover & Cash flow.			
1.	Annual Turnover in anyone of the last **three** financial years Rs. in Crores (2016-17, 2017-18 and 2018-19) – **100%** of BOQ Value **Rs.147.00 Crore**.	147.00 Crore		
2	Minimum Annual turnover in last **three** financial year. (Rs. in Crores) (2016-17, 2017-18 and 2018-19) – **50%** of BOQ Value of **Rs.147.00 Crore**.	73.50 Crore		
3	Net worth (**10%** of BOQ value **147.00 Crore**)	**14.70 Crore**		
4	Minimum Cash flow required in Rs in Crores = B.O.Q Value x 3 Months / Completion period in months (36 months)	12.25 Crore		
5	Similar Work - The bidder should have satisfactorily completed and commissioned Water supply scheme of value not less than Rs.in crore in last **five** years. Either **single agreement** with **40%** of BoQ value **Rs. 147.00 Crore**. **or** **Two agreements** with **60%** of BoQ value during the last **five** financial years.	**58.80 crore** in single Agreement (or) **88.20 Crore** in Two Agreements		
6	Bid capacity Assessed Available Bid capacity = (A X N X 1.5) - B should be more than the total bid value.	**Rs.147.00 Crore**		
B	**Physical (Work Experience)** Minimum aggregate during last **five** financial years (2014-15, 2015-16, 2016-17, 2017-18 & 2018-19)			
6.a	Minimum aggregate experience of sewer line during the last **5 years** in km Supply ,laying ,jointing and testing of sewer line with **SW/ RCC/UPVC/DWC** of any size **up to 4m below GL**. (10% of the total length of **136.00 Km**)	13.60 Km	–	–

6.b	Minimum aggregate experience of sewer line during the last **5 years** in Km Supply ,laying ,jointing and testing sewer line with **SW/ RCC/UPVC/DWC** of any size **above 4m below GL**. (10% of the total length - Km)	-		
6.c	Minimum aggregate experience of pumping main during the last 5 years in m Supply, laying, jointing and testing of pumping main with **CI / DI** of any size of the same material ie (10% of the total length of **45.17 Km**)	4.52 km		
6.d	Minimum experience – should have constructed, completed & commissioned **one** sewage pumping station during the last 5 years.(Total **6 Nos**)	1 No.		
6.d	Minimum capacity of pump set should have supplied, erected and commissioned **one** pump set with **HT Power supply** during the last **5 years** 25% of Total requirement - **360 KW**)	90 KW		
6	Manufacturer's Experience Criteria			
i.	Pump and Electrical equipments	Minimum No. of years.		
	Vertical Turbine	-		
	Horizontal Split Casing	-		
	Centrifugal	-		
	Submersible	5		
ii.	Valves above …….mm size	Minimum Number of years - 5 years and sold a minimum of 200 units per year		
iii.	PVC pipe	Minimum Number of years - 5 years and sold a minimum 200% of total length required		

7. Whether performance eligibility is based on certificate issued by the officer not less than the rank of Executive Engineer of that user departments and in the case of Private organization from the General Manager of that Organisation (along with necessary countersignature / Notarisation & photograp hs) (Yes/No)

8. Whether Annexure - I to XII are all filled up fully and enclosed? (Yes/No)

TENDERER CHIEF ENGINEER/TWAD/VELLORE

9) If Yes, give details as under (Notarised as per requirement)

Sl. No.	Description	Page Nos. in the Bidder's Document.
1.	Performance of the bidder showing total monetary value of Civil Engineering work for the past three years (Annexure– I)	
2.	Average Annual Construction Turn over (Annexure – II)	
3.	Experience in works of similar nature of Magnitude within a period of **5 years** (Annexure – III)	
4.	Commitment of works on hand (Annexure – IV)	
5.	Works for which Bids are already submitted (Annexure-V)	
6.	List of equipments available with bidder (Annexure – VI)	
7.	Qualification / Experience of key personnel proposed for technical and administrative functions under this Contract (Annexure – VII)	
8.	Sample Format for evidence of access to or availability of credit facilities (Annexure – VIII)	
9.	Details of Litigation if any (Annexure – IX)	
10.	Declaration by the bidder pertaining to blacklisting / debarment etc., (Annexure – X)	
11.	Details of components proposed to be sublet and sub contractor involved (Annexure – XI)	
12.	Technical staff to be employed (Annexure – XII)	

10) List of Certificates to be enclosed by the Bidder (Notarised as per requirement)

Sl. No.	Description	Page Nos. in the Bidder's Document
1.	Signature of the proprietor or proprietress attested by the Notary public.	
2.	Signature of all the partners / power of attorney attested by the Notary public	
3.	Registration of the firm, Signature of all the authorised person attested by the Notary public	
4.	A copy of the listed Power of Attorney authorizing the signatory of the bidder.	
5.	Proof of Registration of firm / company.	
6.	Audited Balance sheets	
7.	Credit line certificate from Financial institutions	
8.	Income Tax clearance certificate.	
9.	GST certificate	
10.	Certificate of performance issued by not less than the rank of Executive Engineer / Responsible person of the organization.	

SIGNATURE OF TENDERER

BID DOCUMENTS

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G. AWARD OF CONTRACT

30. Award Criteria
31. Employers Right to accept any Bid and to Reject any or all Bids
32. Notification of Award
33. Registration in TWAD
34. Performance Security
35. Signing of Agreement
36. Mobilization Advance
37. Forfeiture of performance Security

IV. PROGRAMME SCHEDULE

38. Project completion and Milestone
39. Programme Schedule/Rate of progress/Milestone
40. Penalty for Defective construction
41. Liquidated damages
42. Foreclosure of works

V. PAYMENTS AND RECOVERIES

43. Payment Schedule
44. Release of performance security and Retention amount
45. Recovery of money payable to the TWAD Board
46. Income Tax
47. Excise Duty
48. GST
49. Fund contribution for manual workers
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VI. LIST OF ANNEXURES AND CERTIFICATES

Annexures:

1) Performance of the Bidder showing total monetary value of Civil Engineering work for the past three years (Annexure-I)
2) Average Annual Construction Turnover (Annexure-II)
3) Experience in works of similar nature and Magnitude within a period of **5 years** (Annexure-III)
4) Commitment of works on hand (Annexure-IV)
5) Works for which Bid already submitted (Annexure-V)
6) List of Equipments available with bidder (Annexure-VI)
7) Qualification/Experience of key personnel proposed for technical and administrative functions under this contract (Annexure-VII)
8) Sample Format for evidence of access to or availability of credit facilities (Annexure-VIII)
9) Details of Litigation if any (Annexure-IX)
10) Declaration by the bidder pertaining to blacklisting / debarment etc. (Annexure-X)
11) Details of components proposed to be sublet and Sub contractor involved (Annexure-XI)
12) Technical staff to be employed (Annexure-XII)

Certificates:

1) Signature of the proprietor or proprietress attested by the Notary Public.
2) Signature of all the partners/power of attorney attested by the Notary Public.
3) Registration of the firm, signature of the authorized person attested by the Notary public.
4) A copy of the listed power of attorney authorizing the signatory of the bidder.
5) Proof of registration of firm/company.
6) Audited Balance sheets.
7) Credit line certificate from Financial Institutions.
8) Income Tax clearance certificate.
9) GST certificate.
10) Certificate of performance issued by not less than the rank of Executive Engineer / Responsible person of the private organization.

VII GENERAL CONDITIONS OF CONTRACT

1. Definitions
2. Interpretations
3. Authority of Engineer Incharge
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8. Commencement of Works
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14. Bill of Quantities.
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21. Notice to Telephone, Railway and Electric Supply Undertaking
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25. Information and Data
26. Coexistence with other Contractors.
27. General Responsibilities and Obligations of the Contractor
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29. Restriction of Working Hours.
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32. Default of contractor in Compliance.
33. Default by Contractor.
34. Power to vary Work.
35. Extra for Varied Works.
36. Omissions.
37. Notices regarding Shoring etc.

VIII SPECIAL CONDITIONS

TWAD BOARD – INVITATION OF BIDS – ITEM WAR (TWO COVER SYSTEM)

IFB No.	**IFB No. 02/UGSS to Tindivanam Mpty - CS/DO/CE/VLR/2020/Dated: 24.04.2020**
Name of Work	Providing UGSS to Tindivanam Municipality in Villupuram District for implementation of Collection system and allied works - Execution period – 36 months, Trial run period – 6 months and paid maintenance of the scheme – 12 months.
Approximate value of work	Rs.154.00 Crore.
Bid security	Rs.77.00 Lakhs.
Eligible class	Class –I.
Tender invitee	The Chief Engineer, TWAD Board, Vellore – 632006.
Sale of Bid & place of sale	**29.04.2020 to 29.05.2020** Bid document may be purchased by remitting an amount of Rs. 1000 +GST from the Executive Engineer, TWAD Board, RWS Division, Water tank compound, e mapper, Kallakurichi – 606 202. If bid documents are required by post an amount of Rs.500/- to be paid additionally.
web site down loading	www.tenders.tn.gov.in and www.twadboard.gov.in. (free of cost)

1.	Date and time of Pre bid meeting	**15.05.2020 at 11.00 AM**
2.	Last date and time of downloading bid documents	**29.05.2020 up to 5.45 PM**
3.	Last date and time for receipt of bid document	**01.06.2020 up to 3.00 PM**
4.	Last date and time for opening of Technical bid	**01.06.2020 at 3.30 PM**

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Sd. S. Settu 24.04.2020
Chief Engineer(I/c),TWAD Board,
Vellore.6.

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II. LETTER OF APPLICATION

(Letter head paper of the Applicant, including full postal address, telephone no., fax no., cable address, and E.Mail)

Dated :

To
The Chief Engineer,
TWAD Board,
No 8. First East Main Road
Gandhi Nagar,
Vellore -632006

Sir,

Being duly authorised to represent and set on behalf of
(hereinafter "the Applicant"),
and having reviewed and fully understood all the information provided, the undersigned hereby apply for consideration as a bidder for the following

IFB No. 02/UGSS to Tindivanam Mpty-CS/DO/CE/VLR/2020/Dated: 24.04.2020.

Providing UGSS to Tindivaam Municipality in Villupuram District for implementation of Collection system and allied works - Execution period – 36 months, Trial run period – 6 months and maintenance of the scheme – 12 months.

Attached to this letter please find copies of original documents defining

- the Applicant's legal status
- the principal place of business and
- the place of incorporation (for applicants who are corporation) or the place of registration and the nationality of the owners (for applicants who are partnerships or individually owned firms)

Your Agency and its authorized representatives are hereby authorized to conduct any inquiries or investigations to verify the statements, documents and information submitted in connection with this application, and to seek clarification from the bankers and clients regarding any financial and technical aspects. This 'Letter of Application' will also serve as authorization to any individual or authorized representative of any institution referred to in the supporting information, to provide such information deemed necessary and requested by yourselves to verify the statements and information provided in this application, or with regard to the resources, experience and competence of the Applicant.

This application is made in the full understanding that

- bids by the applicants will be subject to verification of all information submitted for consideration, at the time of bidding.

Your Agency reserves the right to

- amend the scope and value of any contract bid under this project

- and reject or accept any application, to cancel the entire bidding process and reject all the applications and

- Your Agency shall not be liable for any such action and shall be under no obligation to inform the Applicants of the grounds for them

It is hereby certified that the unit rates and price for all the items covered in the Bill of Quantities set out in the Price Schedule have been furnished clearly in figures and words and it is hereby agreed to execute the works at the rates and prices mentioned therein and to receive the payments on measured quantities as per the Conditions of the Contract.

It is hereby distinctly and expressly declared and acknowledged that before the submission of the bid, the instructions therein have been carefully followed and the conditions of the Contract and other terms and conditions have been read. It is also declared and acknowledged that careful examination of the bid documents has been carried out with reference to the specifications, quantities, location where the said work is to be done, investigation of the works to be done, materials required for this contract and their source and other requirements, covenants, stipulations and restrictions. It is distinctly agreed that no claim or demand will be made on the TWAD Board by the applicant, arising out of any misunderstanding or misconception or mistake of the said requirements, covenants, stipulations, restrictions, conditions etc on the part of the Applicant.

The Income Tax Clearance Certificate and GST Verification Certificate in currency are enclosed

The Bid Security of **Rs.75.00 lakhs (Rupees Seventy Five Lakhs only)** is enclosed in the shape of …… (Enter the form and other details of the bid security) drawn in favour of the **Executive Engineer, TWAD Board, RWS Division, Kallakurichi.**

It is hereby agreed that in case the bid is accepted, the Performance Security to the value and in the manner/form prescribed by the Employer will be submitted and agreement entered into within the time frame stipulated for the due fulfillment of the contract. It is agreed that in the event of non remittance of the required Performance Security and execution of the Agreement within the stipulated time frame, the Bid Security deposited with the bid will be forfeited. In the event of non acceptance of the bid offered by the Applicant, the Employer shall intimate the applicant of the rejection of his bid, upon which the applicant can get his Bid Security refunded on an application for the same. Any notice required to be served on the applicant shall be deemed to have been sufficient if delivered personally or left at the address given herein or sent by post either by registered mail or ordinary. Such notice shall, if sent by post shall be deemed to have been served on the applicant at the time when in due course of post it would be delivered at the address to which it is sent. For all purposes, the address given herein will serve as permanent address and any change therein will be promptly intimated then and there

It is fully understood and agreed that on receipt of communication of acceptance of the bid from the accepting authority, there emerges a valid contract between the Applicant and TWAD Board represented by the officer accepting the bid and is expressly agreed that the bid documents with the schedules, conditions of the contract, negotiation communications and other correspondence connected to this contract will all constitute the contract for this purpose and be the foundation of rights on both the parties.

It is agreed that time shall be considered as the essence of this contract and the work will be commenced immediately on getting information of the acceptance of the bid and any slow progress will be subjected to the relevant penal clauses contained in the Conditions of the Contract

It is hereby agreed that the professionally qualified personnel to execute and supervise the works shall be deployed as required in clause 10 of General Conditions of Contract.

The Applicant hereby agrees to undertake full responsibility for the stability and soundness of the works executed.

The Applicant hereby agrees that the bid will not be withdrawn during the period of validity as indicated in the bid documents and also during such extended periods agreed to by the applicant The Applicant agrees that in the event of withdrawal of the bid during the validity period or extended period, the Bid Security is liable to be forfeited by Employer.

It is explicitly understood that the Employer is not bound to accept the lowest or any bid the Board may receive. It is hereby agreed that the Employer reserves the rights to reject any or all the bids without assigning any reasons therefor.

Dated this day of
Month of

Signature of the Applicant
(To be signed by the authorized
signatory with seal)

NAME OF WORK

Providing UGSS to Tindivanam Municipality in Villupuram District for implementation of Collection system and allied works - Execution period – 36 months, Trial run period – 6 months and maintenance of the scheme – 12 months.

III . INSTRUCTIONS TO BIDDERS

A.GENERAL

1. Scope of the Bid

This is a "Procurement, Construction Contract" and the contractor is responsible for the execution of the water supply works including the supply and installation of all materials, machineries, equipment etc in accordance with the specifications stipulated in the Bid Document and in conformity with the Quality Parameters laid down in the relevant BIS, TNBP, Bid Documents etc and completing the entire works in all respects satisfactorily and commissioning within the stipulated period and maintaining the scheme for the specified period

1.1 The Chief Engineer, TWAD Board, Vellore – 6 (hereinafter referred as "Employer" in these documents) invites bids for the construction of works (as defined in these documents and referred as "the works") as detailed in the Bill of Quantities. The bidder shall offer their/his price for all the items of works detailed in the Bill of Quantities.

Providing UGSS to Tindivanam Municipality in Villupuram District for implementation of Collection system and allied works - Execution period – 36 months, Trial run period – 6 months and maintenance of the scheme – 12 months

UGSS TO TINDIVANAM MUNICIPALITY IN VILLUPURAM VILLUPURAM DISTRICT

SALIENT DETAILS

Name of Work : Providing UGSS to Tindivanam Municipality in Villupuram District for implementation of Collection system and allied works - Execution period – 36 months followed by Trial run period – 6 months – Operation and maintenance of the scheme – 12 months for Collection System.

Added Areas ; Total number of Zones – 9

1. Avarapakkam - Zone 1
2. Agalikulam - Zone 2
3.TheerthaKulam - Zone 3
4. Wahab Nagar - Zone 4,
5. Thillai Nagar - Zone 4A
6.. T.M.G Nagar - Zone 4B.
7. Indra Nagar - Zone 5
8. Venkateswara Nagar – Zone 6 &
9. Vinayagar Nagar - Zone 6A

1) Sewer Main:

Pipe material	**Up to 4m below GL**	**Above 4m below GL**	**Total**
UPVC pipe	127061 m	--	127061 m
DWC pipe	8922 m	--	8922 m
CI Pipe	16646 m	13260 m	29906 m
Total	**152629 m**	**13260 m**	**165889 m**

2) Sewerage Pumping Main

150 mm CI pipe - 3160 m

200 mm CI pipe - 5100 m

300 mm CI pipe - 1100 m

350 mm CI pipe - 4100 m

500 mm CI pipe - 1300 m

600 mm CI pipe - 500 m

Total - 15260 m

3) Sewerage pumping station ; -

3a). Sub Pumping Stations (6Nos.)

i) SPS 1 at Avarapakkam of Zone 1

Screen well 4.00m Dia / 6.32 m Depth
Grit Well 3.50m Dia / 7.42 m Depth
Collection Well 5.00m Dia / 8.70 m Depth

Non Clog Sub P'set : 1DWF - 1999 lpm x 19 m Head (18.50 HP) - 3 Nos - 55.50 HP

ii) SPS 2 at Agalikulam of Zone 2

Screen well 3.50 m Dia / 5.76 m Depth
Grit Well 3.00 m Dia / 5.50 m Depth
Collection Well 5.00 mDia / 7.00 m Depth

Non Clog Sub P'set : 1DWF - 755 lpm x 29m Head (12.50 HP) - 3 Nos – 37.50 HP

iii) SPS 3 at Theerthakulam of Zone 3

Screen well 7.50 m Dia / 4.85 m Depth
Grit Well 5.50 m Dia / 6.10 m Depth
Collection Well 7.50 mDia / 7.66 m Depth

Non Clog Sub P'set : 1DWF - 5207 lpm x 25 m Head (65 HP) -3 Nos. – 195.00 HP

iv) SPS 4 at Wahab Nagar of Zone 4

Screen well 5.00 m Dia / 3.57 m Depth
Grit Well 3.50 m Dia / 4.85 m Depth
Collection Well 6.00 mDia / 5.98 m Depth

Non Clog Sub P'set : 1DWF - 2165 lpm x 32m Head (35 HP) -3 Nos – 105.00 HP

v) SPS 5 at Indra Nagar of Zone 5

Screen well 3.00 m Dia / 6.10 m Depth
Grit Well 2.50 m Dia / 6.98 m Depth
Collection Well 4.50 mDia / 7.58 m Depth

Non Clog Sub P'set : 1DWF - 686 lpm x 11 m Head (4 HP) -3 Nos. – 12.00 HP

vi) SPS 6 at Venkateswara Nagar of Zone 6

Screen well 3.50 m Dia / 5.10 m Depth
Grit Well 2.50 m Dia / 6.19 m Depth
Collection Well 4.00 mDia / 7.17 m Depth

Non Clog Sub P'set : 1DWF - 855 lpm x 16 m Head (7.50 HP) -3 Nos. – 22.50 HP

3b). LIFT STATIONS (3 Nos) :-

i) ZONE 4A at Thillai Nagar

Lift Station 1
Collection well 3.00 m Dia / 6.50 m Depth

Non Clog Sub P'set : 1DWF 1100 lpm x 23m (12.50 HP) - 2Nos - 25.00 HP

ii) ZONE 4B at T.M.G Nagar

Lift Station 2
Collection Well 3.00 M Dia / 7.00 m Depth

Non Clog Sub P'set : 1DWF 124 lpmx11m (1 HP) - 2Nos - 2.00 HP

iii) ZONE 6A

Lift Station 3
Collection Well 3.00 M Dia / 6.50 m Depth

Non Clog Sub P'set : 1DWF 244 lpmx13m (2 HP) - 2Nos - 4.00 HP

3c). LIFT MANHOLES - 4 Nos.

i) LMH 529 in BS-72 of Zone 1
Collection Well 2.50m Dia / 7.50 m Depth

Non Clog Sub P'set : 1DWF 574pmx10m (3 HP) - 2Nos - 6.00 HP

ii) LMH 1113 in BS-185 of Zone 1
Collection Well 2.50m Dia / 8.00 m Depth

Non Clog Sub P'set : 1DWF 600 lpmx11m (4 HP) - 2Nos - 8.00 HP

iii) LMH 1010 in BS-150 of Zone 6
Collection Well 2.50m Dia / 7.50 m Depth

Non Clog Sub P'set : 1DWF 308 lpmx 10m (2 HP) -2Nos - 4.00 HP

iv) LMH 1674 in BS-261 of Zone 6
Collection Well 2.50m Dia / 7.50 m Depth

1DWF 300 lpmx10m (2 HP) - 2Nos - 4.00 HP

Total – 480.50 HP = 358.45 KW or say 360KW

3d). Pump Room

i) 5m x 4m – 6 No
ii) 4m x 3m – 7 No

4) Construction of Manholes:

Brick work Manholes	-	5381 Nos.
RCC Manholes	-	1389 Nos.
Total		6770 Nos

5) House Sewer Connections

Domestic	-	16474 Nos
Non-Domestic	-	2756 Nos
Total	**-**	**19230 Nos**

6) Project completion Period : 36 months followed by 6 months trial run Period

7) Operation & Maintenance : 12 Months for Collection System

MAINTENANCE

1.2 Maintenance of the above work for a period of **12 Months**. (One year) (Paid maintenance)

1.3 The successful bidder will be expected to complete the works within the period stipulated for completion in the programme schedule.

1.4 In these bidding documents, the terms bid and tender and their derivatives (bidder/ Bidder, bid/ tender, bidding/tendering etc) are synonymous.

1.5 **Down loading the documents from web site**.

If the documents are down loaded from the web site: www.tenders.tn.gov.in and www.twadboard.gov.in by the Bidder and offer their tender duly filled and signed along with all required documents to the tender inviting authority as notified in the IFB subject to the following.

a) The bidder shall furnish a certificate to the effect that **no correction/ alteration on the bid document as found in the web site** was made by him and he shall abide by all the terms, conditions and specifications contained in the bid document.

b) **No cost towards bid document shall be required to be paid by the bidders who are using the forms downloaded from the designated website.**

The bidder shall submit the tender to the tender inviting authority as prescribed in the IFB.

1.6 The Bid documents can be purchased from the **Executive Engineer, TWAD Board, RWS Division, Water tank compound, e mapper, Kallakurichi – 606 202** by remitting the required cost of Bid documents as stipulated in invitation for Bid.

2. Method of Bidding

2.1 If the bid is made by an individual, the bid documents shall be signed by the individual with his full name and current address.

2.2 If the bid is made by a proprietary concern, the bid documents shall be signed by the proprietor with his full names as well as the name of the firm and full address. In the case of an authorised person holding power of attorney signing the bid documents, a certified copy of the registered power of attorney should accompany the bid documents. The signature of the proprietor shall be attested by a notary public and enclosed as documentary evidence.

2.3 If the bid is made by a partnership firm, the bid documents shall be signed by all the partners of the firm along with their full names and current address with specific mention on the registered address of the firm. In the case of a partner holding power of attorney signing the bid documents, a certified copy of the registered power of attorney should accompany the bid. It is also mandatory to furnish a certified copy of the registered partnership deed, current address of the partners, registered address of the firm along with the bid. The signature of all the partners/ power of attorney shall be attested by a notary public and enclosed as a documentary evidence.

2.4 If the bid is made by a limited company or a limited corporation, it shall be signed by a duly authorised person holding power of attorney for signing the bid documents in which case a certified copy of the registered power of attorney shall accompany the bid. Such limited company or corporation may be required to enclose satisfactory evidence of its existence along with the bid.

2.5 The bids from the contractors / firms shall be accompanied by an attested copy of the Income Tax Clearance Certificate and Sales Tax Verification Certificate relating to the year prior to the previous financial year 2017-18.

3. One Bid per Bidder

3.1 Each bidder shall submit only one bid for the whole scheme and in the case of packages, only one bid for a package. A bidder who submits or participates in more than one bid (other than sub contractors) will be disqualified.

4. Cost of Bidding

4.1. The bidder shall bear all the costs associated with the preparation and submission of his bid. The Employer will in no case be responsible for those costs, regardless of the conduct or the outcome of the bidding process.

5. Site Visit.

The bidder, at the Bidder's own responsibility and risk is advised to visit and examine the site of works and its surroundings and obtain on his own all information that may be necessary for preparing the bid and entering into contract for the construction of the works. The costs of visiting the site and its surroundings shall be at the bidder's expense. Site levels, Soil data made available are only for the information of bidder and the employer is not responsible for their correctness.

5.2 The bidder and any of his personnel or agents will be granted permission by the Employer to enter upon its premises and lands for the purpose of such visit, but only upon the express condition that the bidder, his personnel or agents, will release and indemnify the Employer and his personnel or agents from and against all liability in respect thereof, and will be responsible for death or personal injury, loss of or damage to property, and any other loss, damage, costs and expenses incurred as a result of the inspection.

5.3 Deleted

5.4 The employer will arrange a site visit for the bidders on **15.05.2020 at 3.00 pm** to enable the bidders to have an understanding of the site conditions and will be able to clarify those associated issues relating to the site conditions in the pre-bid meeting.

B. ELIGIBILITY / QUALIFICATION CRITERIA

6. Eligible Bidders

6.1 The Invitation to Bid is open to any bidder meeting the following requirements:

6.2 A bidder shall not be associated nor has been associated in the past, directly or; indirectly, with the Consultant or any other entity that has prepared the design, specifications and other documents for the project.

6.3 A bidder shall not be associated directly or indirectly with the firm engaged by the Board for providing consultancy services for the preparation and supervision of the works and any of its affiliates.

6.4 Bidders shall provide such evidence of their continued eligibility satisfactory to the Employer as the Employer shall reasonably request.

6.5 Joint Ventures will not be accepted.

7. Qualification of the Bidder

7.1 General

7.1.1 Bidders shall provide the following as part of their bid in the prescribed formats.

7.1.2 A registered power of attorney authorizing the signatory of the bid to commit on behalf of the bidder should be enclosed.

7.1.3 Proof of registration of the firm/company under companies Act should be enclosed.

7.1.4 Total monetary value of Civil Engineering works performed during each of the last three years should be furnished in Annexure – I.

7.1.5 Average Annual turnover (Civil Engineering works) for the past three financial years (Audited balance sheet for the last three financial years) should be enclosed. Annual turnover for the **past three financial years** should be certified by a registered Chartered Accountant and the certificate should be affixed with the seal of the office of the Chartered Accountant with the registration number legibly in Annexure – II.

The contract receipt / contract income of the audit profit and loss account or audited income and expenditure account shall only be considered for the purpose of annual Turnover (Civil engineering works) for the past three financial years.

7.1.6 Experience in works of similar nature and magnitude during each of the previous **Five financial years**, the details of works on hand and works for which bid already submitted should be furnished in the Annexures – III, IV and V respectively.

7.1.7 List of equipments available with the bidder for deployment in the project should be furnished in Annexure – VI.

7.1.8 Technical, administrative and managerial personnel proposed to be employed for key site management in this work with their qualification details should be furnished in Annexure – VII.

7.1.9 Evidence of access to lines of credit and availability of other financial resources, Credit line certificates from financial institutions should be enclosed in Annexure – VIII.

7.1.10 Litigation details of the bidder with the details of the parties concerned and the amount involved should be furnished in Annexure – IX.

7.1.11 The bidder should declare clearly whether the bidder has been black listed, banned or debarred in Central Government Department / Under taking / Organisation or any State/ Union Territory / Department Undertaking/ organisation in Annexure – X.

7.1.12 Proposals to Sub-contract components of the works with experience details of the Sub-contractor in similar nature of works proposed to be sublet should be furnished in Annexure – XI.

- The Sub-contractors shall have experience of successfully completing and commissioning of at least two works of similar nature and magnitude to the work to be sublet during the last 5 years.

- The Sub-contractors shall not further Sub-contract any portion of their work, Sub-contracted to them by the Contractor.

- The value of sub contracted work under any such sub contract shall not exceed 15% of the contract value and total sub contracted work shall not exceed 60% of the contract value.

  The contractor shall notify the Executive Engineer concerned in writing for objections, if any, about the sub-contractor that he proposes to appoint if the value of a sub contract work exceeds 10% of the contract value. If nothing is heard from the Executive Engineer within 15 days of the receipt of the Contractor's notice, then the contractor may proceed with the appointment of the sub-contractor concerned. If any objections are received about the appointment of the sub contractor from the Exe. Engineer concerned, the contractor shall give due weightage to such objections and either change the sub contractor, or refer the matter to the Chief Engineer concerned for his decision, which shall be final.

7.1.13 Income Tax Clearance Certificate in currency as proof of having remitted the income tax for the year prior to the previous financial year (with reference to the year in which the bid is opened)

7.1.14 GST Certificate as proof of having remitted the GST. In the case of not liable to the Commercial Tax Department, a valid certificate issued by the competent authority to this effect.

CONDITIONS TO BE SATISFIED:

7.2. Performance Eligibility

SL. NO.	DESCRIPTION	CRITERIA
A.	**(a) Financial & Physical Capacity.**	**Rs in Lakhs**
	Financial Turn over and Cash Flow	
1	Annual Turnover in any one of the last **three** financial years Rs. in Crores (2016-17, 2017-18 and 2018-19) – **100%** of BOQ Value **Rs.147.00 Crore**.	147.00 Crore
2	Minimum Annual turnover in last **three** financial year. (Rs. in Crores) (2016-17, 2017-18 and 2018-19) – **50%** of BOQ Value of **Rs.147.00 Crore**.	73.50 Crore
3	Net worth (10% of BOQ value **147.00 Crore**)	**14.70 Crore**
4	Minimum Cash flow required in Rs in Crores = B.O.Q Value x 3 Months / Completion period in months (36 months)	12.25 Crore
5	Similar Work - The bidder should have satisfactorily completed and commissioned Water supply scheme of value not less than Rs.in crore in last **five** years. Either **single agreement** with **40%** of BoQ value **Rs. 147.00 Crore**. **or** **Two agreements** with **60%** of BoQ value during the last **five** financial years.	**58.80 crore** in single Agreement (or) **88.20 Crore** in Two Agreements
6	Bid capacity Assessed Available Bid capacity = (A X N X 1.5) - B should be more than the total bid value.	**Rs.147.00 Crore**
B	**Physical (Work Experience) Minimum Aggregate during last five financial years. (2014-15, 2015-16, 2016-17, 2017-18 & 2018-19)**	
6.a	Minimum aggregate experience of sewer line during the last **5 years** in km Supply ,laying ,jointing and testing of sewer line with **SW/ RCC/UPVC/DWC** of any size **up to 4m below GL**. (10% of the total length of **136.00 Km**)	13.60 Km
6.b	Minimum aggregate experience of sewer line during the last **5 years** in Km Supply ,laying ,jointing and testing sewer line with **SW/ RCC/UPVC/DWC** of any size **above 4m below GL**. (10% of the total length of - Km)	-
6.c	Minimum aggregate experience of pumping main during the last **5** years in m Supply, laying, jointing and testing of pumping main with **CI / DI** of any size of the same material ie (10% of the total length of **45.17 Km**)	4.52 km
6.d	Minimum experience – should have constructed, completed & commissioned **one** sewage pumping station during the last 5 years. (Total – **6 Nos**)	1 No.
6.e	Minimum capacity of pump set should have supplied, erected and commissioned **one** pump set with **HT Power supply** during the last **5 years** (**25%** of Total requirement - **360 KW**)	90 KW

Note : in Addition to the above requirements the following criteria also to be satisfied.

BID CAPACITY

- Bidders who meet the minimum qualification criteria will be qualified only if their available bid capacity is more than the total bid value.

  Assessed Available Bid Capacity = [A*N*1.5-B]

  Where A = Maximum value of civil engineering works executed in any one year during the last three financial years [updated to 2019-20 price level @ 6.00% per annum] taking into account the completed as well as works in progress.

  N = Number of years prescribed for completion of the works for which bids are invited i.e. one year.

  B = Value of existing commitments and on-going works to be completed during the next one year. [Updated to 2019 – 20 (Current) Price Level]

7.3 In order to prove that the Goods offered are of acceptable quality and standard, the bidders shall furnish documentary evidence that the Goods offered have been in production and similar capacity have been sold, as indicated in the table below. **Further documentary evidence to establishment the manufacturers credential including the certificate from the manufacturing company's Auditor is requested to be submitted along with the bid.**

Item	Goods	Manufacturer's Experience Criteria	
		Minimum No. of years preceding the due date of tender the goods offered are in production	Minimum average units sold per year
1	Pumps, Electrical & Mechanical equipments		
1.1	Pumps:		
	Vertical Turbine	-	
	Horizontal Split Casing	-	
	Centrifugal Pump	-	
	Submersible Pump	5	50 Units
1.2	Electrical Transformer		
	Above 1000 KVA		
2	Valves Above …… mm size	5	200 Units**
3	Electromagnetic / Ultrasonic Flow Meter, Electronic and ICA Equipment.	5	-
4	Pipes		
4.1	PVC pipes	5	200% of total length required (…… km)

***** **Pumpsets :** Pumpset with ISI specifications of reputed brands. such as Jyothi, Kirloskar, Best & Crompton, Mather and platt, Worthington, KSB, Calama, Waterman, Atlanda, Flow more, Fair more fair banks, Morese or equivalent.

** Valves: Valves with ISI Specifications of reputed brands, such as Kirloskar, Venus, Upadyaya, CALSONS, Endress and Hauser / Siemens / ABB / Krohne - Marshall or equivalent

Unless otherwise stated in the Contract, the Accepted Contract Amount covers the entire Contractor's works under the Contract (including those under Provisional Sums, if any) and all things necessary for the proper design, installation, test, commission and trial operation at Section I of the Works and operation and maintenance at Section II of the Works. The Accepted Contract Amount shall cover the completion of both Sections of the Works and the re-modifying of any defects.

Note:

i. The performance eligibility shall pertain to the similar works executed by the tenderer in any of the Central/State Government Departments/Quasi Government Organizations and Government Undertakings, a Private Organization. The performance experience for Central/State Government Department/Undertaking/ Quasi Government Organization should be supported by performance certificates issued by the concerned organization by an officer not less than the rank of Executive Engineer. **The experience certificates issued by an officer below the rank of Executive Engineer or on behalf of Executive Engineer will not be considered.**

In case of experience of a Private Organization, the following criteria should be satisfied:

a) The Photographs of the works undertaken for the Private Organization should be enclosed as a proof.

b) The certificate of the work done for the Organization be enclosed by a Senior Official who should be at least of the rank of the General Manager or Equivalent.

c) The above certificate should be countersigned by a Government Department Engineer at least of the rank of Assistant Executive Engineer and should also be Notarised.

ii. For the experience certificates furnished by the bidders which are obtained from the Departments outside the State, clarification will be obtained by the Employer from the concerned Department whenever felt necessary as to whether the details furnished in the certificates are genuine, before finalization of evaluation.

iii. The bills / claims should be prepared by the contractor as per Agreement and in accordance with the agreement executed and submitted to the Department

iv. Sub contractors' experience for the particular works to be sublet **shall not be taken into account for arriving at the eligibility of the contractor / firm.**

v. The tenderer should enter into proper agreement with sub contractor proposed to be sub let and furnish the documentary evidence along with bid.

Special Condition:

In case if a contractor/firm worked as sub contractor previously, then their experience in those particular components of work will be considered only if their sub contract/sublet work was properly approved by the User Department. A certified copy to that effect from Engineer in charge (not below the rank of Executive Engineer) must be produced for arriving at the performance eligibility for the particular work to be sublet.

7.4. Disqualification:

Even though the bidders meet the above qualifying criteria, they are subject to be disqualified at any point of time if they have

i) made misleading or false representation in the form statements and attachments submitted and/or

ii) Record of poor performance during the last **5 years** as on the date of application such as abandoning the work rescinding of contract for which the reasons are attributable to the non performance of the Contractor inordinate delays in completion, consistent history of litigation awarded against the applicant or any of its constituents or financial failure due to bankruptcy etc.

iii) been debarred / blacklisted as on the date of application by any Central/State Government Department/Undertaking/Organization and their bid will not be taken up for evaluation.

SPECIAL ATTENTION TO BIDDERS :

I. Copies of experience certificates obtained from the Officer not below the Rank of **Executive Engineer** of respective user departments must be attested by Notary Public and produced.

II. These Certificates should contain the following details

1) Name of Scheme (Name of the State also to be specified) :
2) Contract No. and date :
3) Value of contract :
4) Name of contractor with full address :
5) Period of completion as specified in the contract :
6) Date of commencement of work :
7) Actual date of completion/ commissioning :
8) Reason for the delay if any :
9) Full details of components executed under this contract :

10) Performance of the work should contain the following :

Component		Performance
i) In case of I.W / Collection well / intake well/Jack well/Foot Bridge/ Off take Well	:	Whether completed and commissioned satisfactorily ?
ii) In case of pipeline work (Type of each pipe with dia, length, pressure must be given)	:	Whether completed and commissioned satisfactorily ?
iii) In case service reservoirs (with capacity of S.Rs. to be clearly Mentioned)	:	Whether constructed and commissioned satisfactorily?
iv) Incase of pumping Machinery installed (The capacity of K.W. must be given)	:	Whether commissioned satisfactorily?

Signature of Officer with Seal

TENDERER CHIEF ENGINEER/TWAD/VELLORE

C. BID DOCUMENTS

8. Contents of Bid Documents

8.1 The Bid Documents will comprise the following documents and addenda issued in accordance with clause 10 below:

Invitation for Bids

Instruction to Bidders

Eligibility/Qualification Criteria

Forms of Bid

Programme Schedule and Financial Milestone

Payment Schedule

General Conditions of the Contract

Special Conditions of Contract

Technical Specifications

Bill of Quantities

Drawings

Forms of Agreement

Indemnity Bond

9. Clarification of Bid Documents.

9.1 A prospective bidder requiring any clarification may raise the same at the time of pre bid meeting in writing or by cable (hereinafter the term cable is deemed to include telex and facsimile) at the employer's address indicated in the invitation for bid. The employer will respond to any clarification sought for.

10. Amendment to Bid Documents

10.1 At any time prior to 48 hours to the deadline for submission of bids, the Employer may amend the bid documents by issuing Addenda.

10.2 Any Addendum thus issued shall be part of the bid documents and shall be communicated in writing or by cable to all purchasers of the bid documents. Prospective bidders shall promptly acknowledge the receipt of each addendum by cable to the Employer.

10.3 To give prospective bidders reasonable time in which to take an addendum into account in preparing their bids, the Employer shall extend as necessary the deadline for submission of bids, in accordance with Clause 21.2 of "Submission of Bids".

D.PREPARATION OF BIDS

11. Language of the Bid

11.1 The bid, and all correspondences and supporting documents related to the bid exchanged by the bidder and the Employer shall be written in English. Supporting documents and printed literature furnished by the bidder may be in other language provided they are accompanied by an accurate translation of the relevant passages in either English or Tamil language, in which case, for purpose of interpretation of the bid, the translation shall prevail.

12. Documents comprising the Bid

12.1 The bid submitted by the bidder shall comprise the following:

Cover – 1 (Technical Bid)

i. The Bid Documents duly filled and signed.

ii) List of Annexure

a) Performance of the Bidder showing value of Civil Engineering work for the past three years – (7.1.4) **Annexure - I**

b) Average Annual Construction Turnover (Civil engineering work) for the last three financial years.– (7.1.5) **Annexure - II**

c) Experience in works of similar nature and Magnitude within a period of 5 financial years – (7.1.6) **Annexure - III**

d) Commitment of works on hand – (7.1.6) **Annexure - IV**

e) Works for which Bid are already submitted – (7.1.6) **Annexure - V**

f) List of Equipments available with Bidder – (7.1.7) **Annexure - VI**

g) Qualification/Experience of key personnel proposed for technical and administrative functions under this contract – (7.1.8) **Annexure - VII**

h) Sample Format for evidence of access to or availability of credit facilities – (7.1.9) **Annexure - VIII**

i) Details of Litigation – (7.1.10) **Annexure - IX**

j) Declaration by the bidder – (7.1.11) **Annexure - X**

k) Details of components proposed to be sublet and sub contractors involved – (7.1.12) **Annexure - XI**

l) Technical staff to be employed (Para 10 of General Conditions) **Annexure - XII**

iii. List of Certificates.

a) Signature of the proprietor or proprietress attested by the Notary Public (2.2)

b) Signature of all the partners/power of attorney attested by the Notary Public – (2.3)

c) Registration of the firm, signature of the authorised person attested by the Notary Public – (2.4)

d) A copy of the listed power of attorney authorising the signatory of the bidder – (7.1.2)

e) Proof of registration of firm/Company (7.1.3)

f) Audited Balance Sheets – (7.1.5)

g) Credit line Certificate from Financial institutions – (7.1.9) (Format-VIII)

h) Income Tax Clearance Certificate – (7.1.13)

i) GST Certificate – (7.1.14)

j) Certificate of performance issued by not less than the rank of Executive Engineer of the organization concerned/responsible person of the private organization – (7.3)

k) Copy of certificates furnished by the firm /contractor should be attested by the notary public.

iv) Bid Security

v) Any other material required to be completed and submitted by the bidders in accordance with these instructions.

Cover – II (Price Bid)

12.2 Priced Bill of Quantity duly signed.

12.3 The Bid should be submitted only in the original documents as issued by the Employer (or) as downloaded from the website. No alteration or correction should be made under any circumstances in the Bid Documents issued by the Employer (or) as downloaded from the website.

12.4 Conditional tenders are liable for rejection.

13. **Bid Prices**

13.1 The contract shall be for the whole works as described in sub clause (1.1), based on the priced bill quantities submitted by the bidder.

13.2 The bidder shall fill in rates and prices and line item total (both in figures and words) for all items of works described in the Bill of quantities along with total bid price (both in figures and words). Items for which no rate or price is entered by the bidder will not be paid for by the employer when executed and shall be deemed covered by the other rates and prices in the bill of quantities. Corrections, if any, shall be made by crossing out, initialing,

13.3 All duties, taxes and other levies payable by the contractor, under the contract or for any other cause shall be included in the rates, prices and total bid price submitted by the bidder.

13.4 The rates and prices quoted by the bidder are subject to adjustment during the performance of the contract in accordance with the provisions of **clause 50.**

14. Currencies of Bid and Payment

14.1 The unit rates and the prices shall be quoted by the bidder entirely in Indian Rupees.

15**. Bid Validity**

15.1 Bids shall remain valid for a period not less than **120 days (one hundred and twenty days)** from the date of opening of Technical Bid. A bid valid for a shorter period shall be rejected by the Employer as non responsive.

15.2 In exceptional circumstances, prior to expiry of the original time limit, the Employer may request the bidders to extend the period of validity for a specific additional period. The request and the bidders' response shall be made in writing or by cable. A bidder may refuse the request without forfeiting his bid security. A bidder agreeing to the request will not be required or permitted to modify his bid, but will be required to extend his bid security for; the period of extension.

16. Bid Security

16.1 The bidder shall furnish, as part of his bid, as bid security of **Rs.75.00 lakhs (Rupees Seventy Five Lakhs only)** duly pledged in favour of the **Executive Engineer, TWAD Board, RWS Division, Kallakurichi** in any one of the following forms Demand draft / Deposit call receipt / Fixed deposit receipt/ Bank guarantee issued by Nationalised Bank/ Scheduled Bank located in India or a Reputable Bank located Abroad, National savings certificate, Post office Savings Bank deposits.

- Unconditional Bank Guarantee in the prescribed format for the bid security issued by a Nationalised Bank/Scheduled Bank located in India or a Reputable Bank located Abroad & **valid for 45 days** after the end of the validity period of the bid

  FDR and deposits at call receipts should contain lien certificate issued by the Bank for encashment by department. The FDR furnished by the firm should also bear the signature of the authorized signatory on a revenue stamp at the back of the FDR.

16.2 Any bid not accompanied by bid security in stipulated form shall be rejected by the Employer as non responsive.

16.3 The bid security of the unsuccessful bidders will be returned as promptly as possible, but not later than 30 days either after the expiration of the period of bid validity or after finalisation of the bid whichever is later.

16.4 The bid security of the successful bidder will be returned after the bidder has furnished the required performance security and signed the agreement. No interest is payable on Bid security by the Employer.

16.5 The bid security shall be forfeited.

- In the case of bidder withdrawing or modifying his bid during the period of bid validity
- If the bidder does not accept the corrections of the bid price, pursuant to clause 28 of "Bid Opening and Evaluation"
- In the case of a successful bidder failing to furnish the performance security in the specified form within the stipulated time.
- In the case of successful bidder failing to enter into agreement within the stipulated time.
- In the case of the bidder severing the conditions after intimation of the acceptance of the bid.

17. Compliance to Technical Design and Specifications.

17.1 Bidders shall submit their offers that comply with the requirements of the bidding documents including the basic technical design as indicated in the drawing and specifications.

18. Format and Signing of Bid

18.1 The bid document submitted to the Employer shall be typed or written in indelible ink and shall be signed by a person duly authorised to sign on behalf of the bidder in accordance with "Instructions to Bidders". All pages of the bid and where entries or corrections have been made shall be initialed by the person signing the bid.

18.2 The bid shall contain no alteration or additions, except those to comply with the instructions issued by the Employer and wherever necessary to correct errors made by the bidder, in which case such corrections shall be initialed by the person signing the bid.

18.3 The technical and price bids (BOQ) as issued by the Employer should be submitted duly signed at the bottom of each page, failing which the bids will be summarily rejected.

19. Pre Bid Meeting:

19.1 The bidder or his authorised representative, who are desirous, may attend the pre bid meeting which will take place at **The Chief Engineer, TWAD Board, Vellore – 6 on 15.05.2020 at 11.00 AM.**

19.2 The purpose of the meeting will be to clarify issues and to answer questions on any matter than may be raised at that stage.

19.3 The bidder is requested, as far as possible, to submit the questions in writing or by cable, to reach the Employer not later than one week before the meeting. It may not be practicable at the meeting to answer questions received late.

19.4 Minutes of the meeting, including the text of the questions (without Identifying the source of enquiry) and the responses given together with any responses prepared after the meeting, will be transmitted without delay to all purchasers of the bidding documents. Any modification of the bidding documents listed in clause 23.1 of "Submission of Bids", which may become necessary as a result of the pre bid meeting shall be made by the Employer exclusively through the issue of an addendum pursuant to clause 10 of the "Bid Document" and not through the minutes of the pre bid meeting. Then will be hosted on www.tenders.tn.gov.in and www.twadboard.gov.com

19.5 Attendance at the pre bid meeting is not mandatory and non attendance will not be a cause for disqualification of the bidder.

E. SUBMISSION OF BIDS

20. Sealing and Marking of Bids

20.1 Two cover system shall be adopted for submission of bids.

20.2 The first cover shall contain the technical bid documents, supporting material relating to the eligibility criteria, Bid Security in the proper form and other connected Certificates.

20.3 No indication direct or indirect, implicit or explicit regarding the rates and prices should be made in the technical bid or any other documents submitted in the first cover.

20.4 The second cover shall contain the Price Bid alone.

20.5 The bids should be submitted in the original bid documents as issued by the Employer.

20.6 The bid documents, under no circumstances, are transferable.

20.7 The first cover containing the Technical Bid and Bid Security and the second cover containing the Price Bid, should be pasted properly, sealed and super scribed indicating clearly the name of work and marking specifically as under:

Cover I - Technical Bid

Cover II - Price Bid

Both the covers containing the Technical bid and Price Bid should be placed in a common envelope, pasted, sealed and super scribed properly.

20.8 Format and signing of Tender

20.8.1 The Tenderer shall submit one original and one copy (Hard) and one soft copy of technical bids comprising of Tender as described in the Instruction to Bidders, bound in a format as stipulated.

20.8.2 All bidders will be provided with an electronic copy of the schedule of prices. Cells that contain permanent information and are not to be changed by the Bidder will be protected.

20.8.3 Cells into which the bidder can enter rates and Amount (where these may vary), will be left unprotected. However, the Employer will not enter any formulae in the spread sheets.

20.8.4 The Bidder is entirely responsible to ensure that the calculations presented in the Schedule of Prices are correct, and that the Bidders offer is complete in all respects. The Price Bid completed in computerized printout, adopting the format of the Bid document in total and shall be signed by a person or persons duly authorized to sign on behalf of the Bidder.

20.8.5 The tenderer shall submit the Price Bid in duplicate one in hard copy and another in soft copy. The BOQ in the excel format is uploaded. The Bidder will need to submit the completed Schedule of Prices together with the bound copy of the Price Proposal which has been issued by the Employer along with the separate Priced Schedule of Prices, and to affix his signature on all pages of his submittal. The Bidder shall give an undertaking that that the content of the CD and the content of hard copies are identical. In the case of discrepancy between the soft copy and hard copy (print out) furnished by the bidder, the hard copy (print out) will prevail. If there is discrepancy between the hard/soft copy furnished by the bidder and the hard copy issued by the Employer, the hard copy issued by the Employer will prevail.

20.8.6 The Tender shall contain no alternations, omissions or additions, except those to comply with instructions issued by the Employer, or as necessary to correct errors made by the Bidder, in which case such corrections shall be initialed by the person or persons signing the Tender.

20.9 All the envelopes shall be addressed to the Employer. The Chief Engineer, TWAD Board, Vellore-632006, and bear the following identification.

Bid for

Providing UGSS to Tindivanam Municipality in Villupuram District for implementation of Collection system and allied works - Execution period – 36 months, Trial run period – 6 months and maintenance of the scheme – 12 months.

IFB No.02 / UGSS to Tindivanam Mpty - CS/ DO / CE / VLR / 2020 / Dt: 24.04.2020.

Do Not Open Before **01.06.2020 at 3.30 PM** (Time and date of bid opening as per Clause 24 of “Bid Opening and Evaluation”) and should be submitted to the following address.

THE CHIEF ENGINEER,
TWAD BOARD,
No. 8, FIRST EAST MAIN ROAD,
GANDHI NAGAR,
VELLORE – 632 006.

20.10 In addition to the Identification required in sub clause above, the envelope shall indicate the name and address of the bidder to enable the bid to be returned in case it is declared late, pursuant to Clause 22 of ”Submission of Bids”.

20.11 If the envelope is not sealed and marked as above, the Employer will assume no responsibility for the misplacement or premature opening of the bid.

21. Deadline for Submission of the Bids

21.1 Bids must be received by the Employer at the address specified in clause 20.8 above not later than **3.00 P.M. on 01.06.2020** In the event of the specified date for the submission of bids declared a holiday for the Employer, the bids will be received up to the appointed time on the next working day.

21.2 The Employer may extend the deadline for the submission of bids by issuing amendment in accordance with clause 10 of ”Bid Documents” in which case all rights and obligations of the Employer and the bidders previously subject to the original deadline will then be subject to the new deadline.

22. Late Bids

22.1 All bids received by the Employer after the deadline prescribed in clause 20 of "Submission of Bid" will be returned unopened to the bidder.

23. Modification, Substitution and Withdrawal of Bids

23.1 The bidder may modify, substitute or withdraw his bid after submission, provided that written notice of the modification, substitution and withdrawal is received by the Employer prior to the deadline for submission of bid.

23.2 The bidder's modification, substitution or withdrawal notice shall be prepared, scaled, marked and delivered in accordance with provisions of clause 20 and 21 of "Submission of Bid", with the envelope additionally marked **'MODIFICATION', 'SUBSTITUTION' or 'WITHDRAWAL'** as appropriate.

The modification / substitution for price bid cover should be super scribed as **PRICE 'MODIFICATION' / SUBSTITUTION COVER.**

23.3 No bid shall be modified, substituted or withdrawn after the deadline for submission of bids.

23.4 Modification, substitution or withdrawal of a bid between the deadline for submission of bids and the expiration of the original period of validity specified in clause 15.1 of "Preparation of Bids" or as amended pursuant to clause 15.2 of "Preparation of Bids" may result in the forfeiture of the Bid Security pursuant to Clause 16 of "Preparation of Bids".

F. BID OPENING AND EVALUATION

24. Bid Opening

24.1 The Employer will open all the bids received (except those received late) including modifications made pursuant to clause 23 of "Submission of Bids", in the presence of the bidders or their representatives who choose to attend on the date at the time in the address specified in clause 20 of "Submission of Bids".(In the event of specified date of bid opening being declared a holiday for the Employer, the bids with be opened at the appointed time and location on the next working day).

24.2 Envelopes marked "withdrawal", "substitution" and "modification" shall be opened and read out first. Bids for which an acceptable notice of withdrawal has been submitted pursuant to clause 23 of "Submission of Bids" shall not be opened. Envelopes super scribed as **'MODIFICATION' / SUBSTITUTION to price bid will be opened at the time of opening of the price bid.**

24.3 The Bidders' names, the Bid prices, the total amount of each Bid, any discounts, bid modification, (substitution) and withdrawals, the presence or absence of Bid Security and such other details as the Employer may consider appropriate, will be announced by the Employer at the opening. Bids (and modifications) sent pursuant to clause 22 of "Submission of Bids" that are not opened and read out at the bid opening will not be considered for further evaluation regardless of the circumstances. Withdrawn bids will be returned unopened to the bidders.

25. Process to be Confidential

25.1 Information relating to the examination. Clarification, evaluation and comparison of bids and recommendations for the award of a contract shall not be disclosed to bidders or any other person not officially concerned with such process until the award to the successful Bidder has been announced. Any effort by a bidder to influence the Employer's processing of Bids or award decisions may result in the rejection of his bid.

26. Clarification of Bids.

26.1 To assist in the examination, evaluation and comparison of bids, the Employer may, at his discretion, ask any Bidder for clarification of his bid, including breakdown of unit rates. The request for clarification and the response shall be in writing or by cable, but no change in the price or substance of the Bid shall be sought, offered, or permitted except as required to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Bids in accordance with Clause 28 of "Bid Opening and Evaluation".

27. Examination of Bids and Determination of Responsiveness

27.1 Prior to detailed evaluation of Bids, the Employer will determine whether each Bid
(a) meets the eligibility criteria set out in clause (7) ;
(b) has been properly signed,
(c) is accompanied by the required securities and
(d) is substantially responsive to the requirements of the Bid Documents,

27.2 A substantially responsive Bid is one which conforms to all the terms, conditions and specifications of the Bid Documents, without material deviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality or performance of the works. (b) which limits in any substantial way, inconsistent with the Bid Documents, the Employer's rights to the Bidder's obligations under the contract, or (c) whose rectification would affect unfairly the competitive position of other bidders presenting substantially responsive Bids.

27.3 If a Bid is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the non conforming deviation or reservation. The decision of the Employer on the issue whether the Bid is responsive or not" will be final and binding on the bidders. The Employer is not bound to disclose the reason in case a bid is determined by him as non responsive.

28. Correction of Errors

28.1 Bids determined to be substantially responsive will be checked by the Employer for any arithmetic error. Errors will be corrected by the Employer as follows:

- If any variation in the rates in words and figures, the lesser of the two will only be taken into consideration.
- Where there is a discrepancy between the unit rate and line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern.
- Where there is an arithmetical discrepancy in the page total as well as grand total, the corrected total by the Employer will govern

28.2 The amount stated in the Bid will be adjusted by the Employer in accordance with the above procedure for the correction of errors and shall be considered as binding upon the Bidder. If the Bidder does not accept the corrected amount of the Bid, his bid will be rejected and his bid security may be forfeited in accordance with Clause 16.5 of "Preparation of Bids".

29. Evaluation and Comparison of Bids.

29.1 The Employer will evaluate and compare only the Bids determined to be substantially responsive in accordance with Clause 27 of "Bid Opening and Evaluation".

29.2 In evaluating the Bids, the Employer will determine for each Bid the evaluated Bid Price by adjusting the Bid price as follows:

- Making any correction for errors pursuant to Clause 28 of "Bid Opening and Evaluation". or
- making appropriate adjustments to reflect discounts or other price modifications offered in accordance with Clause 23 of "Submission of Bids"

29.3 The Employer reserves the right to accept or reject any variation/deviation.

29.4. If the Bid of a successful Bidder is seriously unbalanced in relation to the Engineer's estimate of the cost of work to be performed under the contract, the Employer may require the Bidder to produce detailed price analysis for any or all items of the Bill of Quantities to demonstrate the internal consistency of those prices with the construction methods and schedule proposed.

After evaluation of the price analysis, the Employer may require that the amount of the Performance Security set forth in Clause 34 of; "Award of Contract" be increased at the expense of the successful Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract.

G. AWARD OF CONTRACT

30. Award Criteria.

30.1 Subject to Clause 29 of "Bid Opening and Evaluation", the Employer will award the contract to the Bidder, whose Bid has been determined to be substantially responsive to the Bid Documents and who has offered the lowest evaluated Bid Price, provided that such Bidder has been determined to be (a) eligible in accordance with the provision of clause 6 of "Eligibility/Qualification Criteria" and (b) qualified in accordance with the provisions of Clause 7 of "Eligibility / Qualification Criteria".

31. Employer's Right to Accept any Bid and to Reject any or all Bids

31.1 The Employer reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids, at any time prior to award of contract, without thereby incurring any liability to the affected bidder or bidders or any obligation to inform the affected bidder or bidders of the grounds for the Employer's action.

32. Notification of Award

32.1 The Bidder whose Bid has been accepted will be notified of the award by the Employer prior to expiration of the Bid validity period by cable, telex or facsimile confirmed by registered letter. This letter (hereinafter and in the Conditions of Contract called the "Letter of Acceptance"), will state the sum that the Employer will pay to the contractor in consideration of the execution, completion and maintenance of the works by the Contractor as prescribed by the Contract (hereinafter and in the conditions of Contract called the "Contract Price")

32.2 The notification of award will constitute the formation of the Contract.

33. Registration in TWAD

33.1 The successful contractor/firm, if not a registered contractor in Tamil Nadu Water Supply and Drainage Board, he / they shall get himself / themselves registered in TWAD Board.

34. Performance Security

34.1 A) Within 28 days from the date of the Letter of Acceptance, the successful bidder shall deliver to the Employer a Performance Security

i) in the form of National Savings Certificate / Post Office Savings Deposit account purchased within the State of Tamil Nadu and pledged in favour of the **Executive Engineer, TWAD Board, RWS Division, Kallakurichi.**

(OR)

ii) Unconditional and irrevocable bank guarantee issued by any one of the branches of Nationalised Bank or scheduled Bank within the State of Tamil Nadu, provided they are in prescribed format (enclosed in this Document) for an amount equivalent to

a. For tenders with any plus % & up to minus 5% of Dept. Value :– 2% of Contract value
b. For Tenders with minus 5% & up to minus 15% of Dept. Value : - 4% of Contract Value
c. For tenders with more than minus 15 % Dept Value : - 5% of Contract Value

in favour of the **Executive Engineer, TWAD Board, RWS Division, Kallakurichi.**

34.2 The bidder along with the performance security shall deliver a non judicial stamp paper for Rs.100/- (Rupees hundred only) at his cost for executing the agreement.

35. Signing of Agreement

35.1 The Employer on receipt of the performance security and non judicial stamp paper, will furnish to the bidder the Agreement in the form prescribed, incorporating all terms and conditions between the Employer and the successful bidder.

35.2 The Bidder should remit the performance security prescribed by the Employer in the form as in Clause 34 above and sign the agreement in the presence of the Employer within 28 days from the date of Letter of Acceptance notifying the award of contract.

35.3 Upon furnishing the performance security by the successful bidder, the Employer will promptly notify the other bidders that their bids have been unsuccessful.

35.4 Failure of the successful bidder to comply with the requirements of Clause 34 & 35 and 35.2 of "Award of Contract" shall constitute a breach of contract, cause for annulment of the award, forfeiture of the bid security and any such other remedy the Employer may take under the contract

Amendment to Agreement

35.5 Any amendment shall be issued by mutual consent between the Employer and the contractor only without any contrary to the bid conditions.

36. Mobilisation Advance

For the works costing more than Rs. 10.00 Crore.

Mobilisation advance at 10% of the contract value repayable with interest rate notified by the Government against irrevocable Bank guarantee.

The Contractor shall ensure that the Bank Guarantee is valid and enforceable until the Mobilisation advance payment has been repaid, but its amount may be progressively reduced by the amount repaid by the Contractor as indicated in the Payment Certificates.

The Mobilisation Advance payment shall be repaid through percentage deductions in Payment Certificates:

(a) deductions shall commence in the next Payment Certificate in which the total of all certified interim payments (excluding the advance payment and the payment of retention money) exceeds thirty per cent (30%) of the Contract value (Construction Period at Section I of the Works) less Provisional Sums; and

(b) deductions shall be made at the amortization rate of 20% of the amount of each Payment Certificate (excluding advance payment and the payment of retention money) in the currencies and proportions of the advance payment, until the Contractor received 80% of their Contract amount and by then the advance payment should be due and have been repaid.

37. Forfeiture of Performance Security

37.1 The performance security is liable to be forfeited in cases where the firm/contractor fails to carry out the work in accordance with the specifications, terms and conditions of the contract leading to termination of the contract.

IV- PROGRAMME SCHEDULE

38. Project completion and Financial Milestone

38.1 The twenty eighth day from the date of issue of work order shall be reckoned as the start date of the contract period.

38.2 Entire project must be completed in all respects **within Thirty Six months** for construction work and six months for trial run, successful commissioning & proof of guarantee performance.

38.3 The mile stone for each component would be as under :

Sl. No.	Description	% of achievement	Cumulative % of achievement
1.	Upto I Quarter (3 Months)	10 %	10%
2.	Upto II Quarter (6 Months)	10 %	20%
3.	Upto III Quarter (9 Months)	10 %	30%
4.	Upto IV Quarter (12 months)	10 %	40%
5	Upto V Quarter (15 Months)	10%	50%
6	Upto VI Quarter (18 Months)	10%	60%
7	Upto VII Quarter (21 Months)	10%	70%
8	Upto VIII Quarter (24 Months)	10%	80%
9	Upto IX Quarter (27 Months)	5%	85%
10	Upto X Quarter (30 Months)	5%	90%
11	Upto XI Quarter (33 Months)	5%	95%
12	Upto XII Quarter (36 Months)	5%	100%
		6 months - Trial Run	

39. Programme Schedule / Rate of Progress / Milestone

39.1 The Contractor, within seven days from the date of signing of the agreement shall submit to the Engineer for approval **an Activity Chart showing the general methods, arrangements, order and timing for all the activities in the Works.**

39.2 An update of the Activity Chart shall be a Programme showing the actual physical progress achieved on each activity and the progress to be achieved on the remaining work including any changes to the sequence of activities. The Contractor shall submit to the

Engineer in charge, for approval, an updated Activity Chart. The Employer reserves the right to approve or reject the updated Activity Chart without prejudice to levying of liquidated damages for slow progress.

40. Penalty for Defective Construction

If any defect is noticed by the Employer in the construction of any portion of work/component, the Employer shall levy penalty up to 10% of the total value of the defective work as assessed by the Engineer in charge, in addition to rectification of defective works at his cost.

41. Liquidated damages

41.1 Provided the firm/contractor fails to maintain the required rate of progress/mile stones liquidated damages will be invoked at the rate of 0.05% per week for the unfinished work. The firm/ contractor achieve the next mile stone within the stipulated period cumulatively (ie including the first mile stone) the levied Liquidated Damages will be revoked The amount recoverable towards liquidated damages shall however be restricted to 10% of the total contract value. The imposition of the liquidated damages clause will be without prejudice to the rights of the Employer to terminate the contract as time barred.

41.2 For imposing liquidated damages, detailed show cause notice shall be served on the defaulting firm/contractor either by RPAD or through personal service. The first notice shall be served allowing 15 days time to the firm/contractor for furnishing the reply by them. In case of non receipt of reply on expiry of 15 days time from the date of first notice, the second notice shall be served allowing 7 days of time to the firm/contractor for furnishing the reply by them. Again in case of non receipt of reply on expiry of 7 days time from the date of second notice, the third notice shall be served allowing 3 days of time to the firm/contractor for furnishing the reply by them. On receipt of the reply, it shall be verified by the Engineer in charge and liquidated damages clause shall be invoked by issuing an explicit speaking order to the firm/ contractor, Similarly, the non receipt of any reply from the firm/ contractor shall attract imposing the liquidated damages clause automatically and in this case also, the liquidated damages shall be imposed by issuing an explicit speaking order to the firm/contractor.

42. Foreclosure of Works

The Employer shall have the right to issue notice to the firm/contractor, for any reason whatsoever does not require the whole or part of the works to be carried out after the award of the contract. The contractor shall not have any claim towards compensation or whatsoever, on account of any profit or advantage, which he might have derived from the execution of such works. For the works executed which could not be utilised in view of the foreclosure, the firm/contractor shall be paid a eligible amount as certified by the Engineer in charge.

V- PAYMENTS AND RECOVERIES

43. Payment Schedule

Payment shall be made in stages for each component as envisaged under:

CIVIL WORKS:

Payment may be released upto

95.00% of the measured and check measured quantity

5.00% on commissioning of the entire scheme as against submission of unconditional irrevocable Bank Guarantee for a period of 2 years.

PUMPING MAIN, BOOSTER MAIN FEEDER MAIN, GRAVITY MAIN AND D'SYSTEM

1. For pipes and allied works

After supply at site	-	75%
After laying, jointing and testing of pipe	-	85%
After satisfactory completion of trial run & commissioning of the entire length of main	-	95%
After commissioning of the entire scheme as against submission of unconditional irrevocable Bank Guarantee for a period of 2 years for the 5% of the amount.	–	100 %

2.Mechanical items in pumping & treatment plant

After receipt of materials at site	-	80%
After erection	-	90%
After commissioning of the entire scheme as against unconditional irrevocable Bank Guarantee for a period of 2 years for the 5% of the amount.	–	100 %

3. For Higher capacity pumpsets (above 25 HP)

After receipt of materials at site	-	80%
After erection, commissioning and Post installation inspection by third Party agency	-	90%
After commissioning of the entire scheme as against unconditional irrevocable Bank Guarantee for a period of 2 years for the 5% of the amount.	–	100 %

MAINTENANCE

Maintenance of the scheme – paid maintenance for **12 months.**

Section – I - Project Completion and Commissioning.- **36 months** ,
Trial run – 6 months
Section – II - Paid maintenance for 12 months

The bill will be prepared at the end of every month and payment will be made accordingly.

Note:

- The percentage of payment mentioned above are with reference to the total value of each component as per the agreement entered into by the firm/contractor except pumping main and distribution system.

- The payment shall be made for each component as per the actual measurement upto the percentages mentioned above for the stage of progress of each component. In the case of actual value of works carried out becoming lesser than the percentage limits prescribed for the stages, the payments shall be restricted to the actuals.

- 5% of the value of every running bill shall be retained by the Employer as additional performance security.

- Payments shall become eligible only for finished items of works in all respects.

43.1 Preparation of bills:

The Contractors will submit their bills every month in the M.Book format for the Quantity only of the relevant running bill duly signed. This will be treated as claim of the Contractor to consider payment every month.

The Contractor shall submit their bills to the Executive Engineer or any of his subordinate officer under his control as directed by the Executive Engineer. The Executive Engineer shall be responsible to scrutinize and make payment to the Contractor within 6 weeks from the date of submission of bills by the Contractor concerned.

44. Release of Performance Security & Retention Amount

44.1 In addition to the withheld amount, 40% of the amount of each bill of the contract shall be deducted and will be retained till the date of receipt of certificate of water tightness from the Executive Engineer, TWAD Board. The whole of the above sum of together with any recovery from the payments already made to the contractor as may be assessed by the Executive Engineer shall be forfeited to the TWAD Board if the RCC reservoir develops structural defects or leaks. The above recovery shall be exclusive of the amount deposited towards security deposit. The fact of carrying out water tightness test should be recorded in the M. Book. The last part bill should be passed only after above certificate is issued. However, the contractor shall be permitted to execute an indemnity bond/BG in lieu of the recovery of 40% in each bill in prescribed form in non judicial stamp paper for a value of Rs.100.00 towards water tightness and structural stability of the reservoir/water retaining structure. The period of guarantee required by the contract shall be two years from the date of

completion and commissioning (with filling of water up to maximum water level in the case of service reservoir/over head tanks/water retaining structure). If defects are noticed within the stipulated period of 24 months of satisfactory performance, the defects should be rectified by the contractor at his own cost and the performance period again shall be reckoned from the date of completion of the rectification of defects by the contractor. In the case of service reservoir/over head tanks and other water retaining structures during this period, structure under full working head of water should show no sign of leakage. The test for water tightness should be arranged to be carried out and completed within 30 days from the date of intimation by the Engineer in charge. The testing of the service reservoir/over head tank and other water retaining structures should be done by the contractor at his own cost inclusive of all necessary equipment, water etc., complete. The test for water tightness of the structure as well as materials of construction used shall be conducted in conformity with the standard specifications as per I.S. 3370 (Part-I) – 1965 as amended from time to time and the other specifications as mentioned in the Bid Document.

44.2 The security deposit less any amount due to the Board and 2 ½ % out of the total 5% of the retention amount made in every running bill shall be released in final bill which shall be prepared after the works are completed in all respects and after completion of maintenance period.

44.3 In respect of building works, RCC reservoir and other works where water tightness and soundness are to be watched for more than 6 months notwithstanding above clause, the balance 2 ½ % out of the total 5% retention amount from final bill in respect of contract for original construction or original building works, construction of RCC reservoir work etc., will be retained by Engineer in charge and paid to then contractor after a period of 24 months of satisfactory performance of entire civil works including maintenance period and on production of irrevocable Bank Guarantee in a prescribed form for the above amount for a further period of 3 years beyond the above said 2 years to ensure structural stability.

44.4 The whole of the above it is the duty of the contractor to check the verticality of water retaining / storage structures with the use of survey instruments as a forming part of the works under WSS / UGSS.

45. Recovery of money payable to the TWAD Board

45.1 All losses, costs, damages and expenses and other money payable to the Board by the contractor under any stipulation in the contract, may be retained out of any money due or which may subsequently become due from the Board to the contractor under any contract or otherwise whatsoever and in case such money then due or to become due to the contractor by the Board shall be insufficient to pay such losses, costs, damages, and other money payable to the TWAD Board by the contractor, it shall be lawful for the Engineer in charge without any further consent on the part of the contractor to sell notes for the securities deposited in the Board by the contractor as aforesaid and with and out of the proceeds of such sale, after payment of all expenses connected therewith or reimburse and pay to the Board all such losses, cost, damages and expenses and other money payable to the contractor. And in case such proceeds of sale of the said securities shall be insufficient for such purpose then and in that case it shall be lawful for the Board to recover the residue thereof, if necessary by legal proceedings and or by resorting to revenue recovery act against the contractor.

46. **Income Tax**

46.1 During the course of the contract period, deduction of income tax shall be made at the prevailing rates from every payment as may be specified by the Income Tax Department and as amended from time to time.

47. Excise Duty

Deleted

48. GST

GST is applicable as per G.O. 296, Finance (Salaries) Dept. Dt. 09.10.2017, GOI, Ministry of Finance - Central Tax (Rate), New Delhi Notification No. 12/2017 / Dt: 28.06.2017 and 20/2017/ Dt. 22.08.2017 and as amended from time to time.

From every payment made to the firm/ contractor, deduction at source towards GST shall be made for civil works contract as per Government of India, Ministry of Finance/ Department of Revenue, New Delhi Notification No. 20 / 2017 – Central Tax (Rate) / Dt.22.08.2017 subject to issue of amendments from time to time.

49. FUND CONTRIBUTION FOR MANUAL WORKERS

Towards contribution of fund for the benefit of manual workers employed in the construction works an amount equivalent to one percent of total estimated cost of the construction work proposed will be paid by the Employer direct to the respective welfare Board, as per G.O. Ms. No. 295/ Labour and Employment (I 2) Department/ Dated: 17.12.2013, subject to issue of amendments from time to time by the respective department of Government of Tamil Nadu.
(*Lumpsum provision for this contribution may be appropriately made in the Estimates sanctioned for the schemes and the amount would be remitted at the end of the financial year to the labour welfare Board, as per G.O Ms. No.283, MAWS Dept, Dated:2010*)

50. Price Adjustment :-

50.1 The conditions for price adjustment shall be as follows.

The conditions for price adjustment shall be in accordance with G.O Ms. No. 101/ Public works (G2) department/ dated: 10.06.2009, G.O Ms.No. 227/ MA&WS (MA3) Department/ Dated: 23.11.2009 & B.P. Ms. No. 93/ COM wing/ Dated: 12.08.2009. The amounts payable to the Contractor shall be adjusted for rises or falls in the cost of specified materials and all labour, by the addition or deduction of the amounts determined by the formulae prescribed in this Clause. To the extent that full compensation for any rise or fall in costs is not covered by the provisions of this or other Clauses, the Accepted Contract Amount shall be deemed to have included amounts to cover the contingency of other rises and falls in costs.

i. Full price adjustment on all components including cement, steel, bitumen and petroleum, oil and lubricants (POL) shall be applicable to the works with contract period of more than 12 months.

ii. In respect of contracts of 12 months and below, price adjustment shall be applicable in respect of cement, steel, bitumen and petroleum, oil & lubricants (POL) only.

iii. Price adjustment clause will be applicable for all works, where value of work put to tender costing Rs.100 lakhs and above. However No price adjustment will be applicable for maintenance and Repair works.

iv. Price adjustment will apply only when the rates exceed or decrease by 3% or more as compared to the estimated rates (RBI Index Price)

v. The Price adjustment shall be calculated only on the departmental estimated cost of the work. (For minus tender, the value of work done will be adopted)

vi. All the works for which price escalation/ variation is contemplated must have milestones fixed in physical terms and have a prefixed time line for use of inputs-clearly indicating the nature and quantum of eligible inputs to be used for the work for the relevant period between two mile stones. Price variation/ escalation will be applicable for those quantities 'actually' used by the contractor including additional quantities, if any, used or achieved ahead of the time line. However, if the contractor does a certain quantity of the work in the third quarter which ought to have been done in earlier quarter, price variation/ escalation will still be applicable on the quantity at the rates applicable in the relevant quarter as per time line or period of actual use, whichever is less.

vii. Liquidated damages will be imposed on the contractor for the lapses/ shortfall in achieving the rate of progress as per existing schedule.

viii. The price adjustment mechanism will cease to operate for value of work executed beyond the agreement period. But agreement period shall include the 'actual period', for which the work was 'suspended offcially' and extension of time permitted for any valid reasons such as war, natural calamities, like-flood, earth quake and other risks arising out of acts of God during the agreement period; work delayed due to the land acquisition process; change in design, change in scope of work, etc., which is given in writing by the Tender Calling Officer of the respective work.

ix. Price adjustments will be calculated once in a quarter as per the specified formula from the last date of submission of bid up to the end of agreement period provided, if the agreement is signed within the minimum specified time, failing which, the price variation will be applicable from the date of agreement only, based on the whole sale price indexes of RBI. The quarter will be reckoned with reference to the quarter of the calendar year in which the last date of bid submission is fixed. In case of delayed agreement, the quarter in which the Agreement is signed will be reckoned for the purpose of calculation of Price Adjustments.

50.2. Formulae for price adjustment.

The price adjustment shall be calculated based on the departmental estimated cost of the work, which is abbreviated as "R" in the formula (For minus tender, the value of work done will be adopted).

(The provisions of the G.O Ms. No. 101/ Public works (G2) department/ dated: 10.06.2009, G.O. Ms. No. 227/MA&WS(MA3)Dept., Dated 23.11.2009 and B.P .MS.No.93 /COM wing/ date 12.08.2009 will be followed)

(i) Adjustment for cement

Price adjustment for increase or decrease in the cost of cement procured by the Contractor shall be paid in accordance with the following formula.

Vc = 0.85 x Pc / 100 x R (C1-C0) / C0

Vc = Increase or decrease in the cost of work during the period under consideration due to changes in the rates for cement.

C_o = The All India Average whole sale price index for cement (grey cement) for the quarter preceding the last date of *submission of bids / Signing of the agreement (as the case may be)* as published by RBI/Office of the Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi**.**

C_1= The All India Average whole sale price index for cement (grey cement)for the quarter under consideration to which a particular Interim Payment Certificate is related as published by RBI/Office of the Economic Adviser, Ministry of Commerce and Industry, Government of India, New Delhi.

P_c = Percentage of Cement component of the item, stipulated in the Table 50.2.

(ii) Adjustment for steel reinforcement / structural steel

Price adjustment for increase or decrease in the cost of steel procured by the Contractor shall be paid in accordance with the following formula.

Vs = 0.85 x Psr / 100 x R (S1-S0) / S0

Vs = Increase or decrease in the cost of work during the period under consideration due to changes in the rates for steel.

S_o = The All India Average whole sale price index for MS bars and rounds for steel reinforcement (Rebars) as applicable for the items for the quarter preceding the last date of *submission of bids / Signing of the agreement (as the case may be)* as published by RBI / Office of the Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi.

S_1 = The All India Average whole sale price indices for MS bars and rounds for steel reinforcement (Rebars) for the quarter under consideration to which a particular Interim Payment Certificate is related as published by RBI/Office of the Economic Adviser, Ministry of Commerce and Industry, Government of India, New Delhi.

Psr = Percentage of component of steel reinforcement or structural steel in the item, stipulated in the Table 50.2.

(iii) Adjustment for Ductile Iron / cast iron pipes and specials

Price adjustment for increase or decrease in the cost of Ductile Iron/Cast Iron pipes and specials procured by the Contractor shall be paid in accordance with the following formula.

Vip = 0.85 x Pip / 100 x R (IP1-IP0) / IP0

Vip = Increase or decrease in the cost of work during the period under consideration due to changes in the rates for Ductile Iron/Cast Iron pipes and specials.

IP_o =The All India Average whole sale price index for grade pig iron for the quarter preceding the last date of submission of bids / Signing of the agreement (as the case may be) as published by RBI/, Office of the Economic Adviser, Ministry of Commerce and Industry, Government of India, New Delhi.

IP_1= The All India Average whole sale price indices for pig iron for the quarter under consideration to which a particular Interim Payment Certificate is related as published by RBI/ Office of the Economic Adviser, Ministry of Commerce and Industry, Government of India, New Delhi.

Pip = Percentage of components of Ductile Iron/Cast Iron pipes in the work in the item stipulated in the Table 50.2.

iv) Adjustment for PVC / UPVC Pipe and specials

Price adjustment for increase or decrease in the cost of PVC / UPVC pipes and specials procured by the Contractor shall be paid in accordance with the following formula.

$Vpv_o = 0.85 \times Pv_o / 100 \times R (Pv_o 1 - Pv_o 0) / Pv_o 0$

Vpv_o = Increase or decrease in the cost of work during the period under consideration due to changes in the rates for PVC / UPVC pipes and specials.

Pv_o =The All India Average whole sale price index for Plastic/ PVC / UPVC pipes for the quarter preceding the last date of submission of bids / Signing of the agreement (as the case may be) as published by RBI/, Office of the Economic Adviser, Ministry of Commerce and Industry, Government of India, New Delhi.

Pv_1= The All India Average whole sale price indices for PVC / UPVC for the quarter under consideration to which a particular Interim Payment Certificate is related as published by RBI/ Office of the Economic Adviser, Ministry of Commerce and Industry, Government of India, New Delhi.

Pv_o = Percentage of components of Ductile PVC/UPVC pipes in the work in the item stipulated in the Table 50.2.

(v) Adjustment for Labour cost

Price adjustment for increase or decrease in the cost of labour procured by the Contractor shall be paid in accordance with the following formula.

V_L = 0.85 x PL / 100 x R (CPI1- CPI0) / CPI0

V_L = Increase or decrease in the cost of work during the period under consideration due to changes in the cost of labour.

CPI_o =The Average Consumer Price Index (CPI) for Industrial workers for ……centre for the quarter preceding the last date of submission of bids / Signing of the agreement (as the case may be) as published by RBI/Labour Burea, Ministry of Labour and Employment, Government of India.

CPI_I= =The Average Consumer Price Index (CPI) for Industrial workers for the …….. centre for the quarter under consideration to which a particular Interim Payment Certificate is related as published by RBI/Labour Bureau, Ministry of Labour and Employment, Government of India.

P_L = Percentage of components of labour in the work in the item stipulated in the Table 50.2.

(vi) Adjustment for Electrical Machineries and Equipments:

Price adjustment for increase or decrease in the cost of Electrical equipments and machinery procured by the contractor shall be paid in accordance with the following formula

V_E = 0.85 x PE/100 x R x (E1 - EO)/ EO

V_E = Increase or decrease in the cost of work during the quarter under consideration due to changes in the rates for Electrical equipments and machinery

Eo =The All India Average whole sale price index for Electrical Machinery and Equipment for the quarter preceding the last date of submission of bids / Signing of the agreement (as the case may be) as published by RBI/ Office of the Economic Adviser, Ministry of Commerce and Industry, Government of India, New Delhi.

E_1= The All India Average whole sale price indices for Electrical Machinery and Equipment for the quarter under consideration to which a particular Interim Payment Certificate is related as published by RBI/Office of the Economic Adviser, Ministry of Commerce and Industry, Government of India, New Delhi.

P_E = Percentage of plant and machinery component of the work stipulated in Table 50.2

(vii) Adjustment of Local materials

Price adjustment for increase or decrease in cost of local materials other than cement, steel, bitumen and POL procured by the contractor shall be paid in accordance with the following formula:

$V_m = 0.85 \times P_m/100 \times R \times (M_i - M_o)/M_o$

V_m = Increase or decrease in the cost of work during the quarter under consideration due to changes in rates for local materials other than cement, steel, bitumen and POL.

M_o =The All India Average whole sale price index for (all commodities) for the quarter preceding the last date of submission of bids / Signing of the agreement (as the case may be) as published by RBI/Office of the Economic Adviser, Ministry of Commerce and Industry, Government of India, New Delhi..

M_1= The All India Average whole sale price index for (all commodities) for the quarter under consideration to which a particular Interim Payment Certificate is related as published by RBI/Office of the Economic Adviser, Ministry of Commerce and Industry, Government of India, New Delhi.

P_m = Percentage of local material component (other than cement, steel, bitumen and POL) of the work stipulated in Table 50.2.

The following percentages will govern the price adjustment for the entire contract.

Table 50.2 : Percentages of various components in the work.

Sl. No,	Component		Percentage
i.	Cement	P_c	8.82 %
ii.	Steel	P_{sr}	3.56 %
iii.	DI / CI Pipe	P_{ip}	13.32 %
iv	PVC / UPVC Pipe	P_{ip}	10.67 %
v.	Labour	P_L	33.71 %
vi.	Electrical machinery and equipments	P_E	3.08 %
vii.	Local materials	P_m	26.84 %
	Total		**100.00%**

VI- LIST OF ANNEXURES

No.	Description	Para No.
I	Performance of the Bidder showing value of Civil Engineering work for the past three financial years	7.1.4
II	Average Annual Construction Turnover	7.1.5
III	Experience in works of similar nature and Magnitude within a period of Five years	7.1.6
IV	Commitment of works on hand	7.1.6
V	Works for which Bid already submitted	7.1.6
VI	List of Equipments available with Bidder	7.1.7
VII	Qualification/Experience of key personnel proposed for technical and administrative functions under this contract	7.1.8
VIII	Sample Format for evidence of access to or availability of credit facilities	7.1.9
IX	Details of Litigation	7.1.10
X	Declaration by the bidder	7.1.11
XI	Details of components proposed to be sublet and sub contractors involved	7.1.12
XII	Technical staff to be employed	Para 10 of General Conditions

VI- LIST OF CERTIFICATES

Sl. No.	Description of Certificate	Para No.
1	Signature of the proprietor or proprietress attested by the Notary Public	2.2
2	Signature of all the partners/power of attorney attested by the Notary Public	2.3
3	Registration of the firm, signature of the authorised person attested by the Notary Public	2.4
4	A copy of the listed power of attorney authorising the signatory of the bidder	7.1.2
5	Proof of registration of firm/Company	7.1.3
6	Audited Balance Sheets	7.1.5
7	Credit line Certificate from Financial institutions	7.1.9 (Annexure-VIII)
8	Income Tax Clearance Certificate	7.1.13
9	GST Verification Certificate	7.1.14
10	Certificate of performance issued by not less than rank of Executive Engineer / Responsible person of the private organization.	

ANNEXURE I

PERFORMANCE OF THE BIDDER SHOWING TOTAL MONETARY VALUE OF CIVIL ENGINEERING WORKS IN THE LAST THREE FINANCIAL YEARS

Year	Monetary Value of Civil Engineering work (Rs. In lakhs)
2016 – 17.	
2017 – 18.	
2018 – 19.	

Seal of the Firm **Signature of the bidder with date**

ANNEXURE II

AVERAGE ANNUAL CONSTRUCTION TURNOVER

Each Bidder must fill in this form

Average Annual Turnover Data (Civil Engineering Works) in the last three Financial Years.		
Sl. No.	**Year**	**Amount Currency**
1	2016 – 17.	
2	2017 – 18.	
3	2018 – 19.	
Average Annual Construction Turnover		

The information supplied should be the Annual Turnover of the Bidder in terms of the amounts billed to clients for each year for work in progress or completed.

Seal

……..
……

(Signature of the Bidder)

ANNEXURE III

EXPERIENCE IN WORKS OF SIMILAR NATURE AND MAGNITUDE WITH IN A PERIOD OF 5 YEARS. (2014-15 to 2018-19)

Sl. No	Contract No. and Name of the Project	Description of the work	Name of the employer with full address	Value of the contract (Rs. In lakhs)	Date of Issue of work order and stipulated period of completion	Actual date of completion	Reason for the delay if any in completing the project

Seal of the firm

Signature of the bidder with date

TENDERER

CHIEF ENGINEER/TWAD/VELLORE

ANNEXURE IV

COMMITMENTS OF WORKS ON HAND

Sl. No	Contract No and Name of the Project	Description of the work	Name of the employer with full address	Value of the contract (Rs. In lakhs)	Date of Issue of work order and stipulated period of completion	Value of works remaining to be completed (Rs. In lakhs)	Anticipated date of completion

Seal of the firm

Signature of the bidder with date

TENDERER

CHIEF ENGINEER/TWAD/VELLORE

ANNEXURE V

WORKS FOR WHICH BID ARE ALREADY SUBMITTED

Sl. No	Contract No and Name of the Project	Description of the work	Name of the employer with full address	Value of the contract (Rs. In lakhs)	Stipulated period of completion	Date when decision is expected	Remarks if any

Seal of the firm

Signature of the bidder with date

ANNEXURE VI

LIST OF EQUIPMENT AVAILABLE WITH BIDDER

Sl. No.	Equipment Name	Requirement for the project		Availability Status			Remarks
		Nos.	Capacity	owned/ leased/ To be procured	Nos and capacity	Age/condition	

Seal of the firm

Signature of the bidder with date

ANNEXURE VII

QUALIFICATION/EXPERIENCE OF KEY PERSONNEL PROPOSED FOR TECHNICAL AND ADMINISTRATIVE FUNCTIONS UNDER THIS CONTRACT

Sl. No	Name of the person	Position for which proposed	Qualification	Total Years of experience	Years of experience in the proposed position	Remarks

Seal of the firm

Signature of the bidder with date

ANNEXURE VIII

SAMPLE FORMAT FOR EVIDENCE OF ACCESS TO OR AVAILABILITY OF CREDIT FACILITIES – CLAUSE 7.1.9

BANK CERTIFICATE

This is to certify that M/s……. is a reputed company with a good financial standing.

If the contract for the work, namely…… is awarded to the above firm, we shall be able to provide overdraft/ credit facilities to the extent of Rs…….. to meet their working capital requirements for executing the above contract.

Name of Bank :
Senior Bank Manager :
Address of the Bank. :

ANNEXURE IX

DETAILS OF LITIGATION, IF ANY

Sl. No	Name of the Govt. Dept. / Private Organisation (Other party)	Cause of the litigation	Amount involved (Rs. In lakhs)	Award for (or) against bidder	Remarks / present stage

Note: Should be attested by the Notary Public.

Seal of the firm

Signature of the bidder with date

ANNEXURE X

DECLARATION BY THE BIDDER:

It is to certify that our firm ……

……has **not** been black listed / banned / debarred by any Central / State, Union Territory Government Department or undertaking / Organization.

Seal

……..
……

(Signature of the Bidder)

ANNEXURE XI

DETAILS OF COMPONENTS PROPOSED TO BE SUBLET AND SUBCONTRACTORS INVOLVED

Sl. No	Name of component proposed to be sublet	Name of the sub contractor	Details of experience in similar work	Annual turnover of Sub-Contractor for the last 3 years (Rs. In lakhs)

Seal of the firm

Signature of the bidder with date

ANNEXURE XII

TECHNICAL STAFF TO BE EMPLOYED

I/We shall/Will employ the following technical staff as per the prescribed rules

Sl. No.	Name of the technical staff to be employed	Designation	Qualification

Seal of the firm

Signature of the bidder with date

VII- GENERAL CONDITIONS OF CONTRACT

1. DEFINITIONS

In the Contract (as hereinafter defined) the following words and expressions shall have its meanings hereby assigned to them, except where the context otherwise requires.

"Board" means the Tamil Nadu Water Supply and Drainage Board, a statutory body constituted under the Tamil Nadu Water Supply and Drainage Board Act 1971 having its office at No.31,Kamarajar Salai, Chepauk, Chennai – 600 005 and any officer authorised to act on its behalf

"Employer" means the Tamil Nadu Water Supply and Drainage Board and shall include the officers duly authorised to act on its behalf

"Contractor" means the person or persons, firm or company whose tender has been accepted by the Employer and includes the authorised representatives, successors, heirs, executors, administrators

"Subcontractor" means any person or persons, firm or company named in the Contract as a Subcontractor for a part of the Works or any person or persons, firm or company to whom a part of the Works has been subcontracted with the consent of the Engineer and includes the authorised representatives, successors, heirs, executors, administrators of such Subcontractors

"Engineer" means the Executive Engineer or any other Engineer appointed from time to time by the Employer to act as Engineer for the purposes of the works brought under this contract

"Engineer in charges" means the Executive Engineer or any other Engineer authorised by him.

"Engineer's representative" means any Resident Engineer or assistant of the Engineer or any clerk of works appointed from time to time by the Employer or/the Engineer to perform the duties set forth in respect of this Contract.

"Contract" means the Invitation for Bids and amendment made thereof, Letter of Acceptance, the formal Agreement executed between the Employer and the Contractor together with the documents referred to therein, General Conditions of the Contract, Special Conditions, Specifications, Minutes of the pre Bid conference, Design, Drawings, Schedule of Rates and Prices, Bill of quantities, Rate of Progress etc., All these documents taken together shall be deemed to form one contract and shall be complementary to one another

The quality parameters laid down in relevant BIS, TNBP, Bid Documents etc., are to be followed and it is stipulated to compete the entire works in all respects satisfactorily and commission within the stipulated period and maintain the scheme for the specified period.

"Contract Price" means the sum stated in the Letter of Acceptance as payable to the contractor for the execution, completion and maintenance of the works, subject to such additions thereto or deductions there from as may be provided under this Contract and the remedying of any defects therein in accordance with the provisions of the contract.

"Constructional Plant" means all appliances or things of whatsoever nature required in or about the execution, completion or maintenance of the works but does not include materials or other things included to form or forming part of the permanent works.

“Works” shall include both permanent works and temporary works. “Permanent works’ means the works of permanent nature to be executed, completed and maintained (including Plant) in accordance with the contract. ‘Temporary works’ means all temporary works of every kind required in or about the execution, completion or maintenance of the works and remedying of the defects therein

Specification” means the schedules, detailed designs, technical data, performance Characteristics and all such particulars referred to in the bid/contract and any modification thereof or addition thereto as may from time to time be furnished or approved by the Employer.

Drawings” means the drawings, calculations and technical information referred to in specification and any modification of such drawings approved in writing by the Engineer and such other drawings, calculations and technical information as may to time be furnished or approved in writing by the Engineer.

“Site” means the land and other places on, under, in or through which the Permanent works and/or Temporary Works are to be executed and any other lands and places provided by the Employer for working space or any other purpose as may be specifically designated in the Contract as forming part of the site.

Approved means approval in writing including subsequent written confirmation of previous verbal approval

“Test” means such test or tests as are prescribed in the specifications or considered necessary by the Engineer

‘ISS” means Indian Standard Specifications

“BIS” means Bureau of Indian Standards

“TNBP” means Tamil Nadu Building Practice

“Day” means a Calendar day from midnight to midnight)

“Week” means seven consecutive days.

“Month” means from the beginning date of a given date of a calendar month to the end the preceding date of the next calendar month

“Quarter” means a period of three months reckoning from the Ist date of January April, July and October and counted to the last date of March, June, September and December respectively.

Rupees means Rupees in Indian Currency

“Bill of Quantities” means the priced and completed bill of quantities forming part of the tender

“Tender” means the Contractor’s priced offer to the Employer for the execution, completion and maintenance of the Works and the remedying of any defects therein in accordance with the provisions of the Contract, as accepted by the Letter of acceptance

Letter of Acceptance” means the formal acceptance by the Employer of the Tender

“Contractor Agreement” means the contract agreement referred to in clause(..)

Appendix to Tender” means the appendix comprised in the form of Tender annexed in these conditions.

“Commencement Date” means the date of signing the agreement or the date of handing over the site to the successful firm/contractor, whichever is earlier and this shall be reckoned as the start date of the project. However the twenty eighth day from the date of issue of work order shall be reckoned as the start date of the contract period.

“Time of Completion” means the time for completing the execution of and passing the Tests on Completion of the Works of any section or part thereof as stated in the Contract (or as extended under Clause...) calculated from the Commencement Date

“Maintenance” means the successful maintenance of the completed and commissioned project as a whole or in parts as the case may be for the stipulated period

“Joint Venture” means two or more firms /contractors aspiring to take up the contract jointly with the lead partner and other partner/partners possessing the required qualifications.

2. INTERPRETATION

In interpretation of these Conditions of Contract, headings shall not be deemed part thereof or be taken into consideration. Words importing persons or parties shall include firms and corporations and any organization having legal capacity. Words importing the singular only also include plural and vice versa where the context requires.

The Employer will provide instructions clarifying the queries about the contract

3. Authority of Engineer in Charge

It shall be accepted that the authority of the Engineer in charge shall be an integral part of the contract in all matters regarding the quality of materials, workmanship, removal of improper work, interpretation of the contract drawings and specifications, mode and procedure of carrying out the works where the decision of the Engineer in charge shall be final and binding on the contractor. The Engineer in charge shall have absolute authority on all technical matters and payment considerations.

4. Sufficiency of Bid

The Contractor shall be deemed to have satisfied himself as to the correctness and sufficiency of the bid and of the rates and prices stated in the Bill of Quantities, all of which shall, except insofar as it is otherwise provided in the contract, cover all his obligations under the Contract (including those in respect of the supply of goods, materials, Plant or services or of contingencies for which there is a Provisional Sum) and all matters and things necessary for the proper execution and completion of the Works and the remedying of any defects therein.

5. Priority of Contract Documents

The several, documents forming the Contract are to be taken as mutually explanatory of one another, but in case of ambiguities or discrepancies the same shall be explained and adjusted by the Engineer who shall thereupon issue to the Contractor instructions thereon and in such event, unless otherwise provided in the Contract. The priority of the documents forming the Contract shall be as follows:

- The Contract Agreement
- The Letter of Acceptance
- The Tender
- Conditions of the Contract
- Technical specifications
- Any other document forming part of the Contract

6. Secrecy of the contract document

The Contractor shall treat all documents, correspondence, direction and orders concerning the contract as confidential and restricted in nature by the contractor and shall not divulge or allow access to these matters to any unauthorized person.

7. Instruction in Writing

Instructions given by the Engineer or Engineer's Representative shall be in writing, provided that if for any reason, the Engineer or the Engineer's Representative considers it necessary to give any such instruction orally, the Contractor shall comply with such instruction. Confirmation in writing of such oral instruction given by the Engineer or Engineer's Representative, whether before or after the carrying out of the instructions given by the Engineer or Engineer's Representative, shall be deemed to be an instruction.

8. Commencement of Works

The Contractor shall commence preliminary works after the receipt by him of the LOA to this effect from the Engineer in charge. Thereafter, the contractor shall proceed with the Works with due expedition and without delay and in accordance with the programme schedule set out in the Contract.

9. Reference Marks

The basic centre lines, reference points and bench marks shall be fixed by the Engineer in charge of the works.

The contractor shall establish additional reference points and bench marks as may be necessary at his cost. The contractor shall remain responsible for the accuracy and sufficiency of the reference and bench marks. The contractor shall take proper precautionary steps to ensure that the reference lines and bench marks established for the works are not disturbed and shall make good any damages caused.

10. Supervision

The Contractor shall provide all necessary superintendence during the execution of the works and thereafter as may be necessary for the proper fulfillment of the obligations under this contract. The contractor shall arrange for the deployment of proper qualified personnel at the site of work constantly, such supervising staff, apart from those separately set out as the requirements of the contract, shall be skilled and experienced technical assistants, foremen and others competent enough to produce proper supervision.

The Contractor shall employ the technical staff as per the prescribed rules. The details of value, scale and minimum qualification prescribed for the employment of technical staff, the rate of penalty for the failure on the part of the contractor to employ the technical staff for the work etc are as follows

Sl. No	Scale and minimum qualification prescribed for the employment of technical staff	No. of persons required	Rate of Penalty
	Above 50.00 Crore.		
1)	**Project Manager BE (Civil)** or equivalent with 15 years experience.	1	Rs.25000/- per month / Person.
2)	**Deputy Project Manager BE (Civil)** or equivalent with 10 years experience	1	Rs.15000/- per month / Person.
3)	**Resident Engineer BE (Civil)** / Mechanical / Electrical or equivalent with 5 years experience	3	Rs.10000/- per month / Person.

If the contractor fails to employ the technical staff to the departmental requirements, the contractor is liable to pay the penalty as indicated above during the period of such non employment of technical staff.

In the event of any staff of the contractor being non co-operative, negligent, incompetent of misconduct, the Engineer in charge shall have the liberty to object to the placement of such staff at the site or other place of works and will promptly issue notice in writing to the contractor for the removal of such staff members. It will be obligatory on the part of the contractor to remove/change such persons in the larger interests of the works.

11. Subletting of Contract

Assignment of the contract is not permissible

Transfer of the contract is not permissible on any grounds

The contractor shall sublet any portion of the contract only with the written consent of the Engineer in charge. It should be clearly understood that any subletting shall in no way absolve the contractor of his responsibilities and obligations under this contract

12. Specifications and Checks

Stated dimensions in the drawings are to be taken for consideration and no measurements based on scaling of the drawings shall be considered. In case of discrepancy between the description of items in the schedule of quantities and the specifications, the later shall prevail. In case of the description, any work having not fully described or doubts prevail, the contractor shall forthwith write to the Engineer in charge and clarify himself before executing that portion of the work. However, this cannot be a cause for any delay in the progress and the contractor should take advance action in this regard ensuring timely completion of the works. Before commencement of the work, it will be obligatory on the part of the contractor to furnish a detailed plan of action along with layouts showing the position of the construction plants and other facilities required and proposed to be provided for this contract.

The contractor shall execute the works true to alignment, grade and levels as set out in the drawings and as directed by the Engineer in charge from time to time. The Engineer in charge or his representative is at liberty to check the correctness of the works, the suitability of the materials used, design mix etc., The contractor will raise no objections for such checks land shall provide necessary labour and instruments to carry out such check to the Engineer in charge as well as his representative and co-operate in the checks. However, such checks will not absolve the contractor of his responsibility of maintaining the accuracy of the work.

13. Custody and Supply of Drawings and documents

The drawings shall remain in the sole custody of the Engineer in charge, but two copies thereof shall be provided to the contractor free of charge. The contractor shall make at his own cost any further copies required by him. Unless it is strictly necessary for the purposes of the contract, the drawings specifications and other documents provided by the Employer or the Engineer in charge shall not, without the consent of the Engineer in charge, be used or communicated to a third party by the contractor. One copy of the Drawings, provided to or supplied to the Contractor as aforesaid, shall be kept by the Contractor at the site and the same shall be made available for inspection and use by the Engineer and by any other person authorized by the Engineer.

14. Bill of Quantities

The Bill of quantities shall contain items for the construction, installation, testing, commissioning and maintenance of the Works to be carried out by the Contractor. The Bill of Quantities will be used to calculate the Contract Price. The contractor shall be paid for the quantum of work done at the rate mentioned for each item in the Bill of quantities

15. Change in the Quantities

If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item/items, the rates as in the agreement for the relevant items shall be paid as per the actual quantity.

16. Additional items

If additional items that are not contemplated in the contract are to be executed, the Engineer in charge will execute the works either through the main contractor/firm or through any other agency. Payment for such works shall be made based on the rates derived by the Engineer in charge as per rules in force.

17. Order Book

An order book will be kept by the Officer in charge of the site (Junior Engineer/Assistant Engineer) of the particular component of the works. Orders entered in this book by the Engineer in charge or any higher authority shall be held to have been formally communicated to the contractor/firm. The Officer in charge of the site will sign each order as it is entered and will hand over the duplicate to the contractor/firm or his agent, who shall sign the original in acknowledgement of having received the order.

18. Independent Inspection

The Engineer shall delegate inspection and testing of materials or Plant to an independent inspector/Agency. Any such delegation shall be considered as prerogative of the Engineer. In addition to third party inspection, wherever felt necessary, the engineer shall be empowered to test the PVC Pipes for its quality such as specific gravity, diameter, thickness

etc. in the TWAD Board laboratory. The cost of the third party quality check pipes, valves and pumpsets shall be borne by the employer.

19. Covering and Opening of Works.

No work shall be covered or put out of view without the approval of the engineer in charge. The contractor shall give due notice to the Engineer in charge whenever such works are ready for examination and the Engineer in charge within a reasonable period, arrange for the inspection and measuring of the work as may be necessary. No portions of the work shall be covered up without the consent of the Engineer in charge. The cost of opening any portion of the works that was covered without the consent of the Engineer in charge and the cost of covering thereafter shall be borne by the contractor. The contractor shall open the covered portion of the works for inspection by the Engineer in charge on a request and the inspection or examination shall be carried out promptly by the Engineer in charge. In the case of defects notified by the Engineer in charge, the contractor shall rectify the same as may be instructed by the Engineer in charge. All costs of opening, covering and rectification shall be on to the account of the contractor. Should the contractor refuse to open such portions of works the Engineer in charge shall open such portions with other persons and inspect the part of the works as he may feel necessary. On inspection, the works being not in accordance with the requirements of the contract documents, the Engineer in charge shall carry out necessary rectification and the entire cost of opening, rectification and closing shall be on to the contractor's account.

20. Temporary Diversion of Roads and Commencement of Work.

During execution of the works, the contractor/firm shall make at his cost all necessary provision for the temporary diversion of roads, car tracks, footpaths,. drains, water courses, channels etc. , Should the contractor/firm fail to do these arrangements, the same shall be done by the Engineer in charge and the cost thereof shall be recovered from the contractor/firm.

21 Notice to Telephone, Railway and Electric Supply Undertaking.

The Contractor/firm shall give all notices required by any law or custom or as directed by the Engineer in charge and irrespective of whether notice be so required so directed or not, shall in all cases give due and sufficient notices to all persons and authorities having charge of the telegraph, water and other pipes, sewers, culverts drains, water courses, railway, telephone, highways, roads, streets, foot and carriage highways, payment and other works, prior to commencements and at the completion of any work under this contract in order to enable the proper bodies or persons in respect of the matters aforesaid to attend and see the works within their jurisdiction and all matters and things incidental and pertaining thereto are secured, re-laid or reinstated in a proper and satisfactory manner. The notices by the contractor/firm shall also serve the purpose of enabling such bodies and persons to attend and secure, shore up, alter the position or remove, relay and reinstate the works and things belonging to them not with standing the notices given as aforesaid the Contractor/firm shall be chargeable and responsible for the proper protection and restoration of all matters and things herein referred to.

22 Watching and Lighting

The Contractor/firm at his expense shall provide at the site of works sufficient fencing, barricading, watching and lighting during day and night. The contractor/firm shall in every respect conform to the police regulations in these matters and shall free and relieve the Board on all such matters. Should the contractor/firm fail/neglect to do these

arrangements, the same shall be carried out by the Engineer in charge and the costs thereof shall be recovered from the contractor/firm.

23 Measurement of Work

The work will be measured by the site engineer (Junior Engineer/Assistant Engineer) and recorded in the measurement book. The contractor/firm will be at liberty to accompany the site engineer in order that they may agree on the measurements but should they neglect to do so, the measurements as recorded by the site engineer shall be taken as final and conclusive. The measurements of works will be recorded as prescribed in the TNBP and as amended from time to time.

24 Tools and Plants

All tools, plants and equipments required for this contract will be arranged by the Contractor at his own expense. The Contractor shall erect necessary construction plant as may be necessary and shall use such methods and appliances for the proper performance of all the operations connected with the work brought under the contract ensuring satisfactory quality of work and maintenance of the programme schedule. The non availability of any tool, plant or equipment shall not be relied upon as a reason for non functioning or slow progress.

25 Information and Data

The information and data made available to the contractor in respect of the works and site conditions are only general and the contractor is advised to get himself fully acquainted with the nature of the location of the works and the surroundings, quarries, local conditions and such other aspects that are relevant to the works.

26 Co-existence with other Contractors.

Where two or more contractors are engaged on work in the same vicinity, they shall work together harmoniously with the spirit of cooperation and accommodation. The contractor shall not disrupt or disturb the works or labour arrangements of the neighboring contractors. In case of disputes and difficulties arising between the contractors in the execution of the respective works, the Engineer in charge shall interfere and give directions for the smooth functioning of the entire works and it shall be the bounden duty of the contractors to abide by these instructions.

27 General Responsibilities and Obligations of the Contractor

The contractor shall, subject to the provisions of the contract, execute and maintain the works with proper care and diligence and provide all labour including the supervision thereof, materials, constructional plant and all other things, whether of a temporary or permanent nature required for such execution and maintenance.

The contractor shall take full responsibility for the adequacy, stability and safety of all site operation and methods of construction.

The contractor shall promptly inform the Employer and the Engineer in charge if any error omission, fault and other defects in the specification or design of the works which are identified at the time of reviewing the contract documents or during the execution for proper rectification thereof.

All notices, certificates connected with the work served by the employer relating to the contract shall be sent by post or by hand to the contractor' principal place of business as

mentioned in the document or at other places as may nominated by the contractor in writing for this purpose. Any change in the address of the contractor should be promptly intimated to the Employer in writing then and there.

The contractor shall visit the spots of work and ascertain the site conditions. The contractor shall satisfy himself of the conditions prevailing in the spots where the work is actually to be executed and its environs and the precise offered by him shall be treated as those which were worked out taking fully into consideration the prevailing site conditions, hydrological conditions, extent and nature of work to be executed, the material availability, etc., Any claim on this ground at a later date shall be summarily rejected.

However during the execution of the works, if the contractor has to encounter artificial obstructions, which in his opinion could not have been reasonably foreseen, then the contractor shall write forthwith to the Engineer in charge of such obstruction and remedial measures needed. The Engineer in charge, if opined that the conditions cannot be possibly foreseen by an experienced contractor, he shall extend possible assistance to the contractor to overcome such obstructions. The opinion of the Engineer in charge shall be final and binding and the contractor is not entitled to advance these as reasons for any delay that may be caused to the completion of the project.

The contractor shall execute and maintain all works in accordance with the specification and to the satisfaction of the Employer. The contractor shall strictly adhere to the instructions and directions of the engineer in charge, whether included in the contract agreement or not but concerning the safe and proper execution of the works.

28 Labour

The contractor shall not employ any person who has not completed fifteen years of age in connection with the works under this contract.

The contractor shall furnish the information on various categories of labour employed by him to the Engineer in charge in the form prescribed for this purpose

The contractor shall in respect of labour employed by him comply with or cause to be complied with the provisions of various labour laws, rules and regulations as applicable to them in regard to all matters provided therein and shall indemnify the Employer in respect of all claims that may be made against the Employer for non compliance thereof by the contractor.

Now withstanding anything contained herein, the Employer reserves the right to take such action as may be deemed fit and proper for the compliance of various labour laws and recover the costs thereof from the contractor.

29 Restriction of Working Hours

Subject to any provisions contained in the Contract, none of the works shall, save as hereinafter provided, be carried on during the night or on locally recognized days of rest without the consent of the Engineer, except when work is unavoidable or absolutely necessary for the saving of life or property or for the safety of the Works, in which case the Contractor shall immediately advise the Engineer, Provided that the provisions of this clause shall not be applicable in the case of any work which is customary to carry out by multiple shifts

30 Right of Way and Facilities

The Contractor shall bear all costs and charges for special or temporary rights of way required by him in connection with access to site. The Contractor shall also provide at his own cost any additional facilities outside the Site required by him for the purposes of the Works

31 Removal of Improper Work, Material and Plant

The contractor shall make his own arrangements for the procurement, supply and use of the construction materials and shall ensure that the materials either procured within the country or abroad conform to the relevant specifications set out in the bid documents. In case of alternatives being used, they should be of equal or higher quality than those specified subject to the review and written approval of the Engineer in charge. Differences between the standards specified and the proposed alternatives must be described in writing to the Engineer in charge at least 30 days in advance from the date on which the approval of the Engineer in charge is needed. The disapproval of the proposal by the Engineer in charge shall result in the contractor confining to the standards set forth in the contract documents. The contractor shall arrange for the inspection of the material at the manufacturing place or other places by the department personnel

All materials and workmanship shall be in accordance with the specifications set out in the contract document and as directed by the Engineer in charge and shall be subjected to tests by the Engineer in charge or his representative at the place of manufacture or at the site of work or places wherever felt necessary. The contractor shall provide all the assistance necessary including instruments, machines and materials that are normally required for carrying out the testing/measuring the quality/quantity of the materials and workmanship. Any material rejected after testing by the Engineer in charge or his representative will not be used on the works. The contractor shall without claiming any extra cost, shall arrange for the testing of materials and supervision of the works. The Engineer in charge or his authorized representative will have access at all ties to the places of manufacture, storage to ascertain as to whether the manufacturing process wherever mentioned is in accordance with the drawings and specifications

The Engineer in charge shall have the right to order the removal of such materials which in his opinion are substandard stipulating a time limit for the removal of the same and replacement with quality material

Notwithstanding the previous tests of the materials by the Engineer in charge or his representative, if any portion of the work, in the opinion of the Engineer in charge is not in order, the contractor shall redo such work to the satisfaction of the Employer at no extra cost. In case of default on the part of the contractor in carrying out such orders, then the Employer shall have the right to carry out such works through some other persons and the expenses thereon or incidental thereto shall be recoverable from the contractor.

32 Default of Contractor in Compliance

In case of default on the part of the Contractor in carrying out such instruction within the time specified therein, if none, within a reasonable time, the Employer shall be entitled to employ and pay other persons to carry out the same and all costs consequent thereon or incidental thereto shall after due consultation with the Employer and the Contractor, be determined by the Engineer and shall be recoverable from the Contractor by the Employer, and shall be deducted by the Employer from any monies due or to become due to the Contractor and the Engineer shall notify the Contractor accordingly, with a copy to the Employer

33 Default by Contractor

If the contractor shall become bankrupt or have a receiving order made against him or shall present his petition in bankruptcy or shall make an arrangement with or assignment in favour of his creditors or shall agree to carry out the contract under a committee of inspection of his creditors, or being a corporation shall go into liquidation (other than a voluntary liquidation for the purpose of amalgamation or reconstruction), or if the contractor shall assign the contract, without the consent in writing of the employer first obtained, or shall have an execution levied on his goods, or if the engineer in charge shall certify in writing to the employer that in his opinion, the contractor.

a) Has abandoned the contractor or

b) Without reasonable excuse has failed to commence the works or has suspended the progress of works for twenty eight days after receiving a written notice from the Engineer in charge to proceed or

c) Has failed to remove materials from the site or to pull down and replace work for twenty eight days after receiving the written notice from the engineer in charge stating that the said materials or work stands condemned and rejected under these conditions, or

d) Despite previous warnings in writing by the Engineer in charge, not executing the works and achieving the progress as stipulated in the programmed schedule drawn for the contractor is persistently or flagrantly neglecting to carry out the obligations under this contractor

e) Has, to the detriment of good workmanship, or in defiance of the instructions of the Engineer in charge or in contract sublet any part of the contract, then the Employer, may at his option, after giving two weeks notice in writing to the contractor, enter upon the site and the works and expel the contractor therefrom without thereby voiding.

f) The contract, or releasing the contractor from any of his obligation or liabilities under this contract, and may himself complete the works or may employ any other contractor to complete the work. The employer or such other contractor may use the construction plant, temporary works and materials which have been deemed to be reserved exclusively for the execution of the works under the provisions of the contract as may be thought fit and proper for the completion of the work. The employer may, at anytime, sell any of the said constructional plant, temporary works and materials which have been deemed to be reserved exclusively for the execution of the works under the provisions of the contract as may be thought fit and proper for the completion of the work. The employer may, at any time, sell any of the said constructional plant, temporary works and unused materials and apply the proceeds of sale in or towards the satisfaction of any sums due or which may become due to him from the contractor under this contract.

g) has carried out the work in a defective manner.

h) has not made payment of labour dues.

i) has become eligible for maximum compensation under the “Liquidated damages clause” leading to Termination of the contract.

The Engineer in charge shall as soon as may be practicable after any such entry or expulsion by the employer, fix and determine expert or by after reference to the parties, or after such investigation or enquiries as maybe thought fit to make or institute, and shall clarify what amount, if any had at the time of such entry and expulsion been reasonably occurred to the contractor in respect of work then actually done by him under this contract and the value of any of the said unused or partially used materials, any constructional plant and any temporary woks.

If the employer shall enter and expel the contractor under this clause, the employer shall not be liable to pay to the contractor any money on account of the contract until the expiration of the period of maintenance and thereafter until the costs of execution and maintenance, damages for delay in completion, if any and all other expenses incurred by the Employer have been ascertained and the amount thereof certified by the engineer. The contractor shall then be entitled to receive only such sum or sums, if any as the engineer in charge may certify would have payable to him upon due completion by him after deducting the said amount. If such amount shall exceed the sum which would have been payable to the contractor on due completion by him, then the contractor shall, upon demand, pay to the employer the amount of such excess and it shall be deemed a debt due by the contractor to the Employer and shall be recoverable accordingly.

If, by reason of any accident, or failure, or other event occurring to or in connection with the work, or any part thereof, either during the execution of the works, or during the period of maintenance, any remedial or other work or repair shall in the opinion of the Engineer in charge or his authorized representative, be urgently necessary for the safety of the works and the contractor is unable or unwilling at once to do such work or repair as the Engineer in charge or his representative may consider necessary, such works shall be carried out by the Engineer in charge. If the work or repair so done, which in the opinion of the Engineer in charge, liable to have been done by the contractor at his expense under this contract, all expenses incurred by the Employer in carrying out such works shall be recoverable from the contractor or shall be deducted by the Employer from the money due to the contractor provided always that the Engineer in charge or his representative, as the case may be, shall as soon after the occurrence of any such emergency as may be reasonably practicable, notify the contractor thereof in writing.

34 Power to vary work

The description of the works required to be executed by the contractor/firm are set out in the specifications, schedules and drawings, but the Engineer in charge reserves the power to vary, extend or diminish the quantities of work, to alter the line, level or position of any work, to increase, change or decrease the size, quality, description, character or kind of any work, to order the contractor/firm to execute the works or any part thereof, by day or night work, or to add or take from the work included in the contract as he may deem fit and proper without violating the contract and the contractor/firm shall not have any claim upon the Employer for any such variation, extension, diminution, alteration, increase, change or decrease other than for the work actually done, calculated according to the prices tendered and accepted in this contract.

35 Extra for Varied Works

Any unforeseen additional work that may become necessary and is accordingly carried out under this contract based on proper written orders shall be measured and valued by the Engineer in charge at the rates contained in the contractor's/firm's original bill of quantities. If these rates do not apply to the additional works ordered to be carried out, then prior to execution of the additional work, a rate for such work shall ordinarily be agreed upon

and entered in a supplemental schedule and signed by both the Engineer in charge and the contractor/firm.

36 Omissions

In the event of anything reasonably necessary or proper to the due and complete performance of the work (Engineer in charge will be the sole judge on these things) being omitted to be shown or described in the drawings, specifications and schedules, the contractor/firm shall notwithstanding execute and provide at the rates noted in the bill of quantities all such omitted works and things as if they have been severally shown and described and the execution should be according to the directions of the Engineer in charge and to his satisfaction.

37 Notices Regarding Shoring etc.,

Wherever shoring or other works for the protection or security of the buildings/structures are necessary, the contractor/firm shall within a reasonable period before the execution of such works, shall serve notices upon the occupiers of the buildings / structures to be shored up or otherwise secured and upon all other parties entitled to notice, apprising them respectively that such works are necessary, that the contractor/ firm about to execute the same and will, at a time to be specified in such notice, enter upon the premises for the purpose of executing such works.

38 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 Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions. **Contractor shall attend to the defect in the work noticed during defects correction period within 3 days from the date of issue of notice to attend to the defects, failing which the defect will be remedied by engaging other Contractors at any cost and that cost will be recovered from the Contractor's money available with the Employer and balance alone will be paid when it is due.**

39 Suspension of Work

The Contractor shall, on the instructions of the engineer, suspend the progress of the Works or any part thereof for such time and in such manner as the Engineer may consider necessary and shall, during such suspension, properly protect and secure the Works or such part thereof so far as is necessary in the opinion of the Engineer in charge.

40 Suspension of Progress

The contractor/firm shall, without recompense, claim or demand, delay or suspend the progress of works as a whole or any part thereof, if and when or so often as directed by the Engineer in charge and for such time or times, as may be in the judgment of the Engineer in charge be necessary for the purposes or advantages of the undertaking. Upon all such occasions, whether directed or not, the contractor/firm at his/their expense, properly cover down and secure so much of the work as may be liable to sustain damage from whether or any other cause and shall at all times and forthwith when required properly make good all the damage or injury which such works or any part thereof may gave sustained and these should be done to the entire satisfaction of the Engineer in charge.

41. Termination

The Employer may terminate the Contract for any reason that is regarded as breach of the Contract.

If the contract is terminated, the contractor shall stop work immediately, make the site safe and secure and leave the site as soon as reasonably possible on termination of the contract, the Engineer shall issue a certificate for the value of work done less payments received upto the date of the issue of certificates, 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. If the total amount due to the Employer exceeds any payment due to the Contractor the difference shall be treated as debt payable to the Employer and can be recovered from any amount due or may become due to the contractor.

In the case of termination, works that are pending for the proper completion of the project, shall be carried out by the Employer either by themselves or through any other agency. Any additional expenditure over the value finalized in the contract for any component or for the whole project, incurred by the Employer by the Employer due to such termination, shall become recoverable from the contractor/firm whose contract stands terminated, from the money due or may become due to him/them. 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 Contractor's default

42. Plant etc not to be removed

The plant, tools and materials provided by the contractor/firm shall, from the time they are brought to the site of the works, during the construction and until the satisfactory completion of the contract, shall become and continue to be the property intended for the proper fulfillment of the contract and the contractor/firm shall not remove the same or part thereof without the consent of the Engineer in charge in writing.

43. Contractor not to occupy Land etc.,

In no case shall the contractor/firm continue to use or occupy or allow to be used or occupied any land or property either for the deposit of materials or plant or for any purpose whatever, after written notice from the Engineer in charge served on the contractor/ firm to the effect requiring the contractor/firm to remove or cause to be removed all such materials from any such land or property as aforesaid and to give vacant possession of such land or property to the Engineer in charge. All such notices shall be served through post office or other modes of delivery to the contractor/firm at his/their usual or last known place of business, It is enough for the Engineer in charge to send the notice through any mode of delivery as he may prefer and implement this clause irrespective of the receipt of the notice by the contractor/firm. Should any materials or plant remain upon any such property or land or should any such land or property continue to be occupied or be used after such notice for any purpose whatsoever as aforesaid, then and in every such case and as often as the same shall happen, the contractor/firm shall forfeit and on demand pay to the Employer the charges fixed by the Engineer in charge as and for liquidated and ascertained damages for each and every day during which the said lands or property are so used and occupied as aforesaid from the time of such notice shall have been served.

44. Power Supply

The power supply connection from the TNEB has to be obtained by the contractor himself and the charges thereon shall be borne by the contractor. However, necessary vouchers in original for the payment made to the TNEB shall be produced to the Employer by the contractor which will be reimbursed by the Employer.

45. Completion and Delivery of the Works

The completion and delivery of the works shall be deemed to be full, complete and sufficient only when the Engineer in charge accepts the same and issues a certificate in writing viz. " Certificate of Completion" under the hand of the Engineer in charge to the effect that all the works contracted for and directed to be executed have been completed and are in a sound, water tight, workmanlike and complete and usable condition and the contractor has in the opinion of the Engineer in charge reasonably fulfilled and completed his contract and undertaking except so far as it relates to the maintenance of the works as hereinafter provided. Provided always and notwithstanding anything contained in the contract, it shall be lawful for the Employer to undertaker and execute either departmentally or through other parties at any period during the continuance of this contract, any kind of work, matter or thing whatsoever, which they mat consider necessary or proper to be performed and executed for the purpose of any in connection with any or all of the works under this contract and that without in any way relieving the contractor/firm from any of his/their liabilities and responsibilities under this contract or in any way violating or voiding this contract.

46. Final Certificate

When the works covered under this contract are completed in all respects, the contractor / firm shall submit a request to the Engineer in charge to make a final measurement of the works and take over the whole of the works on behalf of the Employer and issue a final certificate to enable him/them to submit a final bill for payment. The Engineer in charge shall thereupon, unless he records reasons in writing to the contrary, make a final measurement of the works and take them over on behalf of the Employer and sign a certificate purporting to be a last certificate. Nothing in this clause or in the agreement shall prohibit the Employer taking over and using any portion of the works which may be completed prior to the completion of the whole works of this contract.

47. Completion Certificate

The Contractor shall request the Engineer to issue a certificate of Completion of the Works and the Engineer shall issue certificate of completion after satisfactory completion of the works in all respects

48. Taking Over

The Employer shall take over the Site with the works within thirty days after satisfactory completion of the maintenance of the entire project for the stipulated period as contemplated in this contract.

49. Performance Guarantee

The period of guarantee for the entire works shall be **24 months** from the date of completion and commissioning of the project to the satisfaction of the Engineer incharge of the work. This will include the maintenance of the entire project by the firm/contractor for a period of 12 months. If defects are noticed during the guarantee period, the firm/contractor

shall rectify/replace wherever necessary at its/his own cost within 30 days of such intimation. If the contractor/firm fails to carry out rectification within the stipulated time, the rectification works shall be carried out by the Employer at the risk and cost of the contractor/firm and contractor/firm will become ineligible for the payment of the retention amount for the said purpose.

50. Maintenance of the project

The contractor / firm shall successfully maintain the project for the stipulated period from the successful commissioning of the works in this project. **During the period of maintenance, all costs towards Labours, consumables, chemicals, repairs and renewals shall be paid as per BoQ. The electrical energy charges payable to the TNEB during the maintenance period shall be borne by the Employer.**

51. Operating and Maintenance Manual

"As built" drawings and operating and maintenance manuals shall be supplied by the contractor/firm at the time of handing over the completed works at his/their cost

52. Work on Private Property

The contractor/firm shall not commence any work in or upon, under, across of through any land, house building, shed, yard, area, roadway, ground, garden or any other place being private property until authorised in writing by the Engineer in charge to do so.

53. Protection

It will be the responsibility of the contractor to take adequate precautions and protect the adjoining sites against structural, decorative and other damages. The contractor shall be responsible for the safety of the public properties wherever the works are executed. Whenever damages are caused to the adjoining structures, roads, bridges etc due to the execution of this contract, it will be the responsibility of the contractor to restore them to their original level at his cost.

54. Accident or Injury to Workmen

The Employer shall not be liable for or in respect of any damages or compensation payable to any workman or other person in the employment of the Contractor or any Subcontractor. The Contractor shall indemnify and keep indemnified the Employer against all such damages and compensation and against all claims, proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto

55. Risk Insurance

The firm/Contractor shall provide risk insurance at their/his cost against loss or damages to the construction to cover from the start date to the end of the Defects Liability Period, for the following events

- Loss of or damage to the Works, Plant and Materials
- Loss of or damage to Equipment
- Loss of or damage of property (except the Works, Plant, Materials and Equipment) in connection with the Contract and
- Personal injury or death

Policies and certificates for insurance shall be delivered by the Contractor to the Engineer for the Engineer's approval before the Start Date. All such insurance shall provide for compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred. The contractor will not be eligible for any payment on this account.

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

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

56. Care and Risk

From the date of commencement to the date of completion of the work and during the period of maintenance, the contractor shall take full responsibility and care thereof for the safety of the installation connected with the works. Any damage or loss are to be made good at the risk and cost of the contractor and shall ensure conformity in every respect with the requirements of the contract. The contractor shall be liable for any damage to the works occasioned by him in the course of any operation carried out by him for the purpose of completing any outstanding work and the damage so occurred shall be rectified at the cost of the contractor.

57. Safety Provisions

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

1) Suitable scaffolds shall be provided for workers for all 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 handholds shall be provided on the ladder and the ladder shall be given an inclination no steeper than 1\4 to 1 (1\4 horizontal to 1 vertical). IS code for scaffolding and ladders I.S 3696 Part -I and Part II and its latest revisions is to be followed.

2) Scaffolding or staging more than 3.25 meters above the ground or floor swung or suspended from an overhead support or erection with stationary support, shall have guard rail properly attached bolted, braced and otherwise secured atleast 1 metre high above the floor or platform of such scaffolding of staging and extending along the entire length of the outside and ends thereof with only such openings 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 the structure.

3) Working platform, gangways and stairways shall be so constructed that they do not sag unduly or unequally, and if height of a platform or gangways or stairway is more than 3.25 metres above ground level, it shall be closely boarded, having adequate width and be suitably fenced, as described in 2 above. Every opening in floor of a building or in a working platform shall be provided with suitable means to prevent fall of persons or materials by providing suitable fencing or railing with a minimum height of 1 meter. 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 7 metres in length. Width between side rails in a rung ladder shall in no case be less than 30 cm, for ladders, this width shall be increased by atleast 6mm for each additional 30cm length. Uniform steps spacing shall not exceed 30cm.

4) Adequate precautions shall be taken to prevent danger from electrical equipment. No material on any of the sites shall be so stocked or placed as to cause danger or inconvenience to any person or to the public. The Contractor shall provide all necessary fencing and lights to protect public from accidents and shall be bound to bear expenses of defence of every suit, action or proceedings at law that may be brought by any person for injury sustaining, owing to neglect of the above precautions and to any such suit, action or proceedings to any such person or which may with the consent of the Contractor be paid to compromise any claim by any such person.

5) All necessary personal safety equipment as considered adequate by the Engineer shall be available for use of persons employed on the site and maintained in a condition suitable for immediate use and the Contractor shall take adequate steps to ensure proper use of equipment by those concerned.

a) Workers employed on mixing asphalt materials, cement and lime mortars /concrete shall be provided with protective footwear, hand gloves and goggles.

b) Those engaged in handling any materials, which is injurious to eyes, shall be provided with protective goggles.

c) Stone breakers shall be provided with protective goggles and protective clothing.

d) When workers are employed in sewers and manholes, which are in use, the Contractor shall ensure that manhole covers are opened and manholes are ventilated atleast for an hour before workers are allowed to get into them. Manholes so opened shall be cordoned-off with suitable railing and warning signals or boards provided to prevent accident to public.

e) The Contractor shall not employ men below the age of 15 and women on the work of painting with products containing lead in any form. Whenever men above the age of 18 are employed on the work of lead painting the following precautions shall be taken:

i) No paint containing lead or lead products shall be used except in the form of paste of ready-made paint.

ii) Suitable face masks shall be supplied for use by workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scraped.

iii) Overalls shall be supplied by the Contractor to workmen and adequate facilities shall be provided to enable working painters to wash during and on cessation of works.

6) When the work is done near any place where there is risk of drowning, all necessary equipment shall be provided and kept ready for use and all necessary steps shall be taken for prompt rescue of any person in danger and adequate provisions shall be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.

7) Use of hoisting machines and tacks including their attachments, anchorage and supports shall conform to the following:

a) i) These shall be of good mechanical construction, sound material and adequate strength and free from patent defects and shall be kept in good working order.

ii) 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

b) Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years shall be in-charge of an hoisting machine, including any scaffold winch or giving signals to operator.

c) In case of every hoisting machine and of every chain ring hook, shackle, swivel and pulley block used in hoisting machine or lowering or as means of suspension, safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with safe working load. In case of hoisting machine having a variable safe working load and the conditions under which it is applicable shall be clearly indicated. No part of any machine or of any gear referred to above in this paragraph shall be loaded beyond safe working load except for the purpose of testing.

d) In case of departmental machine, safe working load shall be notified by the Engineer. As regards Contractor's machine, the Contractor shall notify safe working load of each machine to the Engineer whenever he brings to the site of work and he shall get it verified by the Engineer.

8) Motors, gearing, transmission, electrical wiring and other dangerous parts or hoisting appliance shall be provided with such means so as to reduce to minimum risk and accidental descending of load; adequate precautions shall be taken to reduce to the minimum 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 shall be provided. Workers shall not wear any rings, watches and carry keys or other materials, which are good conductors of electricity.

9) All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in a safe condition and no scaffold ladder or equipment shall be altered or removed, while it is in use. Adequate washing facilities shall be provided at or near place of work.

10) The safety provision shall be brought to the notice of all concerned by displaying on a notice board at a prominent place at the work spot, persons responsible for ensuring compliance with the safety provision shall be named therein by the Contractor.

11) To ensure effective enforcement of the rules and regulations relating to safety precautions, arrangements made by the Contractor shall be open to inspection by the Engineer or his representative and the inspecting Officer.

12) The Contractor shall obtain prior permission of the competent authority such as Chief of Fire services for the site, manner and method of storing explosives near the site of work. All handling of explosives including storage, transport shall be carried out under the rules approved by the "Explosive Department of the Government".

13) The Contractor shall at his own cost provide and maintain at the sites of works, standard first aid box as directed and approved by the Engineer, for the use of his own as well as the Employer's staff on site.

14) Notwithstanding the above provision 1 to 15 Contractor is not exempted from the operation of any other Act or rules in force relating to safety provisions.

58. Provision of Health and Sanitary Arrangements

The contractor/firm, shall provide at his/their own expenses, first aid appliances and medicines including an adequate supply of sterilized dressing and sterilized cotton wool kept in good order under the charge of a responsible person who shall be readily available during working hours.

Water of good quality fit for drinking purposes shall be provided for the work people on a scale of not less than 15 litres per head per day. Each water supply storage shall be at a distance of not less than 15 metres 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 other sources of pollution, the well shall be properly chlorinated before water is drawn from it for drinking.

Adequate washing and bathing places shall be provided separately for men and women and such places shall be kept in clean and drained condition. Latrines and urinals shall be provided within the precincts of work place and the accommodation separately for each of them shall be at the rate of 2 seats upto 50 persons, 3 seats above 50 persons but not exceeding 100 persons, and 3 seats for every additional 100 persons. The contractor/firm shall employ adequate number of scavengers and conservancy staff to maintain the latrines and urinals in a clean condition.

Two sheds one for meals and the other for rest shall be provided separately for the use of men and women workers and properly maintained.

All the above amenities shall be provided at the contractor's/firm's own expenses besides providing sheds for his/their workmen.

59. Patent Rights

The Contractor shall save harmless and indemnify the Employer from and against all claims and proceedings for or on account of infringement of any patent rights, design trademark or name or other protected rights in respect of any Contractor's Equipment, material or Plant used for or in connection with or for incorporation in the Works and from and against all damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

60. Royalties

Except where otherwise stated, the Contractor shall pay all seignorage and other royalties, rent and other payments or compensation, if any, for getting stone, sand, gravel, clay or other materials required for the Works.

61. Old Curiosities

All old curiosities, relics, coins, minerals and any other item of archeological importance found at the site shall be the property of the Government and shall be handed over to the Engineer in charge for depositing to the Government exchequer. Should any structure be uncovered, the instruction of the Engineer in charge shall be provided before demolition or removal of the structure.

62. Contractor Dying, becoming Insolvent or Insane

In the event of death or insanity of the contractor, the contract may be terminated by notice in writing, pasted at the site and advertised in the issue of the local newspaper. All acceptable works shall thereafter, be paid at appropriate rates after recovering all the contractor's dues to Employer, to the persons entitled to receive and give a discharge for such payments.

In the contractor is imprisoned because insolvent compound with his creditors has a receiving order made against him or carriers on business under receiver for the benefit of the creditors of any of them or being a corporation goes into liquidation or commences to be wound up not being a voluntary winding up for the purpose only of amalgamation or reconstruction, the employer shall be at liberty.

a) To give such liquidator, receiver or other persons in whom the contract may become vested the option of carrying out the contract or a portion there of to be determined by the employer, subject to his providing an appropriate guarantee for the performance of such contractor.
b) To terminate the contract forthwith by notice in writing to the contractor the liquidator, the receiver or person in whom the contract may become vested and take further actions as provided in the clause pertaining to default by contractor, treating as if this termination is ordered under the respective clause.

63. Force Majeure

The works taken by the contractors under the contract shall be at the contractor's risk until the work is taken over by the Executive Engineer. The contractor shall arrange his own insurance against fire, flood, volcanic eruption, earth quake and other convulsions of nature and all other natural calamities, risks arising out of acts of god, Acts of Terrorism, Civil disturbances, Riots during such period and that the TWAD Board/Government shall not be liable for any loss or damages occasioned by or arising out of any such acts of God.

Provided however that the contractor shall not be liable for all or any loss or damages occasioned by or arising out of acts of foreign enemies, invasion, hostilities or war like operations (before or after declaration of war) rebellion military or usurped power.

64. Payment out of Public Funds

The payments to the contractor/firm shall be made out of the funds under the control of the Employer in their public capacity and no member or officer of the Employer shall be personally responsible to the contractor/firm.

65. Bribery and Collusion

In the event of the contractor offering or giving any official of the employer, any gift or consideration of any kind as an inducement or regard for doing, or for bearing to do, any action in relation to obtaining or in the execution of the contract or any other contract with the employer, or for showing favour to any person in relation to the contract or any other contract with the employer, or if any of the such acts shall have been done by any person employed by the contractor or acting on his behalf, either with the knowledge of the contractor or not which are all grounds for the employer to terminate the contract awarded to the contractor. Similarly if the contractor colludes with another contractor or number of contractors whereby an agreed quotation or estimate shall be offered as a bid, that will also form the basis for the employer to terminate the contract.

66. Technical audit

It is a term of this contract that department shall have the right to carry out post payment audit and technical Audit by the Engineers of Technical audit cell (or by an approved consultant of repute). The Technical audit officer shall have the powers to inspect the work or supply running account bill, final bill and other vouchers, measurement books, test reports and other documents either during progress of work or after completion of the same and order recoveries from the contractor for recorded reasons even though the contractor might have been paid earlier. These recoveries are enforceable against the contractor from any amount due to him, from performance security or withheld amounts or any amounts due to the contractor or may become due to him from the department in any work or supply.

67. Settlement of dispute

a. Dispute Redressal Committee

In order to ensure a dispute Redressal mechanism, a Committee headed by the Managing Director / Joint Managing Director and consisting of Engineering Director, TWAD Board and Engineering Director, CMWSS Board as Member, will comprise the " Dispute Redressal Committee" for each package in order to resolve any disputes between the Employer / Engineer - incharge concerned and the contractor

b. Jurisdiction of Court

In the event of non settlement of any dispute by the Dispute Redressal Committee arising between the parties hereto in respect of any matter comprised in the contract, the same shall be settled by a competent court having jurisdiction over the place where the contract is awarded and agreement is concluded and by no other court.

68. Reservation of Right

The Employer reserves the right to accept or reject any or all the bids and to annul the entire process of bidding at any time. Under such circumstances, the Employer will neither be under any obligation to inform the bidders of the grounds for the action of the Employer nor the Employer will be responsible for any liability incurred by the bidder on this account.

SPECIAL CONDITIONS OF CONTRACT

Section - I : Construction period of the contract
Section – II : Operation & Maintenance by the contractor

In Section I of the Works, the Contractor shall, except as stated below, be responsible for the provision of all electricity power, water, gas, consumables, chemicals and other services he may require. In Section II of the Works, the **Contractors shall be responsible for the provision of all water, gas, consumables, chemicals, other services and all spares and tools** not listed in Schedule of Technical Particulars T11 but actually be required for the Works. **The electricity power cost as related to the normal operation and maintenance at Section II of the Works shall be borne by the Employer**. **During the construction and trial run period, EB power has to be borne by the bidder only.** However, the electricity power being used by the Contractor in Section II of the Works to carry out any outstanding pre-commissioning tests, final commissioning tests or to repeat these tests as a result of failure during the 'Test on Completion for Section I of the Works', shall be borne by the Contractor. The cost of water, gas, consumables, chemicals and other services shall be borne by the Contractor, as mentioned above, except when such items are explicitly entered in the Schedule of Prices of the Contract such that the Contractor shall be entitled to obtain reimbursement after they are provided by the Contractor.

Unless otherwise stated in the Conditions of Particular Applications, at each of the two Sections of the Works, monthly progress reports shall be prepared by the Contractor and submitted to the Engineer in six copies. The first report of each of the two Sections shall cover the period up to the end of the first calendar month following the commencement date of that Section. Reports shall be submitted monthly thereafter, each within 7 days after the last day of the period to which it relates.

Reporting shall continue until the Contractor has completed all works in each of the two Sections of the Works, which are known to be minor outstanding at the completion dates stated in each of the Taking-Over Certificate for each of the two Sections of the Works.

Each report in Section II of the Works shall include:

a) Photographs showing status of each equipment, plant, civil structures at all sites of the Works;
b) Logs of all alarms, events, trends that can be obtained in the SCADA System to show the operational status of the Works;
c) Logs to show the maintenance record to all equipments;
d) Logs to show the replacements of damage and defective components of each equipment or the whole equipment of a Plant;
e) Logs to show the attendance records of all the operation and Maintenance staff; and
f) Comparisons between the recommendations from the Operation and Maintenance Manual with the actual maintenance, defective parts replacement records as described in (c) and (d) above.

Contractor's Operations on Site:

Upon the issue of the Taking-Over Certificate for Section I of the Works, the Contractor will be handed over the whole Works by the Employer such that the whole Work will be under possession by the Contractor. The Contractor shall be responsible for all works that are required for possession of the whole Works. Upon the issue of the Taking-Over Certificate for Section II of the Works, the Contractor may retain on Site, during the Defects Notification Period for Section II of the Works, as that are required for the Contractor to fulfill the works under the Contract.

General Design &Obligations :

The requirements to As-Built Documents to Section I and Section II of the Works are described in Part A – General Specification of the Contract. The requirements to Operation and Maintenance Manuals to Section I and Section II of the Works are described in Part A – General Specification of the Contract.

The Contractor shall allocate his operation and maintenance staff at the Works everyday to conduct operation and maintenance work to the Works, in multiple shifts, with details as specified in the Employer's Requirement Facilities for Staff and Labour Save insofar as the Contractor may otherwise provide, the Contractor shall provide and maintain such accommodation and amenities as he may consider necessary for all his staff and labour, employed for the purposes of or in connection with the Contract, including all fencing, water supply (both for drinking and other purposes), electricity supply, sanitation, cookhouses, fire prevention and firefighting equipments, cookers, refrigerators, furniture and other equipments in connection with such accommodation or amenities. On completion of Section I of the Contract, unless otherwise agreed with the Employer, the temporary camps/housing provided by the Contractor shall be removed and the site reinstated to its original condition, all to the approval of the Engineer.

LETTER OF NEGOTIATION

In pursuance of negotiation with the Executive Engineer/Superintending Engineer/Chief Engineer of Division/Circle/Region on

I/We agree to reduce the rates for the items in the BoQ as follows.

Sl.No.	Item No. In the BoQ	Reduced rate/unit

Signature of Contractor

TAMILNADU WATER SUPPLY AND DRAINAGE BOARD

Forwarding Slip to The Lump sum Agreement No.

1. Name of Work :

Estimate Amount :

Sanctioned in Original Estimate No. :

Revised Estimate No. :

2. Name of Contractor and Address :

3. Original or Supplemental :

4. If Supplemental, Original Agreement No. :

5. Approximate value of work :
to be done under this Agreement :

6. If this is Supplemental, approximate value of works to be done under Original Agreement :

7. If bids have been called for, is the lowest tender accepted? :
If not reasons to be recorded

8. Has the contractor; signed the divisional copy of TNBP and Its addenda volume brought upto date. :

9. Is data furnished for all items of works noted in the Schedule :

10. Are the rates in Agreement within the estimate rates or schedule of rates whichever is less and the Lump sum provision sufficient or likely to be exceeded. :

TENDERER CHIEF ENGINEER/TWAD/VELLORE

II. Additional Information

A. Original Agreement

1. Original Agreement amount of tender excess and percentage over the estimate rate. :

2. If concessional rate of EMD & SD have been allowed ref. to sanction thereof :

B. Supplemental Agreement

1. Whether the approval of the competent authority has been obtained for the rates as required as per B.P.Ms.No.27/CMW/ dated 5.2.2002 :

2. If entrusted without tenders whether sanction is necessary with reference to total value of work covered by the supplemental agreement so far accepted. :

TAMILNADU WATER SUPPLY AND DRAINAGE BOARD

Form of Agreement (Lump sum)
Articles of Agreement made this----------

Day of ----------
between Thiru----------

hereinafter referred to as the contractor which expression shall where the context so admits include his heirs, executors, administrators and legal representatives of the one part and the Tamil Nadu Water Supply and Drainage Board (hereinafter called the Employer) which expression shall where the context so admits include its successors in office and assigns) of the other part. Whereas the contractor delivered to the Employer the bid which was opened on ----------whereby the contractor offered and undertook to carryout the works specified under this contract and allied work, i.e. (name of work) ----------

In the State of Tamil Nadu in India, and provide the works, materials matters and things described or mentioned in these presents at the prices set forth in the schedule annexed to such bid and the contractor also undertook to do all extra and varied works which might be ordered as part of the contract on the terms provided for in the conditions and specifications hereto annexed and the Employer accepted such tender in pursuance where of the parties hereto have entered into this contract.

And whereas the contractor in accordance with the terms of the said Bid has deposited in the Office of the ----------Engineer, TWAD,----------as performance security for the due and faithful performance by the contractor of this contract, the sum of Rs.----------(Rupees----------)

And whereas the contractor fully understands that on receipt of communication of acceptance of bid from the accepting authority, there emerges a valid contract between the contractor and the Employer represented by the Officer accepting the agreement and the bid documents, i.e. invitation for bids, letter of application, bill of quantities and other schedules, general conditions of the contract, technical specifications of the bid, negotiation letter, communications of acceptance of bid, shall constitute the contract for this purpose and be the foundation off rights of both the parties, as defined in clause 8.1 of ""Bid Documents "Now hereby agreed that in consideration of payment of the said sum of Rs. (Rupees) or such other sum as may be arrived at under the clause of the General conditions of the contract relating to payment by final measurement at unit prices, the contractor shall and well within the time specified in his bid thoroughly and efficiently and in a good workman like manner perform, provide, execute and do all the works, materials matters of things incidental to or necessary for the entire completion of the works specified under this contract and necessary works including all works shown in the drawings hereinafter referred to or described or set forth the said specifications and schedule hereto annexed and in accordance with such further drawings and instructions as the Engineer of the Board or other Engineer duly authorised in that behalf (therein after) and in the annexed documents

referred to as the Engineer) shall at any time in accordance with the said schedule (Bill of Quantities) and specifications provide and give together, with any alterations in the works or additions thereto, in the time and manner in such schedule (Bill of Quantities) and specifications stipulated to the entire satisfaction of the Engineer, the Employer for themselves and their successors convenient and agree with the Contractor that during the progress of the works and on the completion of contract to the satisfaction of the Engineer, the Employer shall and will from time to time on receiving the certificates in writing of the Engineer pay to the contractor according to such certificates and the terms of this contract the price or sum mentioned in such certificates as due to the contractor under the terms of this contract subject nevertheless to deductions or additions thereto or therefrom which may be lawfully made under terms of his contract. It is hereby mutually agreed and declared as follows.

a) All certificates or notice or orders for items or for extra varied or altered works which are to be the subject of an extra or varied or altered works charge shall be in writing whether so described in the contract or not and unless in writing shall not be valid or binding or be of any effect whatsoever.

b) The term contract include these presents and the invitation for bid, bid documents, bill of quantities and other schedules, general conditions and specifications hereto annexed and the plans drawings herein and hereafter referred to.

c) If the contractor claims that the decisions or the instructions of the Employer are unjustified and that accordingly, he is entitled to extra payments on account thereof he shall forthwith notify this to the Employer to record his decisions and reasons there for in writing and shall within two weeks state his claims in writing to the Employer thereafter. The Employer shall thereafter within four weeks of the receipt of the claim, reply to the points raised in the claim. Unless resolved by negotiation or discussions immediate thereafter, within further four weeks the question of liability for such payment will be treated as a dispute.

d) In the contract whenever, there is as discretion or exercise of will, by the Employer during the progress of the work, the mode or manner of the exercise of discretion shall not be a matter for dispute.

e) The decision of the Employer shall be final conclusive and binding on all, Parties to the Contract upon all questions relating to the meaning of specifications, designs, drawings and instructions, and as to the quality of workmanship or material used on the work or any matter arising out of or relating to the specifications, designs and drawings and instructions concerning the works or the erection of or failure to execute the same arising during the course of works. The above shall not be the subject matter of dispute and in no case shall the work be stopped consequent on such a dispute arising and the work shall also be carried out by the contractor strictly in accordance with the instructions of the Employer.

f) In case any question, difference or dispute shall arise on ,matters other than clauses (d) and (e) above and except any of the “excluded matters” mentioned in bid documents touching the construction of any clause herein contained on the rights, duties and liabilities of the parties hereto or any other way touching or arising out of these presents, the same shall.

Settlement of dispute

i. Dispute Redressal Committee

In order to ensure a dispute Redressal mechanism, a Committee headed by the Managing Director / Joint Managing Director and consisting of Engineering Director, TWAD Board and Engineering Director, CMWSS Board as Member, will comprise the "Dispute Redressal Committee" for each package in order to resolve any disputes between the Employer / Engineer - incharge concerned and the contractor

ii. In the event of non settlement of any dispute by the Dispute Redressal Committee arising between the parties hereto in respect of any matter comprised in the contract, the same shall be settled by a competent court having jurisdiction over the place where the contract is awarded and agreement is concluded and by no other court.

iii. Provided always the contractor shall not except with the consent in writing of the Engineer in any way, delay carrying out works in any such matter, question or dispute being referred to court but shall proceed with the works with all the diligence and shall until the decision of the Employer and no award of Competent Civil Court shall relieve the contractor of his obligations to adhere strictly to the instructions of the Engineer with regard to the actual carrying out of the works.

d) Time shall be considered as essence of the contract and the contractor hereby agree to commence the work immediately after taking over of site or signing the agreement whichever happens earlier, complete the work within **Thirty six** months and to show progress at the stipulated milestone.

In witness where of the contractor and the Employer on behalf of the Board have caused their common seal to be affixed the day and year first above written Signed, sealed and delivered by the said.

In the presence of

Signature of Contractor

Name and Seal.

Signature, Name and

Designation of Witness.

Signed by on behalf of
TWAD Board.

Signed, Name and
Designation of Witness

CHIEF ENGINEER
TWAD BOARD,VELLORE.

INDEMNITY BOND

This deed of indmnity bond executed at (place) on this Day of (month) year by and between Thiru/Tmt. (Name) widow/Wife/Son/Daughter of Thiru / Tmt residing at

(Full Address) (hereinafter called "Contractor" which expression unless excluded by or repugnant to the context include his/her heirs, executors administrators and legal representatives) to and in favour of the TWAD Board (hereinafter called" the Engineer, which expression shall unless excluded by or repugnant to the context include its successor and assigns) represented by the **Superintending Engineer of / TWAD Board/ Sewerage Circle, Tindivanam. Executive Engineer, TWAD Board, RWS Division, Kallakurichi,** Assistant Executive Engineer of sub division (Place) shown as follows.

2. Whereas the contractor has submitted the bid for **Providing UGSS to Tindivanam Municipality in Villupuram District for implementation of Collection system and allied works - Execution period – 36 months, Trial run period – 6 months and maintenance of the scheme – 12 months** and such bid has been accepted subject to the relevant conditions to contract appended to Tamil Nadu Building Practice and other conditions issued along with bid documents.

3. And where as in pursuance of the terms of contract, that a sum equal to $2^1/_2$% of the total value of work done have been retained with the Employer for a period of two years reckoned from the date of completion of the work in order to enable the departmental officers to watch the effect of all seasons on the work and the structural stability of the work executed by the contractor.

4. And whereas it was decided to refund the said sum equal to $2^1/_2$% of the total value of the work done retained with the Employer on the expiry of two years period reckoned from the date of completion of work provided that the contractor execute an indemnity bond for a period of three years indemnifying the Board against any loss or expenditure incurred to rectify any defect noticed due to the faulty workmanship by the contractor or substandard material used by the contractor during the period of three years.

5. Now this deed of indemnity witness that in consideration of the contract entrusted to the contract or by the Employer, the contractor has agreed to the following terms and conditions and executed this indemnity bond in conformation of all and undertakes to comply with the terms referred to infra.

6. The contractor both hereby indemnify the Employer against any loss or damage that may be caused to the Employer in respect of rectification of any defect noticed due to the faulty workmanship by the contractor, or substandard material so used by other contractor in the execution of work entrusted to the contractor during the period of three years i.e. from up to (dates to be specified)

7. It is hereby confirmed that in all other respects, the agreement conditions will be binding between the parties.

In witness whereof Thiru / Tmt / Miss Contractor has signed this deed on this day of month

year.

Witness:

TENDERER CHIEF ENGINEER/TWAD/VELLORE

INDEMNITY BOND

(In lieu of water tightness and structural stability)

To accompany the Lump sum agreement No.

This deed of Indemnity made this day of between Thiru S/o (hereinafter called contractor "which expression shall unless excluded by or repugnant to the context include his heir/executors, administrators and legal representatives) and in favour of the Tamil Nadu Water Supply and Drainage Board (hereinafter called the Employer which expression shall unless excluded by or repugnant to the context include its successors and assigns) represented by the Superintending Engineer of / TWAD Board / Sewerage Circle, Tindivanam. Executive Engineer, TWAD Board, RWS Division, Kallakurichi, Assistant Executive Engineer concerned Sub division as follows:

Whereas the contractor agreed to construct construction of …….. capacity service reservoir …… staging height including pipe connections as per departmental plan and designs under Water supply improvement scheme Rs. (Rupees) as per Lump Sum Agreement No. /and two of the conditions of the said agreement are:

1. That the contractor should produce a water tight structure and guarantee its water tightness for two years as per clause in Form in General conditions of contract, definitions and interpretations.

2. That in lieu of the 40% (Forty present) of the amount of each bills scheduled to be withheld from the payment and kept with the Employer with security deposit till the expiry of the above guarantee period and till a certificate of soundness of structure is furnished by **the Executive Engineer, TWAD Board, RWS Division, Kallakurichi** the contractor has agreed to execute an Indemnity bond vide clauses in Form in General conditions of contract, definitions and interpretations of Lump Sum Agreement No.

And whereas the Employer has agreed to accept a deed of Indemnity from the contractor in lieu of 40% (Forty percent) of the amount of each bill to be withheld from payment.

Now these present witness that in pursuance of the above said agreement and for the consideration above said, the contractor hereby agrees with the Employer that he will at all times indemnity and keep harmless of the Employer as a result of the failure of the contractor to remedy or to replace any failure or defects in the water tight structure for a period of two years from the date of commissioning which includes maintenance period of one year.

The contractor further agree with the Employer that on receipt of the report of the Engineer in charge about any failure or defects noticed in the structure within a period of two years from the actual date of commissioning and handing over to the Employer after maintenance for one year, a joint inspection has to be made immediately by the Engineer of the contractor and the Engineer in charge of water supply scheme and if in the opinion of the **Executive Engineer, TWAD Board, RWS Division, Kallakurichi.**

the failure or defects noticed are due to the defects in the structure (construction) the contractor undertakes to rectify or replace immediately the structure at contractor's cost and the contractor agrees to extend the guarantee period for two more years from the date of rectification of the defects.

The contractor further agrees with the Employer that in the case of any dispute arising between the contractors on one hand and the Executive Engineer, TWAD Board RWS Division, Thiruvallur on the other hand as to any matter relating to the defects or failure noticed in the structure and the contractor's guarantee for water tightness for a period of two years from the accepted date of completion of the structure as indicated above such dispute shall be referred to the Chief Engineer, TWAD Board, Vellore – 6 whose decision shall be final. In witness whereof Thiru

S/o

District and the Chief Engineer / Superintending Engineer / Executive Engineer, Tamil Nadu Water Supply and Drainage Board acting on behalf of the Tamil Nadu Water Supply and Drainage Board have hereunto set their hands on the day and the year first written above.

PERFORMANCE BANK GUARANTEE (UNCONDITIONAL)

To

The Executive Engineer,

TWAD BOARD,

RWS Division,

Kallakurichi.

---------- (Name of Employer)

----------(Address of Employer)

WHEREAS————————————————(name and address of contractor)

(hereinafter called" the contractor" has undertaken, in pursuance of contract No.----------

----

Dated ———————— to execute----------

(name of contract and brief description of works) hereinafter called " the contract*"

AND WHEREAS it has been stipulated by you in the said contract that the contractor shall furnish you with a Bank Guarantee by a recognised bank for the sum specified therein, as security for compliance with his obligations in accordance with the contract.

AND WHEREAS the contractor has requested us to give the Bank Guarantee

AND WHEREAS we have agreed to give the contractor such a Bank Guarantee unconditionally and irrevocably to guarantee as primary obligator and not as mere surety, all the payments to the

----

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the contractor, upto a total of ———————————— (amount of Guarantee) ——— ————————————————————————————— (amount in words such sum being payable in the types and proportion of currencies in Which the contract price is payable, and we undertake to pay you unconditionally and Irrevocably upon your first written demand and without cavil or argument, any sum or Sums within the limit of ———————————(amount of Guarantee) as aforesaid Without you needing to prove or to show grounds or reasons for your demand for the Sum specified therein.

We hereby waive the necessity of your demanding the said debt from the contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the contractor or of the Works to be performed there under or of any of the contract documents which may be made between you and the contractor shall in any way release as from the liability under this guarantee and we hereby waive notice of any such change, addition or modification.

The Bank Guarantee is drawn at ——————————branch of—-————————-———-bank in -—————————-—-Town in Tamil Nadu only.

This guarantee shall be valid until 28 days from the date of expiry of the defects liability period. '

SIGNATURE AND SEAL OF THE GUARANTOR

Name of Bank ——----------

Address ——————————————

——————————————

Date ——————————

BID SECURITY (BANK GUARANTEE)

WHEREAS, _____ *[name of Bidder]* (hereinafter called "the Bidder") has submitted his Bid dated _____ *[date]* for the construction of _____*[name of Contract]* (hereinafter called "the Bid").

KNOW ALL PEOPLE by these presents that We _____ *[name of bank]* of _____ having our registered office at _____ (hereinafter called "the Bank") are bound unto _____*[name of Employer]* (hereinafter called "the Employer") in the sum of _____[1] for which payment well and truly to be made to the said Employer the Bank binds itself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this _____ day of _____ **2020 .**

THE CONDITIONS of this obligation are:

1) If after Bid opening the Bidder withdraws his bid during the period of Bid validity specified in the Form of Bid;

or

2) If the Bidder having been notified of the acceptance of his bid by the Employer during the period of Bid validity:

(a) fails or refuses to execute the Form of Agreement in accordance with the Instructions to Bidders, if required; or
(b) fails or refuses to furnish the Performance Security, in accordance with the Instruction to Bidders; or
(c) does not accept the correction of the Bid Price pursuant to Clause 28.2;

we undertake to pay to the Employer 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 Employer will note that the amount claimed by him is due to him owing to the occurrence of one or any of the three conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date _____[2] days after the deadline for submission of Bids as such deadline is stated in the Instructions to Bidders or as it may be extended by the Employer, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this guarantee should reach the Bank not later than the above date.

DATE _____ SIGNATURE OF THE BANK

WITNESS _____ SEAL _____

[signature, name, and address]

_____

1 The Bidder should insert the amount of the guarantee in words and figures denominated in Indian Rupees. This figure should be the same as shown in Clause 16.1 of the Instructions to Bidders.

2 45 days after the end of the validity period of the Bid.

BILL OF QUANTITIES

(To be furnished separately as Price Bid)

General

The Bill of Quantities shall contain items for the construction, installation, testing, commissioning and maintenance of the Works to be carried out by the Contractor

The Bill of Quantities will be used to calculate the Contract Price. The contractor shall be paid for the quantum of work done at the rate quoted for each item in the Bill of Quantities.

Where there is a discrepancy between the rates in words and figures , the lesser of the two will only be taken into consideration.

Where there is a discrepancy between the unit rate and line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern.

Where there is an arithmetical discrepancy in the page total as well as grand total, the corrected total by the Employer will govern

The rates quoted in the BOQ shall be for carrying out the work in conformity to the BIS, TNBP and Technical Specifications and other Terms and Conditions set out in the Bid Document

All pages in the BOQ should be signed without omission. All corrections/over writing should be properly attested by the Bidder.

Change in the Quantities

If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item/items, the rates as in the agreement for the relevant items shall be paid.

GST :

GST is applicable as per G.O. 296, Finance (Salaries) Dept. Dt. 09.10.2017, GOI, Ministry of Finance - Central Tax (Rate), New Delhi Notification No. 12/2017 / Dt: 28.06.2017 and 20/2017/ Dt. 22.08.2017 and as amended from time to time.

From every payment made to the firm/ contractor, deduction at source towards GST shall be made for civil works contract as per Government of India, Ministry of Finance/ Department of Revenue, New Delhi Notification No. 20 / 2017 – Central Tax (Rate) / Dt.22.08.2017 subject to issue of amendments from time to time.

Name of Work:

Providing UGSS to Tindivanam Municipality in Villupuram District for implementation of Collection system and allied works - Execution period – 36 months, Trial run period – 6 months and maintenance of the scheme – 12 months.

Item. No.	Description of Item of Work	Probable Quantity Figures	TNBP NO & other Specification	Units	Rates in		Amount in figures.
					Figures	Words	

TAMIL NADU WATER SUPPLY AND DRAINAGE BOARD

TECHNICAL SPECIFICATIONS

Name of work :-

Providing UGSS to Tindivanam Municipality in Villupuram District for implementation of Collection system and allied works - Execution period – 36 months, Trial run period – 6 months and maintenance of the scheme – 12 months.

Last date of submission: Upto 3:00 PM on 01.06.2020

Technical Specifications

Index

I. SCOPE OF WORK

UGSS TO TINDIVANAM MUNICIPALITY IN VILLUPURAM DISTRICT

1 INTRODUCTION

Tamil Nadu Water Supply and Drainage Board (TWAD Board) has been directed to take up the investigation works and preparation of Detailed Project Report (DPR) for providing Under Ground Sewerage Scheme for Tindivanam Municipality in Villupuram District vide The Commissioner of Municipal Administration, Chennai Lr.No. 47718/2013/UGSS-2/dt.19.02.2019 and Municipal council resolution No. 453,dt.28.02.2019.

Tindivanam is a Grade -I Municipality in Villupuram District . The town is spreaded over an area of 22.33 sq.km and divided into 33 wards. It lies on the Chennai – Trichy National Highway (NH 45) at a distance of 120 Kms south of Chennai. The town lies at 12° 15' Northern latitude and 79° 39' Eastern longitude. This town is a commercial centre dealing with agriculture and food products.

At present Tindivanam Municipal town is not provided with underground sewerage system and the house hold sewage/ Sullage water is collected through open drains available for 64.436 km having its discharge in the low lying area inside the town. The drain out falls pollute the existing water bodies causing environmental pollution and health hazard to public. Government is therefore committed to protect the people with good sanitation & Hygienic facility by implementing underground sewerage system. The Investigation works include topographical surveys, sample collection, analysis of existing system, design of new system, cost estimates, financial analysis and preparation of Project report. Accordingly, the Executive Engineer, Project Formulation Division, Tindivanam started the Investigation work in the month of July'2019

2 DATA COLLECTION:

The basic requirement for preparation of Detailed Project Report is survey work and Data Collection. Following information was collected for UGSS to added areas of Villupuram Municipality from the Revenue officials of concerned village and Municipal office, Villupuram

1. Comprehensive development and report.
2. Existing and proposed land use plan and details.
3. Existing ward boundaries and ward wise population.
4. Existing water supply arrangements.
5. Existing drainage facilities in the town.
6. Topo Sheet of the Project area.
7. Land availability for UGSS infra structures.

The data is useful for the design of UGSS to Tindivanam Municipality in Villupuram District.

3 SURVEY ACTIVITIES:

Field survey activities were started by PF Sub Division, Tindivanam from July ’2019. The GTS bench mark is located on the top of the rail in Tindivanam Railway station with a value of (+)44.00 m was considered as the reference bench mark. Temporary bench marks were established in the permanent structures like temples, buildings, parapet of culverts and 60 bench mark stones were erected in various areas of town for field reference during execution of project.

For carrying out the survey, the town was divided into 10 Zones. All the Zones were surveyed by well experienced teams. The teams are batched into two groups and started the work from Tindivanam Railway station. The Survey work was completed by September’ 2019. The DPR for UGSS system taken up in Nine Zones and one Zone namely Rajeswari Nagar and allied areas is proposed under Septage Management under technical guidance of TNUIFSL. There by finalising the UGSS project with 9 Zones.

6 PROPOSED SYSTEM:

The proposed UGSS Scheme is designed for the ultimate stage i.e. year 2052. The Sewerage work is divided into the following six categories and described subsequently.

1. House connections and local sewerage.
2. Main and trunk sewers.
3. Pumping station.
4. Pumping main.
5. Pump set.
6. Sewage Treatment plant

7 MAIN AND TRUNK SEWERS:

Considering the terrain, topography, NHAI, Railway lines and crossings etc. in the added areas of Tindivanam Municipality, the areas are divided into 9 zones. Collection system with trunk sewer for 9 Zones have been designed to collect waste water generation from House hold of respective zones. The collected sewage will be received by gravity system to respective collection wells.

The sewage is then lifted and conveyed through the pumping mains to Sewage treatment plant for final treatment. The design period of the scheme is 30 years(i.e. 2052). Though the system is designed for ultimate period of 30 years, the STP and Pumping station units were designed for intermediate year.

As per Municipal town records, the number of House hold assessment is found to be 19230 of which domestic and Non domestic HSC connection were 16474 Nos and 2756 Nos respectively. The scheme will be executed by TWAD Board as resolved by Municipality and will be handed over to the Commissioner, Tindivanam Municipality on completion of O & M period.

Description	Zone I	Zone 2	Zone 3	Zone 4	Zone 4A	Zone 4B	Zone 5	Zone 6	Zone 6°
Wards Coverage details (Total wards:33)	10Part, 14Part & 27 to 32	24, 25 & 26	1Part, 2 to 8, 9Part, 10Part, 11, 13 & 33	17,18, 19Part, & 20Part	9Part, 12Part & 15	16Part	16Part & 20 Part	19Part, 21, 22 & 23	23Part
Population(2011)	18320	6919	22473	5725	4469	567	6283	6720	1114
Base year(2022)	21161	7992	25959	6613	5162	655	7257	7762	1287
Intermediate year(2037)	25033	9455	30715	7823	6107	776	8585	9183	1523
Ultimate year(2052)	28908	10919	35467	9035	7051	894	9914	10605	327
Sewer size	200mm UPVC, 250mm to 300mm DWC and 200 to 450mm CI								
No. of Manholes (7018)	1583	651	1845	371	267	141	1092	699	121
Length of sewer (165889 m)	42644	14282	45841	8834	6426	3244	25132	16639	2847
Depth range	0.8- 6.0m	0.8-6.2m	0.8-6.5m	0.8- 6.0m	0.8- 4.6m	0.8- 6.7m	0.8- 6.3m	0.8- 6.0m	0.8- 6.0m
Average discharge(LPS)	38.43	14.58	47.22	12.04	9.38	1.16	13.19	14.12	2.31

8 PUMPING STATION:

The capacity of collection well has been determined by adopting detention time of 1 minute, 1 minute and 5 minutes for screen well, Grit well and Collection well respectively. While designing the quantity of inflow carrying in the collection well of pumping station for design year, it is observed that there is no significant difference in the flow developed between intermediate stage of 2037 (11.44 mld) and ultimate stage of 2052(13.21 mld) respectively. Hence the capacity of collection well is designed by considering the flow conditions at ultimate stage.

The Salient features of the proposed pumping station are presented below.

1)Sub Pumping Station 1 at Zone 1

Type : Circular RCC Collection well with screen well and Grit well.

Pump type	:	Submersible Non-Clog
Pump configuration	:	3 Nos 1 DWF 1999 lpm x 19m head
Screen Well Dimensions	:	4.00 m dia & 6.32 m depth
Grit well Dimensions	:	3.50 m dia & 7.42 m depth
Collection well Dimensions	:	5.00 m dia & 8.70 m depth
Diameter to incoming sewer	:	450 mm dia
IL of Incoming Sewer	:	36.665m
FSL	:	35.915m
FVL		34.375m
Bottom R.L.	:	34.135m
SWD	:	1.54m
Pump room.	:	5m x 4m

2) Sub Pumping Station 2 at Zone 2

Type : Circular RCC Collection well with screen well and Grit well.

Pump type	:	Submersible Non-Clog
Pump configuration	:	3 Nos 1 DWF 755 lpm x 29 m head
Screen Well Dimensions	:	3.50 m dia & 5.76 m depth
Grit well Dimensions	:	3.00 m dia & 5.50 m depth
Collection well Dimensions	:	5.00 m dia & 7.00 m depth
Diameter to incoming sewer	:	300 mm dia
IL of Incoming Sewer	:	33.171m
FSL	:	32.651m
FVL	:	31.531m
Bottom R.L.	:	31.281m
SWD	:	1.120m
Pump room.	:	5m x 4m

3) Sub Pumping Station 3 at Zone 3

Type : Circular RCC Collection well with screen and Grit well.

Pump type	:	Submersible Non-Clog
Pump configuration	:	3 Nos 1 DWF
		5207 lpm x 25m head
Screen Well Dimensions	:	7.50 m dia & 4.85 m depth
Grit well Dimensions	:	5.50 m dia & 6.10 m depth
Collection well Dimensions	:	7.50 m dia & 7.66 m depth
Diameter to incoming sewer	:	400 mm dia
IL of Incoming Sewer	:	39.552m
FSL	:	38.652m
FVL	:	36.892m
Bottom R.L.	:	36.592m
SWD	:	1.760m
Pump room.	:	5m x 4m

4) Sub Pumping Station 4 at Zone 4

Type : Circular RCC Collection well with screen well and Grit well.

Pump type	:	Submersible Non-Clog
Pump configuration	:	3 Nos 1 DWF
		2165 lpm x 32m head
Screen Well Dimensions	:	5.00 m dia & 3.57 m depth
Grit well Dimensions	:	3.50 m dia & 4.85 m depth
Collection well Dimensions	:	6.00 m dia & 5.98 m depth
Diameter to incoming sewer	:	400 mm dia
IL of Incoming Sewer	:	30.825m
FSL	:	29.895m
FVL		28.565m
Bottom R.L.	:	28.265m
SWD	:	1.33m
Pump room.	:	5m x 4m

5) Sub Pumping Station 5 at Zone 5

Type : Circular RCC Collection well with screen well and Grit well.

Pump type	:	Submersible Non-Clog
Pump configuration	:	3 Nos 1 DWF
		686 lpm x 11m head
Screen Well Dimensions	:	3.00 m dia & 6.10 m depth
Grit well Dimensions	:	2.50 m dia & 6.98 m depth
Collection well Dimensions	:	4.50 m dia & 7.58 m depth
Diameter to incoming sewer	:	300 mm dia
IL of Incoming Sewer	:	30.729m
FSL	:	30.099m
FVL		29.349m
Bottom R.L.	:	29.099m
SWD	:	0.75m

Pump room. : 5m x 4m

6) Sub Pumping Station 6 at Zone 6

Type : Circular RCC Collection well with screen well and Grit well.

Pump type	:	Submersible Non-Clog
Pump configuration	:	3 Nos 1 DWF
		855 lpm x 16m head
Screen Well Dimensions	:	3.50 m dia & 5.10 m depth
Grit well Dimensions	:	2.50 m dia & 6.19 m depth
Collection well Dimensions	:	4.00 m dia & 7.17 m depth
Diameter to incoming sewer	:	300 mm dia
IL of Incoming Sewer	:	28.326m
FSL	:	27.576m
FVL		26.396m
Bottom R.L.	:	26.096m
SWD	:	1.18m
Pump room.	:	5m x 4m

1) Lift Station 1 at Zone 4A

Type	:	Circular RCC Collection well.
Pump type	:	Submersible Non-Clog
Pump configuration	:	2 Nos 1 DWF
		1100 lpm x 23 m head
Collection well Dimensions	:	3.00 m dia & 6.50 m depth
Diameter to incoming sewer	:	250 mm dia
IL of Incoming Sewer	:	35.814m
FVL	:	34.414m
Bottom R.L.	:	33.874m
SWD	:	1.400m
Pump room.	:	4m x 3m

2)Lift Station 2 at Zone 4B

Type	:	Circular RCC Collection well.
Pump type	:	Submersible Non-Clog
Pump configuration	:	2 Nos 1 DWF
		124 lpm x 11 m head
Collection well Dimensions	:	3.00 m dia & 7.00 m depth
Diameter to incoming sewer	:	200 mm dia
IL of Incoming Sewer	:	35.702m
FVL	:	34.746m
Bottom R.L.	:	34.086m
SWD	:	0.960m
Pump room.	:	4m x 3m

3)Lift Station 3 at Zone 6A

Type	:	Circular RCC Collection well.
Pump type	:	Submersible Non-Clog
Pump configuration	:	2 Nos 1 DWF 244 lpm x 13 m head
Collection well Dimensions	:	3.00 m dia & 6.50 m depth
Diameter to incoming sewer	:	200 mm dia
IL of Incoming Sewer	:	31.296
FVL	:	30.496
Bottom R.L.	:	29.916
SWD	:	0.80m
Pump room.	:	4m x 3m

8) **Lift Man Holes :- 4 Nos.**

1.**LMH No.529 in Zone 1**

Collection Well 2.50m Dia / 7.50 m Depth

1DWF 2.50pm x 10m (3 HP) - 2Nos

2.LMH No.1113 in Zone 1

Collection Well 2.50m Dia / 8.00 m Depth

1DWF 600 lpmx11m (4 HP) -2Nos

3.LMH No. 1010 in Zone 6

Collection Well 2.50m Dia / 7.50 m Depth

1DWF 308 lpmx 10m (2 HP) -2Nos

4.LMH No.1674 in Zone 6

Collection Well 2.00m Dia / 8.30 m Depth

1DWF 300 lpmx10m (2 HP) -2Nos

Pump room. : 4m x 3m

9) <u>PUMPING MAIN:</u>

Pumping mains are designed by taking into consideration of achieving self cleaning velocity of 0.6m/s at minimum flow condition. The velocity of sewage in the pumping main is restricted to 2.2m/s under peak flow conditions. Sizes of 150 mm to 600 mm CI pipes are proposed for pumping main in the Scheme

While designing the size of pumping main an attempt is made to adopt economical analysis of rising main for determining the diameter of the delivery pipe. Minimum of 150mm dia CI pipe is proposed for pumping main for Lift stations/Lift Manholes.

Pumping main 1

The pumping main 1 carries the sewage collected from SPS 1 of Zone 1 located at Avarapakkam to SPS – 3 of Zone 3 located at Theerthakulam through 300 mm dia CI LA CL pipe to a length of 1100m.

Pumping Main 2

The pumping main 2 carries the sewage collected from SPS – 2 of Zone 2 located at Agalikulam to SPS – 3 of Zone 3 located at Theerthakulam through 200 mm dia CI LACL pipe to a length of 2200m.

Pumping main 3

The pumping main 3 carries the sewage collected from SPS -3 of Zone – 3 located at Theerthakulam to STP at Salavathi through 500 mm dia CI LACL pipe to a length of 1300m.

Pumping main 4

The pumping main 4 carries the sewage collected from SPS-4 of Zone 4 located at Wahab Nagar to STP at Salavathi through 350mm dia CI LA pipe to a length of 4100m.

Pumping main 5

The pumping main 5 carries the sewage collected from Lift Station – 1 of Zone 4A located at Thillai Nagar to STP at Salavathi through 150mm dia CI s/s LA pipe to a length of 2260m.

Pumping main 6

The pumping main 6 carries the sewage collected from Lift Station 2 of Zone 4B located at TMG Nagar to MH 3357 of Zone -4A located at Thillai Nagar through 150mm dia CI s/s LA pipe to a length of 250m.

Pumping main 7

The pumping main 7 carries the sewage collected from SPS 5 of Zone 5 located at Indira Nagar to the SPS – 4 of zone – 4 Collection well directly located at Wahab Nagar through 200mm dia CI s/s LA pipe to a length of 2000m.

Pumping main 8

The pumping main 8 carries the sewage collected from SPS 6 of Zone 6 located at Ventkateswara Nagar to the MH 67 of Zone – 4 located at Wahab Nagar through 200mm dia CI s/s LA pipe to a length of 900m. .

Pumping main 9

The pumping main 9 carries the sewage collected from Lift Station 3 of Zone 6A, located at Vinayagar Nagar to the MH 1673 of Zone – 6 located at Venkateswara Nagar through 150mm dia CI s/s LA pipe to a length of 450m.

Pumping main for Lift Man holes-4 Nos.

Pumping main of 150mm CI LA class pipe of 50 m length is proposed for each Lift Manhole. Total length proposed for 4 lift man holes is 200m (4Nosx50m =200m)

Where ever topography levels permit, arrangements has been made to discharge sewage through MH of successive zones. The sewage thereon will be flowing though gravity up to collection well. In these cases, Bell Mouth Receptor chamber has been proposed to dissipate turbulent flow into laminar flow and also to overcome surge condition during peak flow hours.

10) <u>Repairs and Maintenance</u>:

The Annual repairs and maintenance cost is mainly dependent on the type of Mechanical and Electrical equipments used in the Sewerage scheme. Generally, these include the pumps diesel generating sets, L.T. Control panel etc. in pumping station and Mechanical accessories used in treatment plants.

Tools such as crimping tools, soldering, brazing and usual test equipments such as AVO meter, megger, tong tester, vibrator tester, tachometers should be available. To rectify pump set failure in all pumping stations / Lift stations / LMHs necessary lifting arrangements are required. Hence to over come the issue, chain pully blocks are provided in order to set right the functioning of pump set at all times. All pumping stations are provided with adequate safety gadgets etc., (usually procured along with pumping equipments and electrical accessories).

11) Phasing of Project: It is proposed to take up the project in single phase for implementation and completion for the beneficial use of the public. The project is proposed

to be implemented within a period of 36 months followed with 6 months trial run period. O&M of scheme will be made for a period of 12 months for Collection System. The charges towards EB will be borne departmentally.

II. GENERAL SPECIFICATIONS

1. Contractor's Responsibility

The information given hereunder and provided elsewhere is given in good faith but the Contractor shall satisfy himself regarding all aspects of site conditions and no claim whatsoever will be entertained on the plea that information supplied by the Engineers is erroneous or insufficient.

2. Construction Water

The Contractor shall make his own arrangement for the fresh water required for the manufacturing of the pipes, construction of civil works and testing of pipeline as well as for the potable water required for his factory & labour camps.

3. Construction Power

The Contractor shall make his own arrangement for supply of electrical energy required at his sites and the works from the Tamil Nadu Electricity Board.

The Contractor is forewarned that there can be interruptions in power supply for reasons beyond the control of the Tamil Nadu Electricity Board and therefore the Contractor is advised to make his standby arrangement to provide and maintain all essential power supply for his work area at his expense. The Contractor shall not be entitled to any compensation for any loss or damage to his machinery or any equipment or any consequential loss in progress of work and idle labour.

4. Survey

The Contractor shall, at his own expense provide and maintain survey stations which he may require to carry out the works and shall remove the same on completion of the works. The Contractor shall, at his own expense, carry out all the necessary surveys, measurements and setting out of the works and shall for this purpose engage qualified and competent engineering surveyors whose names and qualifications shall be submitted to the Engineer for his approval.

The Contractor shall for the purpose of checking the survey and setting out, provide to the Engineer all the assistance, which he may require. The surveyor shall be selected having appropriate experience and as far as possible, the same surveyor shall be provided throughout the contract period. Before commencing any work at any locations, the Contractor shall give the Engineer not less than two days notice of his intention to set out or give levels for any part of the work in order that arrangements may be made for inspection. The Contractor shall provide for the sole use of the Engineer and his staff, all necessary survey instruments and other equipment and all technicians, labour and attendants which the Engineer may require for checking the setting out and marking of the works. The Contractor shall maintain in good working order at all time during the period of contract the instruments provided by him, for the proper setting out of the works. The Contractor shall make available at his own expense, any poles, staging templates.

5. Temporary Fencing

The Contractor shall, at his own expense, erect and maintain in good condition temporary fences and gates along the boundaries of the areas assigned, if any, to him by the Employer for the purpose of the execution of the works.

The Contractor shall, except when authorized by the Engineer, confine his men, materials and plant within the site of which he is given possession. The Contractor shall not use any part of the site for purposes not connected with the works unless prior written consent of the Engineer has been obtained. Access shall be made to such areas only by way of approved gateways.

6. Return Of Labour And Plant

The Contractor shall supply to the Engineer by 9 a.m. every working day a return of the men employed by him and his sub-contractors on the previous working day and all of the work on which they were engaged specifying also the number employed in each trade. He shall also supply monthly any other returns which may be required as to the number of men and constructional plant employed and the nature and type of the work done.

7. Sanitary Facilities

The Contractor shall provide and maintain in a clean and sanitary condition adequate W.C.'s and wash places which may be required on the various parts of the site for use of his employees, to the satisfaction of the Engineer. The Contractor shall make all arrangements for the disposal of sewage or drainage in accordance with the directions of the Engineer.

8. Restricted Entry To Site

The Contractor shall get the prior permission of the Engineer before any person not directly connected with the works visits the site.

9. Existing Services

Drains, pipes, cables, overhead electric wires and similar services encountered in the course of the works shall be guarded from injury by the Contractor at his own cost, so that they may continue in full and uninterrupted use to the satisfaction of the Employer and the Contractor shall not store materials or otherwise occupy any part of the 'site' in a manner likely to hinder the operation of such services. Should any damage be done by the Contractor on any mains, pipes, cables or lines (whether above or below ground), whether or not shown on the drawings, the Contractor must make good or bear the cost of making good the same without delay to the satisfaction of the Engineer and of the Employer.

10. Local Roads and Haul Roads

The approach roads and other public roads in the state may be used by the Contractor to haul construction materials and equipment subject to restriction of load carrying capacity on the roads in particular over bridges and culverts. However, the Contractor will have to pay customary vehicles license and permit fees for use of public roads.

The Contractor shall plan transportation of construction materials to site in such a way that road accidents are avoided.

11. Permission for Road Cuts

Wherever the Contractor considers that it is necessary to cut through an existing road or track he shall submit details to the Engineer for approval, a minimum of seven days before such work commence.

In the event of cutting a road by the Contractor without permission from the Engineer the Contractor shall pay compensation as claimed by the owner of the road until it is restored at the cost of the erring Contractor.

Trench Digging:

Digging of trench by the Contractor beyond the length than that is specified by the Engineer shall invite a fine of Rs.500/- per day till such time the damage is restored.

12. Temporary Diversion of Roads

During the execution of the works the Contractor shall make at his cost all necessary provision for the temporary diversion of roads, cart-tracks, footpaths, drains, water courses, channels etc., Should he fail to do so, the same shall be done by the Engineer and the cost thereof will be recovered from the Contractor.

13. Notice to Telephone, Railways & Electricity Supply Under Takings / Depts., etc.

The Employer shall deposit an amount to the respective local bodies/Highways department for restoration of road surface after completion of pipe laying work. The Employer shall obtain general permission to cut the road.

Before commencing operations the Contractor has to obtain specific permission from local bodies/Highways Department when he wants to cut any section of the road. Where operations involve cutting of roads, shifting utilities etc. during the process of work, the Contractor shall also give notice to the concerned authorities viz. the panchayats /the Municipalities, the Railway department, the Electricity Board, Telegraphs department, the Traffic department attached to the police and other departments or companies as may be affected by the work. The notice should identify the specific details so that the necessary diversion of traffic may be arranged and permissions obtained. The Contractor shall co-operate with the department concerned and provide for necessary barricading of roads, protection to existing underground cables etc. met with during the excavation of trenches. The Contractor shall provide at his own expenses watching and lighting arrangements during day and night and erect required notice board such as “Caution Road closed for Traffic” etc. He should also provide and maintain at his own cost the necessary supports for underground cables etc. to afford best protection to them in consultation with the authorities in-charge of the properties and to their best satisfaction. The Contractor has to make necessary arrangements to get supply of electricity from TNEB for operating the machinery and equipments. The Employer will pay the necessary service connection and S.D. charges. The Contractor should obtain all approvals for the installation and commissioning of machinery and accessories offered by them from the respective inspecting authorities such as CEIG or CIFG etc., Fees if any, to be paid to the inspecting authorities will be reimbursed by the Employer.

14. Barricading

The pit / trench shall be barricaded on all four sides. The Contractor who has dug up the trench shall be responsible for any mishap, which may occur. Non-barricading of trenches by the Contractor shall be liable for a fine of Rs.500/- per day.

15. Length of Trench Open at One Time

The Pipe line shall be excavated in such length as may be ordered by the Engineer depending on the nature of the ground, the depth from the surface and the risk of damage to the adjoining property. The pipes shall not be covered until they may have been tested to the satisfaction of the Engineer. But in bad ground in close proximity to buildings or in other places where the Engineer shall consider necessary he may limit the length of trench so that there shall not be more than three pipes lengths from the refilled trench to the unbroken ground ahead.

16. Watching and Lighting

The Contractor shall at his expense provide at the site of work sufficient lighting and watching and fencing by night and by day and shall in every respect conform to the police regulations in these matters and he shall free and relieve the Employer, Should he neglect to do so, the same shall be provided by the Engineer and the cost thereof will be recovered from the Contractor.

17. Filling In Holes and Trenches Etc.

The Contractor immediately upon completion of the Works shall fill up holes and trenches which may have been made or dug, level the mounds, or heaps or earth that may have been raised or made, and clear away all rubbish which may have become superfluous or have been occasioned or made in the execution of the works, and the Contractor shall bear and pay all costs, charges etc. Failure to carry out the work within two days will attract a fine of Rs 500/- per day.

18. Power to Vary Work

The Engineer reserves the power to vary, extend or diminish the quantities of Work, to alter the line, level, or position of any work to increase, change or decrease the size, quantity, description, character or kind of any Work, to order the Contractor to execute the Works or any part thereof, by day or night Work, or to add or to take from the Work included in the contract as he may think proper without violating the contract and the Contractor shall not have any claim upon the Employer for any such variation, extension, diminution, alteration, increase, change or decrease other than for the Work actually done, calculated according to the prices tendered and accepted in this contract.

19. Extra for Varied Work

If the Engineer uses the power reserved to him under Clause 18 above an order in writing signed by the Engineer, shall be given to the Contractor to that effect and any Work executed under such order shall be paid for at the rates set forth in the Schedule of Prices prevailing at the time of execution where such rates in the opinion of the Engineer apply. This shall apply to unforeseen items of work which are not found in the Bill of Quantities. If the rates are not available in the Schedule of Prices, a rate or price shall be agreed upon between the Engineer and the Contractor in writing and failing their agreement the Contractor shall forthwith execute such order and the Engineer shall determine the rates or prices at which the work shall be paid of.

20. Free Flow of traffic

While executing the work, as soon as possible, the Contractor should allow as much traffic as possible on the roads/streets, by refilling the trenches cut across.

21. Tools and Plants

All tools and plants required for the work including sheet piles and timber for shoring and strutting, pump sets etc. shall be supplied by the Contractor at his own cost. The rate for the relevant items of work are inclusive of all such tools and plants and apparatus required for the execution of the work.

22. Excess Materials

The Contractor shall be responsible for the procurement of required quantity of materials like pipes, specials, machinery, electrical items etc. Any materials procured for the work, if found excess due to any reasons after completion of the works, shall be taken back by the Contractor and the Employer / Engineer shall not be responsible for such excess materials. Amount paid if any for such excess materials shall be deducted from any bills payable to the Contractor.

23. Commissioning of Works

The Contractor shall be responsible for successful commissioning of the scheme and maintenance period of one year.

24. General

Before submitting the bids, the bidder should carefully go through all the bid documents, drawings and also inspect the place of work so as to get full and first hand knowledge of the site conditions based on which he has to quote his rate.

24.1 Accidents

It shall be the duty of the Contractor to arrange for the execution of the works in such a manner as to avoid the possibility of the accidents to persons or damage to the properties at any stage of the progress of work. Nevertheless he shall be held wholly responsible for any injury or damage to persons and properties, which may occur irrespective of any precautions he may take during the execution of the works. The Contractor shall make good all claims and loss arising out of such accidents and indemnify the Employer from all such claims and expenses on account thereof.

24.2 Flood Damages etc.

The Contractor has to take risk insurance at his cost against losses due to unprecedented floods and other acts of God. No claim shall be entertained on this account and paid for.

24.3 Water and Lighting

The Contractor shall pay all fees and provide water and light as required from Municipal mains or other sources and shall pay all charges therefor (including storage tanks, meters etc.) for the use of the works and workmen, unless otherwise arranged and decided on by writing with Engineer. The water used for the works shall be free from earthy vegetable or organic matter and from salts or other substances likely to interfere with the setting of mortar or otherwise prove harmful to the work and conform to relevant standards.

24.4. Rates

The Contractor shall particularly note that the accepted rates of the various items shall be inclusive of all incidental charges such as baling by manual labour, dewatering, shoring etc. if found necessary during the execution and no extra shall be due therefore on any account during the currency of the contract, unless stated other wise.

24.5. Royalty Charges

The Royalty will be charged for the materials obtained from P.W.Department, or other Government quarries. Assistance as necessary will be given to the Contractor by the Engineer. No plot rent shall be charged for materials stacked on Employer's lands during the course of construction provided all such materials are removed within one month after the work is completed. Royalty or charges due in the case of private quarries and private bodies shall be paid by the Contractor.

24.6. Payment to Labourer

The Contractor should note that in the event of emergency, he shall pay all Laborers every day and if this is not done, the Employer shall make requisite payment and recover the cost from the Contractor. The Contractor shall not employ any laborer below the age of 15 years.

24.7 Night Works

If night work is required to fulfill the agreed rate of progress and to complete the work within the period stipulated, prior written approval is necessary and all arrangement shall be made by the Contractor including lighting without any claim for extra rate.

24.8. Errors, Omissions And Discrepancies

In the case of errors, omissions, and/or disagreement between the written and the scaled dimensions on the drawings or between the drawings and the specifications, the following order of precedence shall apply;

i) In case of discrepancies in dimensions of any item of work as described between the descriptive specifications and detailed working drawings, the dimensions given in the detailed working drawings shall apply.

ii) In case of discrepancies in description of scope of work between what is indicated in the item of work given in Bill of Quantities and the corresponding detailed technical specifications, the latter shall apply.

iii) Figured dimensions shall supersede scaled dimensions. The drawings on a large scale shall take precedence over those on a smaller scale.

iv) Drawing issued as construction drawings from time to time shall supersede the corresponding drawings previously issued.

24.9. Equivalence of Standards and Codes

Whenever reference is made in the contract to the respective standards and codes in accordance with which plant, equipment or materials are to be furnished and work is to be performed or tested the provisions of the latest current edition or revision of the relevant

standards and codes in effect shall apply, unless otherwise expressly set forth in the contract. Where such standards and codes are national in character, or relate to a particular country or region, other authoritative standards which ensure equal or higher quality than the standards and codes specified will be accepted subject to the prior review and written approval by the Engineer. Difference between the standards specified and the proposed authoritative standards must be fully described in writing by the Contractor and submitted to the Engineer well in advance for approval. If on the prior review, the Engineer determines that such proposed deviations do not ensure equal or higher quality, the Contractor shall comply with the standards set forth in the contract document.

24.10 Bidder To satisfy Himself

It will be the Contractor's responsibility to satisfy himself from the inspection of the site that sufficient quantities of construction materials required for the works exist in the designated borrow areas and quarry sites.

Failure by the Contractor to have done all the things, which in accordance with this condition he is deemed to have done shall not relieve him of the responsibility for satisfactorily completing the work as required.

24.11 Employment of Scarcity Labour

If Government of Tamil Nadu declares a state of scarcity or famine to exist within 16 kms. of the project site, the Contractor shall be required to employ in his works for which he will need unskilled labour and to the extent his works can accommodate any person or persons certified to him by the Engineer to be in need of relief and the Contractor shall pay to such persons wages not below the minimum wage which the Government may fix in this behalf from time to time.

24.12 All labourers and other employees of the Contractor should be covered by a suitable accident insurance policy to cover liabilities under the Workman's Compensation Act.

24.13 Electricity Tariff

The unit rates and prices quoted by the Bidder in the Bill of Quantities shall include the cost of electric energy required for construction at the rates fixed by the Tamil Nadu Electricity Board.

III. GENERAL SPECIFICATION FOR MATERIALS

All materials required for the works shall be procured and supplied by the contractor himself. The materials shall be of good quality and conforming to relevant BIS. The materials which are classified for ISI marking should be supplied with ISI marking only.

1. **Cement and Reinforcement :**

1.1 The entire quantity of cement and steel required for the work will be procured by the contractor . The contractor is responsible for all transport and storage of the materials and shall bear all related cost. The Employer shall be entitled at any reasonable time to examine the cement and steel supplied by the contractor.

1.2 The cement procured by the contractor shall comply with the requirements of IS 269/ 1976 with the latest revision thereof for ordinary portland cement and IS 8112/ 1989 with the latest revision thereof for 43 grade ordinary portland cement. The Sulphate Resisting Portland Cement procured by the contractor shall comply with the requirements of IS 12330 with the latest revision. It shall be of the best normal setting quality unless specially rapid hardening or quick setting quality if expressly instructed by the Engineer to be supplied. Each bag shall bear ISI Certification mark and as per specification no. 10 of TNBP volume I.

1.3 The steel bars shall comply with the requirements set forth in the IS 432 Part I, IS 1139, IS 1786 as the case may be with the latest revision thereof and the test as described for ultimate tensile strength, bond test and elongation tests.

All reinforcing steel shall be clean and free from oil, grease, loose scales or rust or other coatings of any character which would reduce or destroy the bend. Each bundle containing the bars shall bear the ISI Certification mark.

1.4 The cement/ steel shall be tested in nearby laboratories of Polytechnic or Engineering College by the Employer. Two samples should be taken by the Engineer in charge in the presence of the contractor or his authorised representatives or the technical personnel employed by the contractor as in the agreement. The contractor shall without extra cost provide samples and cooperate in the testing of the cement/ steel. One sample shall be got tested and the other sample shall be retained by making clear identification in the sample by the Engineer in charge so as to identify at a later date. The cost of such test shall be borne by the contractor.

1.5 All cement shall be procured in bags and shall be stored in a dry place for which the contractor shall be responsible. Consignment of bagged cement shall be properly stacked in a manner which will permit easy access for inspection and definite identification. Cement shall be used in approximately in the chronological order in which it is received, but cement that has been stored for a period longer than 4 months from the date of initial sampling shall not be used unless it has been retested at the expenses of the contractor and passed by the Engineer in charge as good quality on the retest. Cement aged more than 180 days from the date of initial sampling shall be rejected.

1.6 Cement which has become caked or perished shall on no account be used on the works and shall be rejected. Although the Engineer may have passed any consignment, he shall however have the power at the subsequent time to reject such consignment if he finds that any deterioration in the quality thereon has taken place.

1.7 A record of the quantity of cement/ steel procured with the name of dealer, bill number and date shall be maintained by the contractor. This should be produced for examination by the Engineer in charge at any time. The age of the cement shall be reckoned from the date of manufacture and it shall be verified by the Engineer in charge.

1.8 The rejected consignment of cement and steel should be removed from the site within two days.

Bricks:

a. Manufacture :

Common burnt clay building bricks shall conform to the requirements of IS 1077 and shall be of quality not less than class 50 with moisture absorption rate not exceeding 15% as defined in IS : 1077. Thick bricks shall be chamber burnt and shall not be damaged in any manner and sizes shall conform to the works sizes specified with tolerates as given in 6.2 of IS:1077.

b. Samples :

The Contractor shall deliver samples of each type of brick to the Engineer, and no orders shall be placed without the written approval of the Engineer. All the bricks used in the works shall be of the same standard as the approved samples. The samples shall be preserved on site, and subsequent deliveries shall be checked for uniformity of shape, colour and texture against the samples. If in the opinion of the Engineer any deliveries vary from the standard of the samples, such bricks shall be rejected and removed from the site.

c. Uniformity :

The bricks selected for exposed pointed brickwork walls shall be of uniform colour, deep cherry red or copper colour and uniform texture. Only such bricks as are permitted by the Engineer shall be used.

d. Testing :

Samples of the bricks shall be tested in accordance with IS : 3495 by the Contractor for compliance with the aforesaid, before any order is placed, and soon after receipt of a consignment. Tests shall be carried out as and when required by the Engineer on samples selected by the Engineer's representative.

a. Laying :

Brickwork shall be uniformly bedded, bricks being laid upwards. Each brick shall be floated and rubbed in upon such sufficient quantity of mortar that the mortar is squeezed up into the joints, but if such joints are not filled with mortar by this process they shall be flushed up with the mortar from the next succeeding bed. The courses shall be laid truly and strictly to line and horizontal level.

B. Bond :

Brickwork courses shall be alternately laid in stretcher bond and header bond. Damaged bricks shall not be used. The greatest care shall be taken to prevent mortar dropping on to or in any other way disfiguring or discoloring the bricks, and all edges and sides shall be kept strictly plumb and square, in-line, and flush with the required finished face. As the work proceeds, it shall be continuously checked with a 2 m long straight edge and spirit level.

c. Construction :

Walls shall be carried up in a uniform manner and no one portion raised more than 1 m above another at any one time, the open end being racked out. Over-hang work shall in no

case be permitted. Brickwork shall be cleaned down after each day's work and newly laid brickwork shall be protected by suitable means.

d. Dry Weather :

In dry weather the suction rate of clay bricks shall be adjusted by wetting as necessary before use. Bricks shall be stored in a free draining area and protected from rain.

e. Lintels :

Where brickwork rests upon lintels or supporting ribs of concrete, the bricks shall be cut as necessary and carefully bedded so that proper support to the outer leaf of brickwork is obtained.

f. Pointing :
At the time of laying, all joint of exposed brickwork shall normally be raked out neatly and pointed to 15mm depth.

g. Approval :

All workmanship shall be strictly in accordance with the foregoing. The Engineer or the Engineer's representative reserves the right to reject any of the work on grounds of shabby workmanship. Such rejected work shall be removed and rebuilt to the Engineer's satisfaction.

Quantity of Mortar :

Quantity of mortar to be used in one Cum. of masonry shall vary from 0.30 Cum. for thin masonry to 0.32 Cum. for massive masonry of conventional bricks (second class).

Cement Mortar :

The cement mortar to be used on the work should be generally conform to specification No.13 of TNBP. Only sufficient mortar shall be mixed as required for immediate use. Partly set mortar shall not be used.

2. Aggregates:

2.1 Sand for use in masonry and plaster works shall confirm to relevant specification in TNBP (specification No.7) and I.S.2116/ 1985, I.S.1542/ 1977.
2.2 The coarse and fine aggregates for concrete shall conform to I.S.383/ 1970 and as specified in the relevant clauses of I.S.456/ 1978 . Other aggregates free from deleterious materials shall be used at the concurrence and approval of the Engineer after sufficient tests have been carried out at the contractor's cost.

2.3 The maximum quantities of deleterious materials in the aggregates, as determined in accordance with I.S.2386 (Part II)/ 1963 shall not exceed the limits given in table I of I.S.383. Unless otherwise specified all coarse aggregate in RCC shall be graded aggregate of 20mm nominal size. All aggregates shall be stored in hard impervious surface to ensure exclusion of all foreign materials and as per IS 4082/ 1977 and specification no. 5 of TNBP volume I.

2.4 Agreegate having a specific gravity below 2.6 (saturated surface dry basis) shall not be used without the special permission of the Engineer.

3. Water required for Construction:

3.1 The water used in the construction shall be of potable quality and shall be tested at the contractor's cost. The contractor has to make his own arrangements at his cost for water required for construction, testing, filling, etc., either from local bodies or from elsewhere, by paying the charges directly and arranging tanker etc., as per necessity. No claim for extra payment on account of non availability of water nearby or extra lead for bringing water shall be entertained. All required piping arrangements and pumping if required for water shall be made by the contractor at his cost. Water for mortar, mixing and curing of concrete shall be free from harmful matter or other substances that may be deleterious to concrete or steel and taken from a source approved by the Engineer. Ground water for mixing and curing shall conform to the provisions in the class 4.3 of IS 456/ 2000.

4. **Admixtures:**

Only where a beneficial effect is produced shall any admixture be used and that too after test has been carried out to convince the Engineer that no harmful effect will be produced by the use of such admixture and after approval by the Engineer. The admixture shall conform to IS 9103/ 1972

5. **Form Work and Centering**

5.1 Steel/ wooden form centering shall be used. If wooden form work is used, it shall consist of planks not less than 40mm thick and strong props. This shall be provided complying with clause 10 of IS 456/ 2000 and specification no.30.8 of TNBP. The timber for form works shall be best hard wood and got approved by the Engineer in charge. This shall be deemed to be included in the items of contract even otherwise specified.

6. **Separator (Cover Block)**

6.1 For bottom cover of beams, slabs etc., separators of pre cast cement mortar blocks of suitable size with wire embedment as directed shall be used and tied to the reinforcement. Between layers of reinforcements, separators consisting of pieces of bars of suitable diameter shall be used . The required cover shall be provided as per clause 24-4 of IS 456/ 2000.

7. **Pipes , Specials and Valves**

7.1 General

7.1.1 All types of pipes required for the works should be of good quality conforming to relevant BIS and should be procured from reputed manufacturer or his authorised dealer. Each pipe should bear the trade mark of the manufacturer, the nominal diameter, class, weight, batch number and the last two digits of the year of manufacture suitably and legibly

marked on it. The Engineer shall have the right to conduct any test to ascertain the quality of the pipes supplied by the contractor. The contractor should make all necessary arrangements for testing the pipes. All the charges and expenses towards the testing shall be borne by the contractor. The materials which are classified for ISI marking should be supplied with ISI marking only.

7.1.2 If on examination of any sample from any portion of the supply, the material is found to be sub standard and not fully in accordance with the relevant specification, the entire consignment shall be rejected. In case of doubt whether the materials conform to the specification or not, the decision of the Executive Engineer shall be final.

7.2 Cast Iron pipes

Cast iron spun pipes shall conform to IS 1536/1976 Cast iron double flanged pipes shall conform to IS 7181/1986 and IS 1537. Cast iron fittings/specials shall conform to IS 1538/1986. All pipes and fittings (but excluding valves) shall be coated with an approved bitumen or coal tar paint.

Where the external coating of the pipes is damaged, the Contractor shall prepare and paint the damaged surface area with a minimum of three coats of bituminous paint and to the full thickness of original coating.

Spigot and socket joints shall be flexible and of an approved 'push-in' type unless otherwise specified.

The pipe shall bear ISI mark. The test certificate furnished by the manufacturer should be produced

7.3 D.I.pipes

The DI pipes shall be centrifugally cast (spun) for Water and Sewage and confirming to IS 8329-2000. The pipes used shall be both gasket joints and flanged joints. The minimum class of pipe to be used shall be class K-9 conforming to IS 8329. In general, pipes inside the buildings and below the structures shall be jointed as double-flanged pipes and those outside the building can be either EPDM gasket in accordance with IS 5382 and manufactured by the pipe manufacturer only. The pipes shall be supplied in standard lengths of 5.5m and 6.00m length with suitably rounded chamfered ends. Any change in the stipulated lengths will be approved by the Engineer's representative. The flanged joints shall confirm to the Clause 6.2 of IS 8329. The pipe supply will also include one rubber gasket for each flange.

7.3.1 Inspection and Testing:

The pipes shall be subjected to following tests for acceptance:
(i) Visual and dimensional check as per clause 13 and 15 of IS 8329.
(ii) Mechanical tests as per clause 10 of IS 8329.
(iii) Hydrostatic test as per clause 11 of IS 8329.
(iv) The test reports for the rubber gaskets shall be as per acceptance tests of the IS 5382 and in accordance to clause 3.8
The sampling shall be as per the provisions of the IS 8329.

7.3.2 Markings

All pipes shall be marked as per clause 18 of IS 8329 and shown as below:
(i) Manufacturer name / stamp
(ii) Nominal diameter
(iii) Class reference
(iv) A white ring line showing length of insertion at spigot end.

7.3.3 Packing and Transport

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

7.3.4 Specials for DI Pipes

The DI specials shall be manufactured and tested in accordance with IS 9523 or BS 46.926.922. The mechanical test and hydrostatic test shall confirm to clause 9 and clause 10 respectively of IS 9523. The tolerances on dimensions shall be as per IS 9523. The manufacturer of the pipes shall supply the fittings.

7.3.5 D I pipes of shall be used in Pumping Main. DI pipes shall be procured from the reputed manufacturer and the pipe shall conform to IS 8329 / 2000. The pipes shall bear ISI mark. The test certificate furnished by the manufacturer should be produced

7.4 RCC Pipes

7.4.1 RCC pipes shall be manufactured with sulfate resistance cement and lined internally with high alumina cement by centrifugal process to resist corrosion and acid formation. RCC Pipes of sizes from 200 mm to 600 mm of NP3 class shall be used for sewer line, with rubber rings as the jointing material. The pipes shall conform to IS;458 in regard to the internal diameter, type, class and 3 edge bearing strength. The pipe laying shall conform to IS 783.

7.4.1.1 Specification for High Alumina Cement Lined RCC Pipes:

The main purpose of using High Alumina Cement for lining is to protect the pipe against sulfate attacks when it is used in sewer lines. All reinforced concrete pipes shall be of spun concrete and lined with a 12 mm thick High Alumina lining.

The normal proportion of the mix shall be as follows:

i. High Alumina Cement one part – as per IS:6452.
ii. Granite dust passing through IS sieve 150 micron – one part
iii. Fine aggregate passing through IUS sieve 1.18 mm as per IS 383.
iv. Water cement ratio of the lining mix shall not be more than 0.35 and shall be sufficient to ensure maximum density.

7.4.1.2 Process of manufacture

The pipes shall be made by spinning process. The centrifugal force generated by spinning action will force the concrete against the mould, removing excess resulting in a dense concrete. The mix for high alumina cement lining shall be mixed in small separation mixer. All the ingredients shall be weighed. As soon as the spinning pipe is completed, the cement mortar shall be fed into the rotating mould uniformly and the pipe shall be spun until the cement mortar is set.

7.4.1.3 Precaution to be taken for high alumina lining

i. It is not desirable to mix and do the lining in high constant temperature (temperatures more than 40o c)
ii. Steam curing should not be used for curing pipes.
iii. The high alumina lining shall be kept moist and cool for the first 24 hours. The curing of lining shall be started after 3 to 4 hours after operation.
iv. The water cement ratio of the lining shall not be more than 0.35

7.4.1.4 Socket and Spigot

The outside of the spigot portion of the pipe shall be coated with epoxy coating and poly solution coating inside the socket portion shall be made before lowering into the trenches.

7.5 PVC pipes

7.5.1 The unplasticised PVC-U rigid pipes shall strictly conform to IS 15328/2003 and as amended from time to time.

7.5.2 The contractor Should procure the PVC-U rigid pipes from a reputed manufacturer

7.5.3 The contractor should furnish the test certificate issued by the manufacturer

7.5.4 The manufacturer's test certificate and third party inspection certificate should be produced by the contractor for the pipes used in the works

7.5.5 In addition to third party inspection, wherever felt necessary, the Engineer shall have the power to test the PVC pipes for its quality such as specific gravity, impact strength at 0oC, internal hydraulic pressure test, diameter, thickness etc. in TWAD Board laboratory

7.5.6 The PVC pipe joints shall be with solvent cement of good quality, conforming to IS 14182/ 1994

7.5.7 The Engineer in charge, shall verify, in addition to the test certificate, whether the pipes are as per BIS, by visual examination, diameter, weight, wall thickness, flexibility, colour etc.

7.5.8. All the PVC specials required for use in conjunction with PVC pipes, should be got approved by the Engineer-in-charge.

7.6 **Stoneware pipes**

7.6.1 The stoneware pipes shall strictly conform to IS 651/ 1992 and as amended from time to time.

7.6.2. The contractor should procure the stoneware pipes from a reputed manufacturer

7.6.3 The contractor should furnish the test certificate issued by the manufacturer

7.6.4 The manufacturer's test certificate and third party inspection certificate should be produced by the contractor for the pipes used in the works

7.6.5 In addition to third party inspection, wherever felt necessary, the Engineer shall have the power to test the stoneware pipes for its quality such as internal hydraulic pressure test, diameter, thickness, crushing strength etc. in TWAD Board laboratory

7.7 **CI D/F pipes**

7.7.1 The CI D/F pipes procured for use in the work should conform to the relevant BIS specification NO.7181/1986 and suitable for use in the work.

7.8 **Valves**

7.8.1 The contractor should procure reputed make of sluice valves, scour valves, reflux valves and air valves from the manufacturer or his authorised dealer and they should

conform to the relevant BIS specification and suitable for use in the work. The valves shall bear ISI marks.

7.9 **CI/ PVC/ Specials and Fittings**

7.9.1 The specials and fittings should be in conformity to the relevant BIS specification

7.10. **Testing of Pipes**

7.9.1 The manufacturer test certificate/ third party inspection certificate should be produced by the contractor for the pipes used in the work. The engineer shall have the right to test the pipes, wherever felt necessary for its quality. All testing charges should be borne by the contractor.

7.10.2 Testing of materials to be used in works, for the quality of finished items shall generally be done by the contractor at his own cost in the laboratory approved by the Employer by providing requisite materials, transport of test specimen and other assistance required there of.

8.0 **M S Ladder**

Supplying and fixing M S ladder 450 mm wide and required height with 40 mm x 5mm thick MS flat on either side and 16 mm round bars at 200 mm intervals. Two coats of anti-corrosive paint over one coat of red oxide is to be painted.

9.0. **Unplasticized Poly Vinyl Chloride (UPVC) Pipes**

The latest versions of Indian standards and codes of practice shall be adhered to for the design, manufacturing, inspection, factory testing, packing, handling, and transportation, laying, and jointing of the UPVC pipes. The rubber rings shall be vulcanized from Ethylene Propylene (EPDM) confirming to IS 5382. The UPVC pipes shall be of minimum 4 kg / sqcm and as per IS 4985 and the pipes for plumbing works in office building shall be SWR (Type B) as per IS 13592, with electrometric sealing rubber ring joints. The method of sampling of rubber rings should be in accordance with IS 5382. The material from which the pipes are made shall consist substantially of unplasticized polyvinyl chloride conforming to IS 10151, to which only those additives shall be added that are absolutely needed to facilitate the manufacture of the polymer and the production of sound, durable pipes of good surface finish, mechanical strength and opacity. The total quantity of additives like plasticizers, stabilizers, lubricants and fillers shall not exceed more than 6.92.0%. The bulk density of UPVC pipes shall be 1.39 to 1.44 g/cm3. The PVC resin of suspension grade K-66/K-66.92

shall be used for extrusion of UPVC pipe. The UPVC fittings shall be fabricated from Class 4 UPVC as per IS 4985.

9.1.1Tests on Material:

Following in house tests shall be carried out on the raw material:

(i) Grade (K-value)
(ii) Particle size distribution
(iii) Bulk density of resin
(iv) Bulk density of compound

9.1.2 Test on Pipes:

The acceptance test shall be conducted in accordance with IS 4985 and in presence of the Engineer's representative–
(i) Visual and dimensional check
(ii) Reversion test
(iii) Vicat softening test
(iv) Ash Content
(v) Bulk density
(vi) Resistance to external blows
(vii) Internal hydrostatic pressure test for pipes and joints
(viii) Opacity

1.39.3 Marking on Pipe:

Each pipe shall be clearly marked as indicated below:
(i) Manufacturer's name and trade mark
(ii) Outside diameter (OD) in mm
(iii) Class of pipe and pressure rating
(iv) Month and year of manufacturing
(v) Length of pipe
(vi) Marking of insert depth of spigot

9.1.3 Marking on rubber ring:

Each sealing ring shall be permanently marked with
(i) The manufacturer's name or trade mark.
(ii) The month and year of manufacture
(iii) Diameter of pipe for which the ring is suitable.
(iv) Type of rubber material

9.1.4 Tests on rubber ring:

Following tests shall be conducted on rubber rings conformity:
(i) Hardness
(ii) Tensile strength
(iii) Elongation at break
(iv) Compression set
(v) Accelerated ageing
(vi) Water Absorption
(vii) Stress relaxation

IV. CIVIL WORKS

1. **General:**

1.1 Tamilnadu Building practice (TNBP) shall be strictly followed for carrying out different items of the work for which no standard specifications are available and no alternate specification have been given under the description of works.

1.2 Where any provision of the TNBP is repugnant to or at variance with any provision under BIS or description of work, technical specifications and conditions of contract, the provisions of the latter shall be deemed to supercede the provision of the TNBP.

2. **Earth Work:**

2.1 Specification

Tamilnadu Detailed Building Practice (specification No.23 to the extent applicable) shall be followed for earthwork excavation.

2.2 Conveyance

The excavated earth, blasted rubble etc., shall be conveyed and deposited in suitable places as directed by Engineer in charge within 150m of plant site on one side of the trench only.

2.3 Disposal of Surplus Earth

The excavated soil which is surplus to that required for refilling and after allowing for settlement will have to be removed, spread and sectioned at places shown on the site during execution for purpose of widening or levelling the road. Sectioning is to be done as detailed in TNBP. The cost of removal of surplus earth after spreading/leveling/sectioning at site approved by the Engineer-in-charge to the disposal site will be measured under the relevant item of work in BOQ.

2.4 Shoring, Strutting and Baling out Water

The rate for excavation of trench work shall include charges of bailing out water wherever necessary and no extra payment will be made for any of these contingent works. While baling out water, care should be taken to see that the bailed out water is properly channelised to flow away without stagnation or inundating the adjoining road surfaces and properties.

For shoring and strutting, the rate for excavation for the first 2 m depth from G.L. shall include. Shorting and strutting beyond 2m depth from G.L., payment will be made as per respective item in BOQ.

3. Concrete:

3.1 Specification

Concrete for use in the works shall generally comply with TNBP (specification No.30) and the relevant BIS.The concrete mix shall be in specified proportions satisfying the maximum aggregate size, water cement ratio and required cube strength and workability as per IS 456-2000. Such concrete must be adequately vibrated to form solid mass without voids. The entire concreting works should be done only with the prior approval and in the presence of Engineer in charge.

3.2 Mixing of Concrete

The concrete shall be proportioned as far as cement and aggregates are considered by volume. The amount of water required being measured either by weight or volume the adjustments must be made to frequent intervals at the discretion of the Engineer or his assistant to account for the moisture content of the aggregates. The mixing operation shall be performed only in a mechanical concrete mixer and shall continue until the whole batch of uniform consistency and colour.The mixing of concrete shall be done in accordance with clause 8 and 9 of IS 456-2000.

3.3 Transporting, Placing and Compacting Concrete

3.3.1 Transportation, placing and compaction of concrete mix by mechanical vibrators shall be done in accordance with clause 12 of IS 456-2000. It is imperative that all concreting operations be done rapidly and efficiently with minimum rehandling and adequate manpower shall therefore be employed to ensure this.

3.3.2 The forms shall be first cleaned and moistened before placing concrete.

3.3.3 The mix should not be dropped from such a height as it may cause seggregation and air entrainment. When the mix is placed in position, no further water shall be added to provided easier workability.

3.3.4 No concrete mix shall be used for the work if it has been left for a period exceeding its initial setting time before being deposited and vibrated into its final position in the member.

3.3.5 While one concrete is being placed in position it shall be immediately spreaded and ramped sufficiently and suitable to attain dense and complete filling of all spaces between and around the reinforcement and in to the corners of form work for ensuring a solid mass entirely free from voids.

3.3.6 Construction joints required in any of the structural members shall be provided generally complying with clause 12.4 of IS 456-2000 and as directed by the Engineer in charge. The efficiency of tempering and consolidation will be judged by complete absence of air pockets, voids and honey combing after removal of form works.

3.4 Curing

3.4.1.1 Curing shall be done to avoid excess shrinkage or harmful effort to the members generally complying with clause 12.5 of IS 456-2000.

3.4.2 The method adopted shall be effective and any special method used must be approved by the Engineer and be subject to complete supervision.

3.4.3 Any deficiency in concreting such as cracking, excessive honeycombing, exposure of reinforcement or other fault which entail replacement of the defective part by fresh concrete and whatsoever remedy reasonable required without hampering the structural safety and architectural concept, all at the cost of contractor.

3.5 Removal of Form Work.

3.5.1 Removal of form work shall be done as per T.N.D.S.S. and as per I.S.456/2000 and as directed by the engineer in such a manner that no damage is caused to the concrete work.

3.6 Testing of Concrete.

3.6.1 During the course of construction works, preparation of test specimens, curing and casting of concrete shall be done in accordance with IS 1199 and IS 516 to ascertain the strength requirements and acceptance criteria indicated in IS 456-2000.The contractor shall provide all apparatus, labour and arrange to test the cubes at his own cost at the test laboratory decided by the Employer.

3.6.2 In addition to the above tests, any other test which may if desired by the Engineer in charge be carried out from time to time as per relevant specifications at the cost of contractor. In case the concrete does not meet the strength required, all corrective measures shall be taken at once at the contractor’s cost.

3.6.3 The inspection and testing of structures shall be done in accordance with clause 16 of IS 456/ 2000.

4. Masonry:

4.1 All masonry works such as Random Rubble / Coarsed Rubble / Brick work must be done as per TNBP Specification and Bid schedule specification.

5. Plastering:

5.1 Plastering would be 12mm, 20mm and 25mm thick cement plaster either plain or with water proof cement as may be specified.

5.2 The plastering items shall be executed in thickness and cement mortar of proportion as detailed in respective item in the BOQ. Similarly the plastering shall be either ordinary or with water proof for components as specified in respective item in the BOQ.

5.3 In case of water proof plaster standard and approved water proofing compound shall be mixed in cement mortar in required percentage as directed and then the plaster is applied.

5.4 The finishing shall be either smooth or rough as may be directed by the Engineer unless otherwise specifically mentioned in the BOQ.

5.5 Neat finish wherever directed by the Engineer shall be done at no extra cost.

5.6 Curing and watering shall be done as directed and plaster shall be in alignment and level. Any substandard work is liable to be rejected and shall have to be re-done at contractors cost. Sand to be used shall be of approved quality only. Cost of all scaffolding shall be included in the rates quoted in the BOQ.

6. **Flooring:**

6.1 40mm thick cement concrete 1:2:4 shall be provided for flooring. The size of metal shall not be more than 12mm and it shall be properly graded. A thin coat of very fine plaster shall be provided on top to give a smooth finish. The marking of false grooves to surfaces as directed includes the cost of labour.

7. Doors and Windows:

7.1 Sizes shown on drawings are clear openings in masonry and not the shutter's size. These sizes shown on drawings are, therefore, inclusive of required frame sizes and doors, windows, etc., and shall be manufactured, accordingly. If sizes bigger than shown in drawings are manufactured, as instructed specifically in writing they shall be measured and paid for accordingly.

7.2 The work shall be executed as per the size of frame thickness of shutter type viz. Plain planked panelled, glazed, etc., and fixture, etc., as described in tender item. Iron bars for windows and ventilators are to be provided if specifically mentioned in the tender item at Contractor's cost. Specifications in TNBP shall be applicable.

7.3 The design of shutters and quality of wood shall be got approved form the Engineer-in-charge before manufacture. The CW/TW to be used for woodwork shall be uniform in substance straight, free from large deed knots, flows flanks. The work shall be done as per specification of TNBP latest edition. The joints shall be perfect.

7.4 Part of wood embedded in masonry shall be painted with the tar. The frames of doors, windows, ventilators, etc., shall have proper hold-fasts embedded in masonry.

7.5 Whenever iron bar is to be provided as per tender item the rate thereof is included in tender item. The painting shall be done as prescribed in tender item. No painting, however, shall be permitted till the woodwork is approved by the Engineer-in-charge.

7.6 Any substandard work not conforming to the specifications are liable to be outright rejected and Executive Engineer's decision in such cases shall be final and binding on the Contractor.

7.5 The mode of measurement shall be on area units as mentioned in BOQ.

8. **Painting:**

8.1 The work shall be carried out as per the description of the tender item and as directed by Engineer-in-charge. It shall be white washing, distempering and /or cement painting. Shade and make shall be as directed by the Engineer and for decorative purpose, Engineer may ask for different shades to be provided for different components or different parts of the same component which the Contractor shall have to do within his tendered rate only at no extra cost to the Employer. Cost of priming coat as directed, scaffolding, etc., shall be included in the tender rate. The work shall be executed as per the specifications of TNBP for painting.

In general, all items of works must be done as per TNBP specifications and bid schedule specifications

9. **Suction Well (Wet Well):**

Diversion of Surface Flow and Isolating the Site of Work

9.1 The contractor himself has to arrange for necessary diversion of surface flow for isolating the site of work for construction of collection well, pumphouse and other allied works. The bund for diversion should be well formed in such a manner that there may not be any breach during the progress of work and the same should also be maintained in good condition till the work is completed.

9.2 The contractor will be personally responsible for any damages caused to the work due to any breach in the diversion formed during the progress of work.

9.3 The Employer will not take any cognizance of any damage to the materials or the equipment required for the work and kept in the river bed or in the bank due to any cause whatsoever it may be. The contractor should take necessary precaution against floods, theft or any loss or damage occasioned by or arising out of act of God and in prticular unprecedented floods etc. The contractor shall arrange for risk insurance at his cost for the above cause.

10. Earthwork Excavation:

10.1 he levels in the drawings are only approximate for the guidance of the contractor in general. From the date of execution, the bed level and the sub soil water level as noted will be reckoned. Thus the payment will be regulated according to the sub soil water level observed.

10.2.1 In regard to the width of the excavation of work above or below water level, sketch will be furnished to the contractor and payment will be restricted as per section shown in the plans irrespective of the facts that the contractor excavates the same with more side slopes for his own convenience.

10.3 The contractor has to fix up and maintain necessary sight rails and ranging rods etc. as required by departmental officers for checking the various levels.

11. **Excavation for Foundation:**

11.1 Unless otherwise specified open well excavation shall be resorted to upto water levels as directed by the Engineer.

11.2.1.1 All precautionary measures for the safety of laborers' while excavation shall be made as per the relevant BIS. for safety code for earth work

11.3 The quantities furnished in the BOQ are only approximate. Any omission or excess in quantities may arise during execution according to the site condition. Any alteration of work or any additional work during execution has to be done by the contractor. If no rate in the BOQ is applicable or derivable for the additional works, the rates will be arrived at as per rules and regulations governing for the working out of rates for supplemental item of work and will be paid to the contractor.

V. SPECIAL SPECIFICATION FOR SEWERAGE WORKS

1. Sight rails and Boning rods

1.1 The works will be set out by the Contractor. The Contractor shall be required to fix over the centre of each manhole or where a change in direction or gradient occurs a strong timber sight rail, 150mm x 25mm with top edge placed straight and true. These shall be supported and fixed to stout wooden posts at each side of the excavation. The centre line of the sewer shall be marked on each sight rail both back and front by a single vertical line drawn thereon and on other side white. All lengths of sewer shall have three sight rails fixed one at each end and one in the centre and worked one with the other. The boning rods shall have a movable cross head at right angles to the rod. So arranged that it can slide up and down the rod and capable of being fixed at any required position on the rod by screws. The foot of the boning rod shall be provided with the shoe made truly at right angles to the rod so that when placed on the pipe being laid it shall rest properly on the pipe when the rod is truly vertical.

2 Laying and jointing of stoneware pipe not on concrete

2.1 Before laying the pipes, the Contractor shall carefully brush them to remove any soil, stones or other materials which may be therein, even and regular bed having been prepared, and joint pit excavated to form a recess under the socket of each pipe of no greater width and depth than to enable the pipe jointing to be properly done. each pipe shall then to carefully lowered and placed singly in the trench and shall rest on the solid ground for a distance of not less than two thirds of its entire length.

2.2 Each pipe shall be brought into a true line from manhole to manhole, for this purpose, a strong twin line (rat thread) sufficiently long to reach the full length between manholes shall be used. Each pipe shall be set correctly to level by means of the boning rod and sight rails.

2.3 The spigot of each pipe shall be carefully wrapped with a ring a spun yam dipped in cement grout or tarred gasket sufficiently thick to properly fit me socket of the adjoining pipe and to allow true alignment. The Pipe shall then be driven fully home into the socket of the adjacent previously laid pipe and yam or tarred gasket carefully driven home with caulking tool.

2.4 The remaining space in the socket shall than be tightly and completely filled with cement mortar composed of one part of Sulphate resisting Portland cement and one and a half parts sand and shall be neatly beveled off alround the circumstances and finished at an angle of 45 degree outside the socket of the pipes. A wooden caulking tool shall be used for forcing the mortar into the sockets.

2.5 A tightly fitting bag of shavings or straw having a rope attached shall be drawn through the pipes as the work proceed to ensure that there is no cement or yam or other obstruction projecting into the interior.

2.6 All joints shall be kept moist either by means of wet bags, wet clay or wet earth which ever may be ordered bv the engineer to protect them from the sun. Such covering shall be removed when the length in tested for water thightness.

3. Laying stoneware pipes on Concrete

3.1 In trench where ordinary socket and spigot stoneware pipes are to be laid on concrete bed, the method to be adopted is as follows,

3.2 When the earth is taken out to the proper depth and gradient, a concrete bed of suitable thickness and width is to be laid as directed by the Engineer. The top of this concrete bed shall also be to the required gradient
.
3.3 When the concrete has set sufficiently, a series of special concrete invert blocks are to be laid about 60cm apart and leveled so that their top surface may be exactly the level of the sewer invert, less the thickness of the pipes. The correctness of level of the pipes is to be ascertained by working a straight edge from the invert of each pipe to block ahead.

3.4 The pipe must also be checked at intervals for the proper line and level and the first pipe of any length must be very carefully bedded and leveled into position.

3.4 The object to be obtained by the method above described is to ensure that the outside of the sockets shall be raised approximately 25mm above the concrete bed in order to allow the joints to be made properly in the under side.

3.5 In his prices for laying concrete, the Contractor must allow for doing the work in the manner as above described including cost of blocks.

4 Junctions on stoneware pipes

4.1 Where shown on the drawings or where directed by the Engineer Junctions pipes shall be provided at intervals during the construction of sewers, the jointing being effected in a similar manner to the pipe of the sewer in which they are placed.

4.2 These junction arms shall be closed with stoneware or cement disc and the sockets filled with cement mortar. The trench shall not be filled in until the position and orientation of each junction has been measured and recorded by the Engineer.

5 Manholes

5.1 Manholes shall be constructed on the sewers in the positions shown in the drawings or in such position as the Engineer may direct. The work shall be done strictly in accordance with the detailed drawings except where alterations are required by the Engineer. The excavation shall not be larger that sufficient to admit of the trench being properly timbered and to facilitate plastering outside. The bottom of the excavation shall be properly leveled up, rammed and a bed of concrete laid thereon. When the concrete has sufficiently set the construction of the brick walls shall then be proceeded with and all stoneware pipe connections through the walls shall be made and all iron work fixed in as constructions proceeds.Sulphate resisting Portland cement shall be used for construction of manholes. Manhole less than 2.5m from invert to sewer to ground level shall be built rectangular and shall have a flat top constructed as shown in the drawings, Manholes more than 2.5m from surface to invert shall be built circular and the walls corbelled as shown in the drawing. The inside of all manholes shall be plastered with cement mortar 1:3 20mm thick and out side of all manholes with cement mortar 1:3 12mm thick. The manholes bottoms shall be properly formed with stone ware channels fixed in cement mortar. The channels shall be neatly formed to the radious of the pipe and all side connection curved and channeled to admit the sewage to entire at an angles of 45 degree to the line of flow Manholes shall be topped with a circular cast iron frame with cover or cover of such pattern as may be ordered by the Engineer. The manhole frame shall be fixed to the top of the brick work by a layer of cement mortar.

5.2 Where pipes pass through walls of manholes relieving arches shall be turned neatly over the upper half of the pipes. If any pipe enters at such an angle that a relieving arch cannot be properly turned the bricks shall be carefully cut and laid so as to fit closely and

neatly against the pipe, and a RCC lintel shall be provided to avoid load of the walls being transmitted to the pipes.

5.3 The stoneware drop pipe connection in manholes shall be secured to the wall of the manholes by suitable clamps and shall be built in as the work proceeds in accordance with the drawings and the above instructions. The cost of this work will be paid separately.

5.4 PVC encapsulated steps shall be built in each manhole as the work proceed one being inserted to every four courses of brick work, horizontal distance centre to centre of each row being 30cm

5.5 The Contractor shall include in his prices for completing all manholes in accordance with the drawings.

6 Cleaning out Sewers and Manholes

During the whole of the work the contractor shall keep interior surface of sewers and manholes free from cement mortar, bricks, soil or other superfluous matter and shall handover the sewers perfectly clean and free from deposit on completion.

7 Water Test of Sewers

7.1 All sewers shall be tested before the filling in of the trench or other excavations. Testing shall also be done after refilling of the trench or other excavation, if considered necessary by the Engineer. The testing or retesting shall be carried out by and at the expenses of the Contractors who shall also provide the necessary appliances and water for the same. The tests will only be made from manhole to manhole after the manholes connected with the length under test have been completely finished.

7.2 The test shall be carried out in the following manner.

7.2.1 The pipes shall be carefully cleared of all earth or materials that may be lying thereon or therein and all joints shall be exposed right round so that through examinations may be made while the pipes are under test.

7.2.2 The ends of the pipe shall be closed by means of expanding stoppers and all junctions with stoneware stoppers or cement disc fixed in cement mortar.

7.2.3. The last but one pipe at the higher end of the length shall be a junction pipe with the junction arm at the top which will permit of the filling of length with water and also allow the escape of all air in the pipes.

7.2.4The expanding stoppers at each end of the length under test shall have a hold in the centre with a small piece of a pipe screwed therein and threaded on the projecting piece to permit of a flexible tube not less than 2m long fixed there to by a coupling. At the end of the tubing, the following shall be fixed.

a) at lower end of length, a sock.

b) at top end of length, a funnel of 15cm diameter.

7.2.5 The top of the runnel shall be fixed rigidly at a height of 30cm above the ground level, or such other height as may be decided by the Engineer.

7.2.6 After the above-mentioned expanding stoppers have been fixed together with flexible tubing and funnel, the length shall then be filled with water through the junction arm of the pipe provided therefore. As soon as the water has risen of the level of the filling junction arm an expanding stopper shall be fixed thereon. After a short time has been allowed for absorption, water sliall be poured into the funnel until the same is filled to the top.

7.2.7 If any of joints are leaking or if during a period of ten minutes the water level in the funnel drops 25mm or more (no more water being added or sewer interfered with in any way during the period) the test shall be considered unsatisfactory. If the water does not drop more than 25mm and there is no sign of leakage at any of the joints, the test shall be continued for one hour and at the end of the hour the pipe lines including the joints shall be examined and, if no indication of sweating or leakage is found then the test will be considered satisfactory. Should the test be unsatisfactory, all such joints or pipes found to be defective shall be removed, replaced or re-laid to the satisfaction of the Engineer by the Contractor at his cost.

7.2.8 The test shall be done as many times as may be necessary until the length is found to be watertight to the satisfaction of the Engineer.

7.2.9 The water required for testing shall be clean.

8. Providing, Laying and Jointing of Pipes & Fittings:
Scope:
This specification covers the requirements for providing, laying & jointing of stoneware, RCC, CI, pipes used for the sewerage system as per the relevant IS & National building code.

Materials:
Salt glazed stoneware pipes:
The stoneware pipe to be used shall be of the approved make and shall conform to IS:651-1980. All pipes shall be perfectly straight and truly cylindrical, glazed inside and outside, free from cracks and flaws, and perfectly burnt. Those not conforming to above mentioned requirements shall be rejected. The pipes used in the project shall be of 200mm, 250mm, 300mm, 350mm & 375mm.

RCC pipes:
RCC pipes shall be manufactured with sulphate resistance cement & lined internally with high alumina cement by centrifugal process to resist corrosion and acid formation. RCC pipes of sizes from 200mm to 600mm of NP3 class shall be used for sewer line, with rubber rings as the jointing material. The pipes shall conform to IS:458 in regard to the internal diamater, type, class and 3 edge bearing strength. The pipe laying shall conform to IS 783.

Specification for High Alumina Cement Lined RCC Pipes:
General:
The main purpose of using High Alumina Cement for lining is to protect the pipe against sulphate attacks when it is used in sewer lines.All reinforced concrete pipes shall be of spun concrete and lined with a 12mm thick High Alumina lining.

The normal proportion of the mix shall be as follows:

1. High Alumina cement - one part - as per IS : 6452
2. Granite dust passing through IS sieve 150 micron - one part
3. Fine aggregate passing through IS sieve 1.18mm as per IS 383
4. Water cement ratio of the lining mix shall not be more than 0.35 and shall be sufficient to ensure maximum density.

Process of Manufacture:

The pipes shall be made by spinning process. The centrifugal force generated by spinning action will force the concrete against the mould, removing excess resulting in a dense concrete. The mix for High alumina cement lining shall be mixed in small separation mixer. All the ingredients shall be weighed. As soon as the spinning of pipe is completed, the cement mortar shall be fed into the rotating mould uniformly and the pipe shall be spun until the cement mortar is set.

Precaution to be taken for high alumina lining:

It is not desirable to mix and do the lining in high constant temperature (temperatures more than 400 c.
Steam curing should not be used for curing pipes.
The high alumina lining shall be kept moist and cool for the first 24 hours. The curing of lining shall be started after 3 to 4 hours after operation.
The water cement ratio of the lining shall not be more than 0.35

Socket and Spigot:

The outside of the spigot portion of the pipe shall be coated with epoxy coating & poly solution coating inside the socket portion shall be made before lowering into the trenches.
Cast Iron pipe and fittings:

Cast iron pipe of LA clause shall conform to IS:1536 and fittings as per IS:1538 and laying shall be as per IS:3114. The test procedure, the scale of sampling and the criteria for acceptance of rubber rings shall be as per IS 5382 and IS 3400 in case of rubber ring joints.

The spigot socket joints shall be with lead joints. The lead jointing is done by first caulking in spun yarn and then filling the remainder of the joint space by running in molten lead, taking care that no extraneous material enters the joint and then thoroughly caulking the lead. The spun yarn shall be used to center the spigot in the socket and to prevent the flow of molten lead in to the bore of the pipe. The CI flanged pipes and specials shall confirm to IS 1538. After laying and jointing of CI pipes and fittings the pipe line shall be tested at work site in suitable stretches before back filling excavated earth, as per specifications.

Manhole-frames & cover:

The manhole frames & covers shall be of fibre reinforced concrete with clear opening of 600mm diameter pipe & of heavy duty type to withstand heavy load of traffic (i.e IRC class AA load). The manhole frame & cover shall conform to IS.12592 part I of 1982. It shall be inspected before supply by the Engineer in-charge.

Manhole steps:

The footrest or steps for entry into the manhole or flush tank shall be of plastic encapsulated steps instead of Cast iron steps generally used. The plastic encapsulated steps shall be of 3mm thick plastic encapsulated as per IS - 10910 on 12mm dia steel bar as per IS - 1786 having minimum cross section as 23 x 25mm and overall minimum length 263mm and width as 165mm with minimum 112mm space between protruded legs having 2mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring / projection on tail length of 138 mm and suitable to withstand the bend test, twist test, plastic integrity test and chemical resistance test as per detailed specification. The manhole steps shall be inspected before supply by the Engineer in-charge.

Carting & Handling of pipes / specials:

Pipes and fittings / specials shall be transported from the factory to the work sites as directed by owner / engineer. Contractor shall be responsible for the safety of pipes and fittings / specials in transit, loading / unloading. Every care shall be exercised in handling pipes and fittings / specials to avoid damage. While unloading, the pipes and fittings / specials shall not be thrown down from the truck on to hard surfaces. They should be unloaded on timber skids with steadying ropes or by any other approved means. Padding shall be provided between coated pipes, fittings / specials and timber skids to avoid damage to the coating. Suitable gaps between pipes should be left at intervals in order to permit access from one side to the other. In case of spigot socket pipes, care should be taken regarding orientation of pipes while unloading. As far as possible pipes shall be unloaded on one side of the trench only. The pipes shall be checked for any visible damage (such as broken edges, cracking or spalling of pipe) while unloading and shall be sorted out for reclamation. Any pipe which shows sufficient damage shall be prohibited.

Storage of pipes:
Each stock of pipes shall contain only pipes of same class and size, with consignment or batch number marked on it with particular of supplier wherever possible. Storage shall be done on firm level and clean ground and wedges shall be provided at the bottom layer to keep the stack stable. The stack shall be in pyramid shape of the pipes laid lengthwise and crosswise in alternate layers. The pyramid stack shall be made for smaller diameter pipes for conserving space in storing them. The height of the stock shall not exceed 1.5m. Fittings / specials shall be stacked under cover and separated from pipes.

Rubber rings shall be stored in a clean, cool place away from windows, boiler, electrical equipment and petrol, oils or other chemicals. Particularly in the field where the rubber rings are being used it is desirable that they are not left out on the ground in the sun or over night under heavy frost or snow conditions.

9. TRENCH EXCAVATION

General:

Trench excavation means excavation of trenches into which the pipe is to be laid. The line and levels of trenches shall be as shown on the drawings or as may be directed by the Engineer-in-charge. Before commencing trench excavation, the route of the trenches shall be pegged out accurately and the natural ground levels shall be agreed with the Engineer-in-charge.
Width of Trench:

The width of trench measured at the crown of the pipe shall permit adequate working space. The trenches shall be widened at sockets and other structures as may be found necessary. Payment for excavation shall be made on quantity basis as per actual dimensions of trench excavated subject to the condition that the quantity shall be limited as per the trench cross-section necessary to keep the trench in vertical position.
Depth of Excavation of Trenches:

The depths for the trenches will be calculated from the surface to the invert of the manholes for the pipes. The trench shall be so dug that the pipe line may be laid to the required gradient between the adjacent manholes and to the required depth. A minimum cover of 0.9 m is to be taken above the crown level of pipe upto the ground level / road level.

Barricading by Fencing, watering, lighting:

The parts of the fencing shall be of timber, securely fixed in the ground not more than 2.50 m. apart. They shall not be less than 10cm in dia or not less than 1.25 m above the surface of the ground. There shall be two rails, one near the top of the post and the other about 0.5m above the ground and each shall be of 5 cm to 10cm in diameter and sufficiently long to run from post to post to which they shall be tied with strong ropes. The method of projecting rails beyond the posts and tying together where they meet will not be allowed on any account. All along the edges of the excavated trenches, a bund of earth about 1 m high shall be formed when so required by the Engineer for further projection. Proper provision shall be made for lighting at night and watchman shall be kept to see that this is properly done and maintained. In addition to the normal lighting arrangements the contractor shall provide, whenever such work is in progress, battery operated blinking lights (6 volts) in the beginning and end of a trench with a view to provide suitable indication to the vehicular traffic. The contractor shall also provide a display special board printed with fluorescent prints indicating the progress of work along the road. In the event of the contractor not complying with the provisions of the clause, they will be imposed fine which will be decided by the Engineer. Further, in all such cases, the work may be carried out at the risk and cost of the contractor. The Contractor shall be held responsible for all claims for compensation as a result of accident or injury to persons during the course of execution of the project.
The contractor shall at his own cost provide all notice boards before opening of roads as directed by the Engineer. Arrangements shall be made by the contractor to direct traffic when work is in progress.

Blasting for pipe laying:

In case of excavation in rock whether by chipping or chiseling in crowded localities or blasting using explosives in other localities, pre measurement of the area to be removed shall be got approved by the engineer in-charge. After the excavation is completed, the rocky material shall be stacked & got measured by the engineer, so that the removed & stacked material shall agree for the purpose of payment.

In case of refilling of the trench, where the pipe are to be laid in rocky strata, the pipe shall be laid true to line & gradient over proper bedding & while the sides & the top of the pipes shall be refilled with borrowed earth from adjoining areas or conveyed earth from other areas. Blasted materials shall not be used for refilling the trenches.

Trench excavation in roads and footpaths:

All trench excavation and other work carried out within the limits of any road shall be completed as rapidly as possible and not more than half of the width of the carriage way shall be obstructed at one time. Road drains shall be kept free from obstruction. In any event the Contractor shall take special precautions, which shall include the continuous support of the sides of the excavation, from the time when excavation is begun until the refilling of the trench in places, to ensure that there is no disturbance of the adjacent road or road foundation.

Where excavated material has temporarily been deposited on a grass margin or road pavement, the margin or road pavement shall on completion of refilling be restored entirely to its original condition to the satisfaction of the concerned department and left free from loose stones.

Trench excavation in fields:

The term "fields" includes fields, moorlands, grass verges and the like and all private lands, and no length of trench excavation located in fields shall be commenced until suitable temporary fencing has been erected around that length unless the Engineer permits otherwise. Temporary fencing shall not be removed without the Engineer's permission, which will not normally be given until the Trench Excavation has been refilled and reinstated to the original ground condition or as directed by the Engineer.
The contractor shall have particular regard to the safety of livestock in fields or which may be introduced to the fields, and shall ensure that all open excavations, access routes and steep or loose slopes arising from the contractor's operations in these fields are adequately fenced and protected.

After the erection of temporary fencing the Contractor shall remove top soil to such depth and over such area as may be necessary to provide sufficient material to ensure adequate surface reinstatement of the working areas occupied by the contractor for construction of the pipe line.

Trench sides:

Loose boulders shall be removed from the sides of the trenches before allowing workmen into the excavation, and the trench sides shall be stabilized with screening or other methods approved by the Engineer. Trench slopes shall be kept moist where necessary to prevent local sliding as ordered by the Engineer.

Timber shoring:

Shoring & strutting has to be done for the total depth of trench including the top 2m when the depth of the trench exceeds 2m & above in loose soil. Shoring & strutting has to be done for both sides of the trench. However, when the depth is less than 2m shoring need not be done. Close timbering shall be done by completely covering the sides of the trenches and pits generally with short, upright members called 'rolling boards'. The boards shall generally be placed in position vertically side by side without any gap on each side of the excavation and shall be secured by horizontal wallings of strong wood at maximum 1.2 metres spacings and suitably strutted. If the soil is very soft and loose, the boards shall be placed horizontally against each side of the excavation and supported by vertical wallings, which in turn shall be suitably strutted. The lowest boards supporting the sides shall be taken into the ground and the portion of the vertical side of the trench or pit shall remain exposed, so as to render the earth liable to slip out.

The shoring material shall not be of sizes less than those specified below unless steel sheet piling is used or unless otherwise approved by the Engineer in writing:

a)	Planks	-	5cm x 25cm
b)	Waling pieces	-	10cm x 20cm
c)	Struts	-	15cm x 20cm

Timber shoring shall be 'close' or 'open' type, depending on the nature of soil and the depth of pit or trench. The type of timbering shall be as approved by Engineer. It shall by the responsibility of the contractor to take all necessary steps to prevent the sides of excavations, trenches, pits, etc., from collapsing.
In the case of open timbering, the entire surface of the sides of trench or pit is not required to be covered. The vertical boards of minimum 25cm x 4cm sections shall be spaced sufficiently apart to leave unsupported strips of maximum 50cm average width. The detailed arrangement, sizes of the timber and the spacings shall be subject to the approval of the Engineer. In all other respects, the specification for close timbering shall apply to open timbering.

In case of large pits and open excavations, where shoring is required for securing safety of adjoining structures or for any other reasons and where the planking across sides of excavations / pits cannot be strutted against, suitable inclined struts supported on the excavated bed shall be provided. Load from such struts shall be suitably distributed on the bed to ensure no yielding of the strut.

Inspection by engineer:

When the required levels of trench excavation are reached, the Engineer will inspect the ground exposed and if he considers that any part of the ground is by its nature unsuitable he may direct the Contractor to excavate further and to refill the further excavation with such material as he may direct.
Should the bottom of any trench excavation while acceptable to Engineer at the time of his inspection subsequently become unacceptable due to exposure to weather conditions or due to flooding or have become puddle soft or loose during the progress of the works the contractor shall remove such damaged, softened or loosened material and excavate further.

Disposing material from trench excavations:

The Contractor shall make his own arrangements for the temporary storage of any excavated material which is required for use in refilling trench excavations, including any necessary double handling. Any excavated material not required for or not suitable for use as refilling shall be removed.

Trenches not to be left open:

Trench excavations shall be carried out expeditiously and, subject to any specific requirements of the contract, the refilling and surface restoration of trench excavations shall be commenced and completed as soon as reasonably practicable after the pipes have been laid and joined.

Refilling trenches:

With a view to restrict the length of open trenches, on completion of the pipe laying operations, refilling of trenches shall be started immediately by the contractor. Pipe laying and testing shall follow closely upon the progress of trench excavation and the contractor shall not permit unreasonable excessive lengths of trench excavation to remain open while awaiting testing of the pipe line.

The trench shall be filled with excavated material above the top of pipe, back filling is to be done keeping at least 90 cm length of pipe open at the joints, for verification of joints for water tightness during testing.

Care shall be taken while back filling, not to injure or disturb the pipe. Filling shall be carried out simultaneously on both the sides of the pipes so that unequal pressure does not occur. Walking or working on the completed pipelines shall not be permitted unless the trench has been filled to a height of at least 30cms over the top of the pipe except as may be necessary for tamping etc. during back filling work.
Filling-in shall be done in layers not exceeding 230mm in thickness accompanied by adequate watering, ramming etc. so as to get good compaction. The trench shall be refilled so as to build upto the original ground level, keeping due allowance for subsequent settlement likely to take place. Before and during the back filling of the trench, precautions shall be taken against the floatation of the pipeline due to the entry of large quantities of water into the trench causing an uplift of the empty or the partly filled pipeline.

Measurement:

The laying of sewers (RCC / stoneware) shall be measured from inside of the first manhole to the inside of the adjoining manhole. The manhole are measured from the invert of the manhole to the ground level as the depth of manhole.

10. LAYING & JOINTING OF STONEWARE PIPES:

The laying, jointing & testing of stoneware pipes shall conform to BIS code. Before laying the pipes, the contractor shall carefully brush them to remove any soil, stones, or other materials which may be therein, even and regular bed having been prepared and joint pit excavated to form a recess under the socket of each pipe of greater width and depth than to enable the pipe jointing to be properly done. Each pipe shall then be carefully lowered and placed singly in the trench and shall rest on the solid ground for a distance of not less than two thirds of its entire length.

Each pipe shall be brought into a true line from manhole to manhole. For this purpose, a strong twine line (rat thread) sufficiently long to reach the full length between manholes shall be used. Each pipe shall be set correctly to level by means of the boning rod and sight rails.

The pipe shall be laid according to the invert levels provided for the sewer line, true to line and gradient. Any variation in levels during execution or any other revision in design, if found necessary shall be carried out by tenderer without any extra cost.
The spigot of each pipe shall be carefully wrapped with a ring of tarred spun yarn dipped in cement grout gasket sufficiently thick to properly fit the socket of the adjoining pipe and to allow true alignment. The pipe shall then be driven fully home into the socket of the adjacent previously laid pipe and yarn or tarred gasket carefully driven home with a caulking tool.
The remaining space in the socket shall then be tightly and completely filled with cement mortar composed of one part of Sulphate resisting Portland cement and one and a half parts sand and shall be neatly bevelled off alround the circumference and finished at an angle of 45 degrees outside the socket of the pipes. A wooden caulking tool shall be used for forcing the mortar into the sockets.
A tightly fitting bag of shavings or straw having a rope attached shall be drawn through the pipes as the work proceed to ensure that there is no cement or yarn or other obstruction projecting into the interior. All joints shall be kept moist either by means of wet bags, wet clay or wet earth whichever may be ordered by the engineer to protect them from the sun. Such covering shall be removed when the length is tested for water tightness.

Laying of stone ware / RCC pipes on rocky strata:

In trenches where the soil is rocky & slushy or at road crossings, socket and spigot stone ware pipes / RCC pipes are to be laid on sand bed & the method to be adopted is as follows:
When the earth is taken out to the proper depth and gradient, bedding of suitable thickness is to be laid as directed by the Engineer. The top of this bedding shall also be to the required gradient and to the required hydraulic level.
In case concrete bedding is necessary in shallow trenches of rocky, slushy or road crossings M15 concrete at the bottom and alround the pipe shall be carried out, keeping the hydraulic level as per the approved drawings.
Junctions on stoneware pipes:
Where shown on the drawings or where directed by the engineer junction pipes shall be provided at intervals during the construction of sewers, the jointing being effected in a similar manner to the pipes of the sewer in which they are placed. These junction arms shall be closed with stoneware or cement discs and the sockets filled with cement mortar. The trench shall not be filled in until the position and orientation of each junction has been measured and recorded by the engineer.

Laying & jointing of RCC pipes:

The laying & jointing of RCC pipes shall be done as per IS 783. The laying of RCC pipes between the manholes is similar to the procedure adopted for laying of stoneware pipes, perfectly true both in alignment and gradient on specified bedding. The pipe shall be laid according to the invert levels provided for the sewer line. Any variation in levels during execution or any other revision in design, if found necessary shall be carried out by tenderer without any extra cost.

After jointing, extraneous materials, if any, shall be removed from the inside of the pipe and the newly made joints shall be thoroughly cured. Rubber sealing rings conforming to IS:5382 are used for jointing the pipes.

Cleaning of pipes:

As soon as stretch of RCC pipes has been laid complete from manhole to manhole or for a stretch as directed by owner/engineer, contractor shall run through the pipes both backwards and forwards a double disc or solid or closed cylinder 75mm less in diameter than the internal diameter of pipes. The open end of an incomplete stretch of pipe line shall be securely closed as may be directed by owner/engineer to prevent entry of mud or silt etc.
If as a result of the removal of any obstructions owner/engineer consider that damages may have been caused to the pipe lines, he shall be entitled to order the stretch to be tested immediately. Should such test prove unsatisfactory, contractor shall amend the work and carry out such further tests as are required by owner/engineer.
It shall also be ascertained by contractor that each stretch from manhole to manhole or the stretch as directed by engineer is absolutely clear and without any obstruction by means of visual examination of the interior of the pipe line suitably enlightened by projected sunlight or otherwise.

Cleaning out sewers and manholes:

During the whole of the work the contractor shall keep interior surface of sewers and manholes free from cement mortar, bricks, soil or other superfluous matter and shall handover the sewers perfectly clean and free from deposit on completion.

Rubber Ring Joints:

The RCC pipes shall be of spigot & socket type with rubber ring joints. In the case of rubber ring joints the groove and the socket shall be thoroughly cleaned before inserting the rubber gasket. While inserting the gasket it shall be made sure that it faces the proper direction and that, it is correctly seated in the groove. After cleaning dirt or foreign materials from the plain end, lubricant shall be applied in accordance with the pipe manufacturers recommendations.

The contractor shall make sure that the plain end is bevelled as square or sharp edged may damage or dislodge the gasket and cause a leak. When the pipe is cut at site, the plain end shall be bevelled with a heavy file or grinder to remove all sharp edges.

The RCC pipes with the rubber ring accurately positioned on the spigot shall be pushed well home in to the socket of the previously laid pipe by means of uniformly applied pressure with the aid of a jack or similar appliance. The plain end of the pipe shall be pushed into the socket of the pipe, and while pushing, the pipe shall be kept straight. If any deflections are to be made in the alignment, it may be made after the joint is assembled. A timber header shall be used between the pipe and crow bar or jack to avoid damage to the pipe while the plain end of the pipe is pushed into the socket either with a crow bar or jack, or lever pullar.

Rider sewer:

Rider sewers of 200mm dia SW pipes are provided on both sides of the road where the road width is more than 30m and house service connections are connected to the rider sewer. The rider sewers are connected to the main sewers at intervals wherever required as per site condition or as directed by the Engineer in-charge. Manholes are also provided in rider sewers at 30m intervals. The procedure for laying & jointing of rider sewers are as per for stoneware pipes for sewer lines.

11. TESTING OF STONEWARE & RCC PIPES:

All sewers shall be tested before the filling in of the trench or other excavations. Testing shall also be done after refilling of the trench or other excavations, if considered necessary by the engineer. The testing or re-testing shall be carried out by and at the expense of the contractors who shall also provide the necessary appliances and water for the same. The tests will only be made from manhole to manhole after the manholes connected with the length under test have been completely finished.

The test shall be carried out in the following manner. The pipes shall be carefully cleared of all earth or materials that may be lying thereon or therein and all joints shall be exposed right round so that through examination may be made whilst the pipes are under test.

The ends of the pipe shall be closed by means of expanding stoppers and all junctions with stoneware stoppers or cement disc fixed in cement mortar.

The last but one pipe at the higher end of the length shall be a junction pipe with the junction arm at the top which will permit of the filling of the length with water and also allow the escape of all air in the pipes.

The expanding stoppers at each end of the length under test shall have a hold in the centre with a small piece of a pipe screwed therein and threaded on the projecting piece to permit of a flexible tube not less than 2m long fixed thereto by a coupling. At the end of the flexible tubing, the following shall be fixed.

a) at lower end of length, a clock.
b) at top end of length, a funnel of 15cm diameter.

The top of the funnel shall be fixed rigidly at a height of 30cm above the ground level, or such other height as may be decided by the engineer.

After the above mentioned expanding stoppers have been fixed together with flexible tubing and funnel, the length shall then be filled with water through the junction arm of the pipe provided therefore. As soon as the water has risen to the level of the filling junction arm an expanding stopper shall be fixed thereon. After a short time has been allowed for absorption, water shall be poured into the funnel until the same is filled to the top.

If any of joints are leaking & if during a period of ten minutes the water level in the funnel drops 25mm or more (no more water being added or sewer interfered with in anyway during the period) the test shall be considered unsatisfactory. If the water does not drop more than 25mm and there is no sign of leakage at any of the joints, the test shall be continued for one hour and at the end of the hour the pipe lines including the joints shall be examined and if no indication of sweating or leakage is found then the test will be considered satisfactory. Should the test be unsatisfactory, all such joints or pipes found to be defective shall be removed, replaced or re-laid to the satisfaction of the engineer by the contractor at his cost.

The test shall be done as many time as may be necessary until the length is found to be watertight to the satisfaction of the engineer.

The water required for testing shall be clean. In case of testing of cement concrete sewer pipes of more than 600mm diameter, the permissible quantity of water replenished can be increased by 10% for each additional 100mm dia of pipe.

12. SEWER APPURTENANCES:

Manholes:

Manholes shall be constructed on the sewers in the positions shown in the drawings or in such position as the engineer may direct. The work shall be done strictly in accordance with the detailed drawings except where alterations are required by the engineer. Any variation in locating the manholes and subsequent revision in levels during execution if found necessary, shall be carried out by the tenderer at his cost. The excavation shall not be larger than sufficient to admit the trench being properly timbered and to facilitate plastering outside. The bottom of the excavation shall be properly levelled up, rammed and a bed of concrete laid thereon. When the concrete has sufficiently set all stoneware pipe connections through the walls shall be made and all ironwork fixed in as constructions proceeds. Sulphate resisting Portland cement shall be used for construction of manholes. Manholes upto 2.5m from invert of sewer to ground level shall be built rectangular and shall have a flat top constructed as shown in the drawings, manholes more than 2.5m from surface to invert shall be built circular and the walls corbelled as shown in the drawings. Manholes shall be constructed of best country bricks kiln burnt of size 83/4 x 41/4 x 21/4 . The inside of all manholes shall be plastered with cement mortar 1:3, 20mm thick and the outside of all manholes with cement mortar 1:3, 12mm thick. The manhole bottoms shall be properly formed with channels fixed in cement mortar. The channels shall be neatly formed to the radius of the pipe and all side connection curved and channeled to admit the sewage to enter at an angle of 45 degree to the line of flow. Manholes shall be topped with a circular FRC frame cover conforming to IS 12592 part 1, heavy duty 600mm dia. The manhole frame shall be fixed to the top of the brickwork by a layer of cement mortar.

Where pipes pass through walls of manholes relieving arches shall be turned neatly over the upper half of the pipes. If any pipe enters at such an angle that a relieving arch cannot be properly turned the bricks shall be carefully cut and laid so as to fit closely and neatly against the pipe and a R.C.C. lintel shall be provided to avoid load of the walls being transmitted to the pipes.
Plastic encapsulated steps shall be built in each manhole as the work proceeds one being inserted to every four courses of brick work, horizontal distance centre to centre of each row being 300mm. The contractor shall include in his prices for completing all manholes in accordance with the drawings.

13. APPLICABLE CODES:

The providing, laying & jointing at work sites of stoneware RCC, CI, PSC pipes & fittings shall comply with all currently applicable statutes, standards & codes. In particular, the following standards unless otherwise specified herein shall be referred. In all cases, the latest revision of the codes shall be referred to. If requirements of this specification conflict with the requirements of the codes and standards this specification shall be covered.

IS	:	458	Specification for precast concrete pipe (with & without reinforcement)
IS	:	782	Specification for caulking lead
IS	:	783	Code of practice for laying of concrete pipes
IS	:	784	Code of practice for pre-stressed concrete pipes
IS	:	1536	Specification for centrifugally cast (spun) Iron pressure pipes for water, gas and sewage.
IS	:	1538	Specification for cast iron fittings for pressure pipes for water, gas and sewage
IS	:	3114	Code of practice for laying of cast iron pipes.
IS	:	3597	Method of tests for concrete pipes
IS	:	5382	Specification for rubber sealing rings for gas mains, water mains and sewers.
IS	:	6587	Specification for Spun hemp yarn
IS	:	8329	Specification for centrifugally cast (spun) Ductile Iron pressure pipes for water, gas and sewage.

VI. PIPE LAYING WORKS

1 General

1.1 .The earthwork for the pipe laying work shall generally conform to the invert level given in the drawing

a. Wherever necessary, sand cushioning for the bed shall be given as per IS Standards and as directed by the Engineer in charge. The pipe should be laid true to the alignment line and grade Wherever necessary, appropriate bends should be used. The pipes laid must be jointed properly and carefully by using approved type of jointing materials.

b. After the pipes are laid and jointed, the pipelines are to be subjected to hydraulic pressure test as detailed in the relevant BIS Specification for various types as indicated below.

Cast iron Pipes	--	Clause	of	lS	1536 / 2001
Ductile iron Pipes	--	Clause	of	lS	9523 / 2000
PVC Pipes	--	Clause	of	IS	4985 / 2000
UPVC pipes	--	Clause	of	IS	15328 / 2003

In portion of pipeline, where the pipes have developed cracks or sweating, such pipes with jointing materials shall be removed and re laid with new pipes at the contractor's cost and the pipe line shall be re tested to the entire satisfaction of the Engineer in charge. No extra payment will be made on this account. The bidder has to make his own arrangements for the procurement of the required equipments for testing of pipes which shall be subjected to such test as the Engineer-in-charge deems fit to ensure the accuracy of the gauge.

c. Refilling shall be done with proper compaction with excavated earth. In no case the contractor shall be allowed to refill the trenches in hard excavated portion to be refilled by the boulders or excavated stuffs. This portion of trench shall be refilled by the soft strata from excavated stuff from distance place at no extra cost. The refilling shall be done in 15 cm thick layers duly watering and compacting each layer. The refilling may be done up to a height of 20 to 30 cm than the natural ground level to allow that sinking afterwards. If the refilling gets sunk below the natural ground level at anytime till the completion of the work, the contractor at his cost should make good the refilling to the required level as may be directed by the Engineer in charge.

d. In case of pipe trenches, the Engineer may reduce the width of trench wherever a hard strata is met with, if he feels adequate and just sufficient to lay the pipe line in order to reduce the hard rock quantity. In such case the contractor will be paid as per the actual measurement.

e. If the work is in a residential area, the contractor should carry out the excavation carefully to avoid collapse of any structure.

f. Valves shall be provided with valve pits with proper cover to bear the loads coming on it as per bid documents and departmental drawings and specification.

g. Adequate protective measures should be taken against surge pressure. Zero velocity valves and air cushion valves should be provided at the appropriate places Thrust blocks and anchor blocks should be provided at all bends and appropriate places.

h. Water required for testing the pipeline shall be arranged by the contractor at his cost.

2 Laying of Cast Iron Pipes / Ductile Iron Pipes

a. The laying and jointing of cast iron pipes shall be carried out as follows:

Before laying the pipes, the contractor shall carefully brush them to remove any soil, stones or other materials which may be therein. An even and regular bed having been prepared and joint pit excavated to form a recess under the socket of each pipe of no greater depth and width than to enable the pipe jointing to be property done. Each pipe shall then be carefully lowered and placed singly in the trench and shall rest in the solid ground for a distance of not less than two thirds of its entire length. In places where the soil is not hard, cement concrete bed blocks or timber piles have to be provided under the pipes if directed by the Engineer in charge.

b. Pipes not Truly Laid

Any pipe or pipes laid, which on inspection are found to diverge from the true lines and levels shall be removed and re laid to the true lines and levels and the old jointing properly cleared off the pipes and fresh joints made by the contractor at his expense. Any pipes damaged in removal shall be replaced by the contractor at his cost.

c. Cutting of C.I. / D.I Pipes

Where necessary and as ordered by the Engineer in charge, the Contractor shall cut the pipes and fix and joint common collars for jointing spigot ends. The cut ends of the pipe shall be made truly at right angles with the axis of the pipe.

d. Covering up Open Ends

The Contractor shall take particular care to ensure that the apertures and open ends of pipes are carefully covered whenever the workmen are not actually employed therein.

e. Jointing of C.I./ D.I Pipes

The trench must be kept quite dry during jointing unless in any particular case the Engineer permits laying of the pipe in wet conditions. Plain spigot and socket pipes shall be joined as follows.

f. Lead Joints

Generally lead joints shall be used for all sizes. In the case of 100 mm pipes, cement joints may be used if specified in which case for every ten cement joints, one lead joint shall be used. Provision of lead joints shall also be made at street crossings, at closing joints and for all specials and as determined by the Engineer depending upon the site condition.
The spigot of the pipe must be forced well home into its socket and must be centered, so that the joint may be of even thickness all round. As many laps of white hemp spun yarn as may be needed to leave the space required for the lead shall be driven to the bottom of the socket without being forced through the joint into the pipe but carefully driven home with a caulking tool. The proper depth of each joint shall be tested before running the lead by passing completely round it a wooden gauge, notched out to the correct depth of lead, the notch being held close against the face of the socket. The joints shall then be run with molten lead insufficient quantity so that after being caulked solid, the lead may project 3 mm beyond the face of the socket against the outside of the spigot but must be flush with outside edge of the socket.
For pouring lead in the joints, a ring of hemp rope covered with clay shall be wrapped around the pipe at the end of the socket leaving an opening at the top of the socket into which the

lead can be poured. The hemp rope shall be supported by clay packing so as to withstand the operation of lead pouring.

The lead used shall be carefully skimmed of all scale, when melted in a cast iron pot or patent melting machine. Sufficient lead shall then be taken by a ladle and run hot into the joint, and the joint filled at one running. The joint shall then be caulked when cool by a suitable caulking tool and a 2 kg hammer and the joint left neat and smooth.

The weight of lead and hemp which shall be used in each joint shall be in conformity with the table given below or as specified by the Engineer.

Quantity of lead and spun yarn for different sizes of pipes

Nominal size of pipe (in mm)	Lead / Joint (in Kg.)	Depth of Lead joint (in mm)	Spun yarn per joint (in Kg.)
80	1.8	45	0.10
100	2.2	45	0.18
125	2.6	45	0.20
150	3.4	50	0.20
200	5.0	50	0.30
250	6.1	50	0.35
300	7.2	55	0.48
350	8.4	55	0.60
400	9.5	55	0.75
450	14.0	55	0.95
500	15.0	60	1.00
600	19.0	60	1.20
700	22.0	60	1.35
750	25.0	60	1.45
800	31.5	65	1.53
900	35.0	65	1.88
1000	41.0	65	2.05
1100	46.0	65	2.40
1200	50.0	70	2.60
1500	66.5	75	2.80
8 Inches	4.54	2.00 Inches	0.29
9 "	5.10	2.00 "	0.31
10"	5.67	2.00 "	0.34
12 "	6.58	2.00 "	0.48
14 "	9.30	2.50 "	0.63
15 "	9.98	2.50 "	0.68
16 "	10.66	2.50 "	0.74
18 "	14.06	2.50 "	0.95
20 "	16.33	2.50 "	1.04
21 "	17.92	2.50 "	1.08
24 "	20.41	2.50 "	1.21
27 "	23.13	2.50 "	1.33
30 "	25.86	2.50 "	1.46
33 "	28.35	2.50 "	1.65
36 "	31.58	2.50 "	2.40

Note:

The quantities of lead and spun yarn given in the table are provisions and variation of 20 percent is permissible.

a) Flanged Joints

Flanged joint should be made by painting the facing of the flange with white lead freely and bolting up evenly on all sides. A thin fibre of lead wool may be very useful in making the joints water tight where facing of the pipes is not true.

When packing must be used, it should be of rubber insertion of approved thickness. The packing should be of the full diameter of the flange with proper pipe hole and bolt holes cut out evenly on both the inner and outer edges. Where the flange is not fully faced, the packing may be of the diameter of the packing strip only. Proper placing of the packing should be checked before another pipe is joined on.

b) Cement Joints

The cement for the joints shall conform to IS 269/ 1989 specification for ordinary, rapid hardening and low heat portland cement.

Cement and water taken in proportion 8:1 by weight shall be thoroughly mixed. The mixture shall be such that when it is tightly compressed by hand into a ball and the ball is broken into two pieces the break shall be clean. If the hand becomes water stained, it has to be considered that the water is excessive. If there is evidence of crumbling in the break, water added is less than required. The cement mixture shall ring with metallic sound while caulked.
Cement which has been wet for more than one hour or which has undergone initial set shall not be used for jointing.

Making the joints

When new pipes are laid close ahead of a newly made cement joint, the disturbance caused during the forcing home of the pipe ends into the sockets during the adjustment of the pipe to proper alignment may damage the new joint. To avoid this damage, jointing shall be done only when there are atleast six pipes laid to the final grade and alignment ahead of the joint to be made. Starting at the bottom of the joint space shall be filled with wetted cement and caulked. The remaining joint space shall than be refilled with cement and caulked until the joint is practically flush with the face of the socket. The mixture shall be thoroughly compacted to make a water tight joint.
No water shall be allowed to touch the joint until the initial set had taken place. Immediately after initial set has taken place, the joint shall be covered with wet burlap, or other approved wet materials to ensure complete hydration of the cement. No water shall be allowed into the pipe until the elapse of 12 hours after the last joint in the line is made. Filling the pipe with water without pressure after this interval will be beneficial to curing of the joint.

c) Rubber Ring Joints

In the case of rubber ring joints or push on joints, the groove and the socket shall be thoroughly cleaned before inserting the rubber gasket. While inserting the gasket it shall be made sure that it faces the proper direction and that it is correctly seated in the groove. After cleaning dirt or foreign materials from the plain end, lubricant shall be applied in accordance with the pipe manufacturer's recommendations.

The Contractor shall make sure that the plain end is beveled as square as sharp edges may damage or dislodge the gasket and cause a leak. When the pipe is cut at site, the plain end shall be beveled with a heavy file or grinder to remove all sharp edges.

The plain end of the pipe shall be pushed into the socket of the pipe and while pushing, the pipe shall be kept straight. If any deflections are to be made in the alignment, it may be made after the joint is assembled. A timber header shall be used between the pipe and crow bar or jack to avoid damage to the pipe while the plain end of the pipe is pushed into the socket either with a crow bar or jack, or lever puller.

g. Fixing Sluice Valve

The sluice valves to be fixed on the pipelines shall be examined, cleaned and placed in the positions as shown in the drawings. The valves shall be placed on the pipeline and valve chambers constructed according to drawings. The depth at which the valve is to be laid and the dimensions of concrete and masonry shall be varied when necessary under the orders of the Engineer.

As the pipes in some instances may be required to be fixed at a less depth than will permit the top of the valve spindle being below the level of the road (but this may only be incases where the position of the valve is to one side of the metalloid road) the walls of the valve chamber shall in such cases be carried upto such height at may be ordered, and the chamber shall have such covering as the Engineer may direct.

The valve shall be supported in the valve chamber so that no stress or strain occurs in the flange or other joints of the valve.
The valve shall be carefully protected from slime or dust by a suitable mat or gunny covering and the pit itself shall be cleared of all unwanted material.

h. Fixing Scour Valve

Scour valves shall be fixed at places shown in the drawings or as directed by the Engineer, and the scour connections from the main shall be carried out completely as per drawings.

i. Fixing Air Valve

Air valves shall be fixed at the summits of pipe lines or at places as may be directed by the Engineer. The air valve connections etc., shall be carried out as per drawing.

j. Interconnection Work

The Interconnection Work between the existing main and proposed main to be laid under this contract shall proceed from the new main to the existing main. Before actually proceeding with the interconnection work, the Contractor shall make ready necessary tools and plants required for the work at site, such as pumpsets, shoring materials etc., He shall also keep ready at site necessary pipes, specials, valves if any required for the work. The Contractor shall keep necessary skilled workmen of sufficient strength at site and once the work is commenced, the entire interconnection works shall proceed without interruption by engaging labour for carrying out the work on a continuos basis both day and night till the work is completed. The work shall be executed as per programme drawn up by the Engineer and shall be completed within the time ordered by the Engineer, for each individual linterconnection. The work shall be carried out under the direction of the Engineer from the beginning to end.

Laying of Specials, valves (except straight pipes from the branch of the new main to the connecting point in the existing main) including conveying specials etc., from the stores or site of stacking, excavation, timbering, pumping out water from the trenches, lowering, aligning, jointing specials and valves cutting the existing mains, baling out water, inserting the necessary branches, jointing, testing, refilling etc ., shall comprise as one unit of work and will be paid at the lumpsum rate quoted in the schedule for interconnections.

k. Works to be left Water tight

The Contractor shall construct the pipes chambers and all other Works so that they shall be water tight. Should any leakage appear, it shall be made good by him at his expense by removing and reconstructing the portions of the Work so affected or by other method which will render the Work thoroughly water tight to the satisfaction of the Engineer.

2.12 **Cleaning of Mains**

During the execution of the work the contractor shall keep the interior surface of the mains free from cement, brick, soil or other superfluous matter and shall hand over the mains perfectly clean and free from deposit on completion.

2.13.**Masonry Chambers**

Chambers for sluice valves, inspection, scour valves, air valves shall be constructed on the pipes in the positions as shown in the drawings or in such positions as the Engineer may direct. The work shall be done strictly in accordance with the detailed drawings or as ordered by the Engineer. The excavation shall not be made lower than necessary to admit of the earth being properly timbered. The bottom of the excavation shall be properly levelled , rammed and a bed of concrete laid thereon. When the concrete has sufficiently set the building of the brick walls shall then be proceeded with and all iron work fixed in as the building proceeds. The inside of all chambers shall be plastered with cement mortar 20 mm thick and the outside with cement mortar 12mm thick. The chamber shall be topped with pre-cast R.C.C. Slab 1:2:4 or cast iron surface box of valve cover as ordered by the Engineer. The surface box or valve cover shall be fixed on the top of the R.C.C. slab by a layer of; cement mortar and sides of the surface box or valve cover covered over with cement concrete.

Where pipes pass through walls of chambers relieving arches shall be turned neatly over the upper half of the pipes or R.C.C. lintels shall be provided to avoid load of the walls transmitted to the pipes.

Cast Iron steps shall be built in each chamber as the Work proceeds on being inserted to every 4 courses of brick work, horizontal distance center to center of each row being 30 cms.

The Contractor shall include in his rate for brick work cost for fixing steps, frame, cover etc., for completing all chambers in accordance with the drawings and with the above specifications.

2.14.**Testing of Main-Hydrostatic Test**

After laying and jointing the pipes and specials, the pipe lines shall be tested for hydrostatic pressure in such length as may be specified by the Engineer.

The test pressure shall be equal to 50% or such other higher percent as may be specified in excess of the pressure the pipe will have to withstand subsequently subject to a minimum test pressure of 7 kg/sq.cm. in the case of lead joints. However in the case of cement joints, the joints may be tested to a minimum test pressure 3.5 kg/sq.cm.

If cement joints show seepage or slight leakage, such joints shall be cut out and replaced as directed by the Engineer and the test repeated.

The contractor shall make his own arrangements to procure, necessary equipments, apparatus etc., required for testing and shall provide necessary labour for filling with water the length of pipes to be tested, fixing all apparatus and for carrying on the testing operations until the length of pipes specials and connections are finally passed by the Engineer.

The length to be tested shall be provided with two blank flanges fastened on in the usual manner by collar bands and bolts to the end pipes or if the length to be tested shall have a sluice value at each end, such blank flanges may be dispensed with.

The length of pipes to be tested shall first be filled in with water from a higher section of pipes already laid or with clean water shall be arranged at the contractor's expense with the approval of the Engineer.

Before the actual testing pressure is applied any air which has lodged in the length of pipes to be tested shall be got rid of, by screwing on at the highest part of the length of pipes or temporary air valve, or, by opening a temporary stop-cock or by other mean as the Engineer may direct.

The test pressure shall then be applied to the length of pipes under test by a hand or powered hydraulic test pump. The connection of the test pump to the length of pipes shall either be at the union connection provided at a blank flange or shall be at a temporary stop cock or fountain connections as the Engineer may in the circumstances direct.

The actual test shall be made by pumping water into the length of pipes under test, until the test pressure as specified above has been reached on the pressure gauge.

The test pressure shall be maintained for one hour or for such other period of time as may set by the Engineer and each joint will be inspected. While the pressure is on, the pipes should be struck smartly with a 2 kg hammer.

When a flange joint is found to be leaking, care shall be taken that while tightening up the flanges, the neighboring joints are not affected.

If the length of pipe line under test is found to be satisfactory and no leaks or sweatiness are found at the pipe joints or at the joints of specials and connections then this length of pipe line will be passed by the Engineer.

But should any pipe, joint, special or connection be found to sweat or leak, the contractor shall make good at his cost such defective joint and the length of pipe line shall be re tested by the Engineer until all pipes, joints, specials and connection are found to be satisfactory.

If any pipe or special leaks or bursts, the damaged portion shall be removed and new pipes or specials shall be laid and jointed at the contractor's cost.

2.16. **Collection of Rubbish**

The Contractor shall, at his cost on the completion of the Work remove all water and all materials or rubbish of every description which may have been collected in the works find a deposit thereof and anything which my have collected within the works during the period of maintenance shall also be removed before the Works are finally accepted by the Employer.

3. **Laying and Jointing of Asbestos Cement Pressure Pipes**

NIL

4. **Laying and Jointing of PVC Pipes**

a) Laying of PVC Pipes (IS 4985/2000)

The trench bottom should be carefully examined and should be free from hard objects, such as flints, rock projections or tree roots etc. The bedding for the pipes should be brought to an even finish providing uniform support for the pipes over their length and pipes laid directly on the trench bottom. In other case the trench should be cut correspondingly deeper and the pipes laid on a prepared under bedding which may be drawn from the excavated material if suitable. As a rule trenching should not be carried out too far ahead of pipe laying. The trench should be kept as narrow as practicable but must allow adequate room for jointing pipes and placing and compacting the back fill. Mains should be laid with a cover of not less than I m measured from the top pipes to the surface of the ground. Mains which might be brought under roadways by future widening schemes should be so laid that the eventual will not be less than I m.

b) **Jointing of PVC Pipes**

The jointing of PVC pipes are done cither by using Solvent Cement Joint or rubber ring joint.

The solvent cement used for jointing should be of the quality as specified in IS 14182/1994. The spigot and socket ends of the pipes should be cleaned and roughened with emery paper. If the ends are grossly contaminated, they should be cleaned with Acetones or Methyl Alcohol. The solvent cement should be thickly applied on the spigot end and thinly in the socket. For larger sizes the first coat should be allowed to dry and a second cot applied. The spigot is then pushed into the socket and the excess cement wiped off at once with a piece of cloth or rag. The joint should not be disturbed for at least 5 minutes. The pipes should not be subjected working pressure for 24 hours after jointing.

i) Rubber Ring Joint.

The pipes for rubber ring joints are supplied with both ends chamfered. A mark should be made at a distance from the pipe an end equal to half the length of the coupler. The inner side of the coupler ring and the chamfered end of the pipe should clean and dry. The 'O' ring is then slipped into the coupler. The ring and the chamfered end of the pipe are lubricated with a lubricant. The coupler and the pipe should be carefully aligned and should be truly coaxial. The coupler is then pushed home into the pipe or the pipe is pushed into the coupler to make the joint.

5. **Laying and Jointing of RCC Pipes**

The laying and jointing of RCC pipes shall be done as per IS 783 -- 1985 and testing will be done as prescribed in the relavant Indian Standards.

6. Disinfection of Mains.

Upon completion of a newly laid main or when repairs to an existing pipe are made, the main shall be disinfected as directed by the Engineer.

The mains shall be flushed prior to disinfection except when the tablet method is used. After initial flushing, the hypochloride solution shall be applied to the water main with mechanically or electrically powered chemical feed pump designed for feeding chlorine solutions. For small applications, the solution may be fed with a hand pump.

In the case of mains of a large diameter, water from the existing distribution system or other approved source of supply shall be made to flow at a constant measured rate into the newly laid pipe line. The water shall receive a dose of chlorine also fed at a constant measured rate. The two rates shall be proportioned so that the concentration in the water entering the pipeline is maintained at not less than 300 mg/I. The chlorine shall be applied continuously and for a sufficient period to develop a solid column of 'Slug' of chlorinated water that will as it passes along the line expose all interior surfaces to a concentration of at least 300 mg/I. for at least 3 hours. As the chlorinated water flows past tees and crosses, related valves and hydrants shall be operated so as to disinfect the appurtenances.

After the applicable retention period, the heavily chlorinated water shall be flushed from the main until the chlorine concentration in the water leaving the mains is not higher than the generally prevailing in the system or less than I mg/I.

After final flushing and before the water main is placed in service, a sample or samples shall be collected from the end of the line and tested for bacteriological quality and shall show the absence of coliform organisms. If the initial disinfection fails to produce satisfactory samples, disinfection shall be repeated until satisfactory samples have been obtained. When the samples are satisfactory, the main shall be placed in service.

7) Laying and jointing of Ductile iron pipes.

a) Ductile iron pipes

The Ductile Iron pressure pipes shall conform to the I.S. 9523 /2000 & specials as per IS 8523/2000.

b) Laying Ductile Iron Pipes as per IS 12288/1987

The pipe should be lowered into the trench with tackle suitable for the weight of pipes. For smaller sizes up to 250mm nominal bore, the pipe may be lowered by the use of ropes but for heavier pipes either a well designed set of shear legs or mobile crane should be used. When lifting gear is used the positioning of the slink to ensure a proper balance, should be checked when the pipe is just clear of the ground. If sheathed pipes are being laid, suitable wide slings are scissor dogs should be used.

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

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

c) **Jointing of Ductile Iron Pipes:**

Two main types of joints are used with Ductile Iron pipes and fittings.

i) Socket and spigot flexible joints.

1. Push on joints
2. Mechanical joints

ii) Rigid flanged joints.

iii) **Flexible joints:**

The spigot and socket flexible joint should be designed to permit angular deflection in direction and axial movement to compensate for ground movement and thermal expansion and contraction. They incorporate gasket of electrometric materials and the joints may be of the simple push-on-type or the type where the seal is effected by the compression of a rubber gasket between a seating on the inside of the socket and the external surface of spigot. Joints of the latter type are referred to as mechanical joints. Both push-in and mechanical joints are flexible joints. Flexible joints require to be externally anchored at all changes in direction such as at bends, etc., and at blank end to resist the thrust created by internal pressure and to prevent the withdrawal of spigots.

Flanged joints:

Flanged joints are made on pipes having machined flange at each end of pipe. The seal is usually effected by means of a flat rubber gasket compressed between two flanges by means of bolts which also serve to connect the pipe rigidly. Gaskets of other materials, both metallic and non metallic are used for special applications.

Jointing procedure:

Procedure for jointing will vary according to the type of joint being used. Basic requirements for all types are:

a) Cleanliness of all parts
b) Correct location of components
c) Centralization of spigot within socket and
d) Strict compliance with manufacturer's jointing instructions.

The inside of sockets and the outside of spigots should be cleaned and wire brushed for a distance of 150 to 225 mm. Glands and gaskets should be wiped clean and inspected for damage. When lifting gear is used to place the pipe in the trench, it should also be used to assist in centralizing the spigot in the socket.

Where the pipeline is likely to be subjected to movement due to subsidence or temperature variations, the use of flexible joints is recommended. A gap should be left between the end of the spigot and the back of the socket to accommodate such movement.

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VII. LIQUID RETAINING STRUCTURES

1. Wet Well shall be executed as per the drawings and specifications and as directed by the Engineer in charge.

2. The wet well shall be provided with suitable size D.I / D/F. Pipes for inlet and delivery connections and painted with two coats of anti-corrosive paint as per BOQ / Drawing.

3. Testing for Water Tightness:

3.1 In case of wet well with top covered, the tanks shall be deemed to be water tight if the total drop in water level over a period of seven days does not exceed 40mm.

3.2 If the structure does not satisfy the condition of the test period, the test may be extended for a further period of seven days and if the specified conditions of the test are satisfied the structures shall be considered to be water tight.

3.3 In case of unsatisfactory test results, the contractor shall ascertain the cause, make all necessary repairs and repeat the procedure in the preceding clauses until the test has been passed satisfactorily at no extra cost to the Employer.

	Steel reinforcement	**Shall comply with the relevant sections of**
i.	IS: 1784 - 1986	Specifications for prestressed concrete pipes
ii	IS: 1785/1983 (Part I & II)	Specifications for plain hard drawn steel wire for prestressed concrete
iii.	IS: 432 - 1982	Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement
iv.	IS: 226 - 1975	Specification for structural steel
v.	IS: 1139 - 1966	Hard rolled mild steel for concrete reinforcement
vi.	IS: 1566 - 1982	Specification for hard drawn steel wires
vii.	IS: 456 – 2000	Code of practice for plain and reinforced cement concrete.
	Rubber jointing gaskets	The joint shall be sealed with a continuous ring gasket made of a special composition rubber of such size and cross section as to fill completely the recess provided for it. The gasket shall be the sole element depended upon to make the joint water tight and shall have smooth surfaces free from pits, blisters, porosity and other imperfections. The rubber compound shall contain not less than 5 percent by volume of first grade synthetic rubber. The reminder of the compound shall consist of pulverised fillers free from rubber substitutes, reclaimed rubber and deleterious substances. The compound shall meet the following physical requirements when tested in accordance with appropriate ASTM specifications of BV Class of BS 2494 Part I – 1955.
		TENSILE STRENGTH
		The tensile strength of the compound shall be atleast 2,700 psi for natural rubber gaskets and 2300 psi for synthetic – rubber gaskets (method of test for tension of vulcanised rubber. ASTM designation D.412).
		ELONGATION AT RUPTURE
		The elongation at rupture shall be atleast 400 per cent for natural rubber gaskets and 350 per cent for first grade synthetic rubber gaskets (method of test of tension testing of vulcanised rubber ASTM Designation D.412)
		SPECIFIC GRAVITY
		The specific gravity shall be consistent

		within 0.05 and within the range of 0.95 to 1.45 (methods for chemical analysis of rubber products "ASTM Designation B.297".
		COLD FLOW
		The percentage of cold flow shall not exceed 20. The cold flow determination shall be made in accordance with "Methods of Test for Compression Set of Vulcanised Rubber" . Method – B (ASTM Designation D.395) with the exception that the disc shall be a 12 mm thick section of the rubber gaskets.
		TENSILE STRENGTH AFTER AGING
		The tensile strength of the compound, after being subjected to an accelerated aging test for 96 hours in air at 158^{o}F shall not be less than 80 percent of the tensile strength before aging "Method of Test for accelerated aging of Vulcanised rubber by the Oven Method" (ASTM Designation D.573)

4. Designation of pipes and fittings:

4.1 Pipes and fittings will be classified according to their diameter, workinghead and they shall be marked as shown below:

a. Name of manufacturer
b. Date of manufacture
c. Internal diameter of pipe
d. Test pressure
e. Permissible working head
f. Effective length of the pipe
g. Serial Number.

Recessed markings will not be permitted.

4.2 Whenever practicable, each rubber rings shall be plainly and clearly marked in a suitable position with

a. Manufacturers name of trade marks
b. Month and year of manufactured
c. Class of ring
d. Number of the British Standard, i.e. BSS 2494 – 1955. In case where marking of the actual rings is not practicable or is likely to be detrimental to their effective use, the rings shall be supplied, fastened together in parcel of suitable size, each bearing a label giving the above particulars.

VIII. ELECTRICAL WORKS AND PUMPING MACHINERY

A ELECTRICAL

1 General

Following clauses specify General Electrical requirements and standard of workmanship for the equipment and installations. General specification classes shall apply where appropriate except where particularly redefined in the Special Specification Clauses.

2 Standards

The equipment offered shall comply with the relevant Indian Standards. The equipment conforming to any other approved International Standards which is considered equivalent or superior shall be acceptable. The tenderer however, shall have to substantiate equivalence or superiority.

3 Requirement of Statutory Authorities

The electrical equipment/installations shall comply with the requirements of Rules/Regulation as amended up-to-data, required by Statutory Acts or Authorities.

- The Indian Electricity Rules, 1956
- The Indian Electricity Act.
- The Indian Electricity (Supply) Act, 1948
- The requirements of Chief Electrical Inspector to the Government of Tamil Nadu.
- The requirement of Tamil Nadu State Electricity Board.
- Fire advisory Committee Insurance Act.
- The contractor shall get the drawings, layouts of HT sub station etc. approved from TNEB and chief Electrical inspector to the Govt. of Tamilnadu, wherever necessary. The contractor also shall arrange to get the installation inspected by CEIG and carryout modifications/ rectification as required by CEIG, prior to commissioning of sub station/electrical equipments.

4 H-Frame Steel Structure

H-frame galvanized steel self supporting structure shall generally have the following equipments.

- Lightning Arresters
- Gang Operated A.B Switch
- DO Fuses
- String Insulators
- Pin Insulators
- ACSR conductors of appropriate sizes to connect all the equipments

4.1 Lightning Arrester

Lightning arresters shall be provided on each 11KV line before the termination on the 11KV isolators in the switch yard. Lightning Arresters shall be suitably mounted on H pole structure or 4 pole structure for receiving 11kv supply as per IS 3070 Part I.

4.2 Gang Operated AB Switch

The Switches shall be provided with horizontal connecting bar, for gang operation, G.I pipe as down rod lever coupling and operating handle with padlock and other components necessary for complete assembly.

4.3 11KV Drop-Out Fuses

The IIKV drop-out fit off fuses shall offer protection against short circuit and suitable for use in conjunction with 11KV system having fault level of 500 MVA as per relevant ISS.

A suitable insulated operating rod shall be provided with each fuse assembly. Two pairs of rubber hand gloves for working on 11KV shall be provided.

4.4 Insulators

The disc, pin and post type insulators used shall be of high quality glazed porcelain. The electrical and mechanical characteristics shall conform to IS:731 and IS:254. The insulators shall have following characteristics suitable for use in an effectively earthed system.

-	System voltage	:	11kv
-	Dry Wet one- minute power Frequency to withstand voltage	:	22 kv
-	1.2/50 micro second impulse withstand voltage	:	75KV
-	Power frequency puncture withstand test voltage on units	:	1.3 times of the dry flash over voltage of the unit.
-	Visible discharge voltage	:	9 KV
-	Total minimum creep age distance for post and disc insulator	:	320 mm for post insulation 320 mm for disc insulation

5 HT Sub Station

5.1 In general HT sub station shall be out door type. The transformer shall be suitable for out door type and installed on cement concrete platform, having capping level well above the flood level of that area. The size of the platform shall be decided by the contractor, depending on the capacity number of transfer to be installed. In case of indoor sub station, the transformer shall be suitable of indoor type. The transformer HT/MV panel rooms shall be decided to suit requirement. The transformer may erected on the structure also with suitable provision made in the H pole structure . Fencing shall be provided as per relevant IE rules.

6 Power Transformers

6.1 General

TRANSFORMER SHALL BE 22 KV /0. 433KV

Type: Outdoor in general. In case of indoor, sub station shall be indoor type, mineral oil filed natural cooled ONAN as per standard IS 2026 with of circuit tap changer of + 5 to - 10% in steps of 2.5%. Adequate number of radiator elements made of low carbon sheet steel should be provided for cooling.

Technical Particulars:

No. of Winding : 2
No. of Phase : 3
Winding connection: primary - Delta
Secondary - Star
Connection Symbol: DYN 11
Rated frequency: 50 Hz
Rated kVA: 400
Rated primary voltage: 11kV
Short circuit level: 26.2kA
Method of system earthing : Solidly earthed
Rated Secondary voltage: 433 V
Impedance voltage: 4%
The temperature rise at reference ambient as per IS: 2026
Top oil 45oC by thermometer method
Winding 55oC by resistance method
Primary and secondary side cable box for cable termination.
All standard fittings and accessories as per IS
Acceptable makes CGL, EMCO, Bharat Bijlee, WSON

6.2 Insulating Oil

The transformer shall be supplied with insulating oil duly filled. The insulating oil shall conform to IS: 335 10% excess oil shall also be supplied to account for loss.

6.3 Transformer Accessories

The transformers shall have the following Accessories

- Off Circuit manual tap changing switch externally operated as specified and positioned on side of transformers accessible from the ground level;
- Conservator with drain plug, filling as specified.
- Explosion vent with diaphragm
- Air-relief vents;
- Inspection cover on the tank covers for all transformers;
- Filtering connections with required valves
- Following valves shall be provided

Oil sampling valve	-	One No
Oil Drain valve	-	One No

- Filtering valves - Two Nos

- Grounding terminals, two for the transformers tank for clamping to purchaser's grounding grid connection;
- Lifting lugs or eyes for the over top part of tanks, cores and coils, and for the complete transformers
- Pulling eyes, for pulling the transformers parallel to and at right angles to the axis of bushings.

- Diagram and rating plate for transformers,

- Rollers

- Thermometer pockets with dial type thermometers for top oil temperature indication. The thermometer shall be clearly visible from ground level as specified.

- Weather proof control cabinet

- Buchholz relay

Transformer shall be tested as per IS 2026.

8 HT /LT Panel Board

PANEL BOARD:

Supply and delivery of floor mounting type weather vermin and dust proof powder coated LT cubical panel board of 14 SWG mild steel sheet and suitable steel angle frames with enclosed energy efficient Aluminium busbar of electrolytic grade E91 PVC sleaved of suitable size for phase and neutral with hinged front door and railway type lock and key arrangements 4 Nos. of required current carrying capacity with all internal wiring as per IE rules and as per IS:8633 and as per CEIG's safety requirements. The design of panel board should facilitate for quick operation of all switches from the front side, and the panel board should be completed with all internal wiring including necessary twin copper earthing arrangements and consists of the components for controlling incoming and outgoing supply.

INCOMING:

a) 2 Nos. of 800 Amps. draw out type ACB lwith insulation voltage of 600 V. 50 KVA breaking capacity with under voltage release and with suitable current transformers,with over load relay.Each breaker shall be fitted with suitable size Ammeter , Voltmeter,Rotary selecter switches,side lock fuses earth fault relay etc.pilot lamps and protection fuses for controlling the transformer secondary side.

OUTGOING:

b) 2 Nos. of 200 amps MCCB suitable to control outgoing supply to the motorswith two locks and one key interlockingarrangementsso as to feed only one of the Motors/Pumps with over current and short circuit releases to. Pumpset vide Sl No.1 a) through VFD
c) 2 Nos. of 100 amps MCCB suitable to control outgoing supply to the motorswith two locks and one key interlockingarrangementsso as to feed only one of the Motors/Pumps with over current and short circuit releases to.Air Diffusers.
d) 15 Nos. of 63 amps MCCB suitable to control outgoing supply to the motorswith two locks and one key interlockingarrangementsso as to feed only one of the Motors/Pumps with over current and short circuit releases to.Pumpset vide Sl No.1 b)

through starters for Primary Sludge Sump To Sludge Thickener,1c)Secondary Sludge Sump To Activated Sludge Chamber,1d) Secondary Sludge Sump To Sludge Thickener,1e)Sludge Thickener Dilution Pump,1f)Sludge Thickener to Sludge Digester,1g)& 1h) Sludge Digester- 2 Nos to Sudge Drying Bed and provision for Lab Equiupments.(Total- 15 Nos)

e) 20 Nos. of 32 amps MCCB suitable to control outgoing supply to the motorswith two locks and one key interlockingarrangementsso as to feed only one of the Motors/Pumps with over current and short circuit releases to.Pumpset/Motos through starter for Primary Clarifier mechanism-2 Nos,Secondary Clarifier mechanism-4 Nos,Sludge Digseter-4 Nos.Chlorination arrangments-2 No.,Coarse Screen mechanical arrangments-2 Nos and fine Screen Mechanical arrangements-2 Nos.etc complete.(Total-20 Nos)

f) 2 No.s 63 Amps MCB to controlthe lighting load.
The fuse switch should have 3 Nos. of suitable 300/5A current transformers for controlling the supply to the pumpsets with machanical interlocking arrangements on the outgoing side so as to make it possible to operate only one motor at a time with suitable Ammeter with suppressed scale with zero adjuster, selector switches etc.. The meters should conform to IS 1245.

g) 144 mm Squaretype Amphere Digital Ammeter with phase selecter switch & side lock fuses,one for the motor and other for capacitor bank in the outgoing feeder.

h) 144 mm Squaretype 0-500 V.Digital Volt Meter with phase selecter switch & side lock fuses,one for the motor and other for capacitor bank in the outgoing feeder.

i) 3 phase & wire digital KW Hr meter for direct reading 3 phase CT operated digital energy meter suitable for the motor to monitor the specific energy consumption of each motor with IS mark as per IS :13010/89 and amended from time to time.

j) 144 mm Square type digital Power Factor Meter.

k) 5 Nos.RYB & LED ON /OFF indicating lamps with control fuse/switch.

l) lSuitable Current Transformer for the above metering.

m) Earth fault relay-1set

n) Vertical Three Phase Lighting Distribution Board with MCBS

12 way vertical TPMCB sheet steel distribution boards Flushtype/Surface typr fitted with bus bars and Neutral Links with three phase MCB outgoing and separate 4 wayprovision for accomadating one no.4 ploe incoming MCB and another separate 4 way for accomadating one no.4 ploe ELCBwith lable holder and provision for taking up cable for not less than32 sq.mm.
Supply, erection on wall, testing, commissioning at site and handing-over in satisfactory working order of Lighting Distribution Board (LDB) 12 ways 3 PhaseDB and as per feeder details given in single line diagram enclosed with technical specifications complete including all lead and lift and as directed by the TWAD board officers.

9 Air Circuit Breakers

The Air Circuit Breakers shall conform with IEC/Indian standards. The ACBs shall be manually draw out type in open execution with over current trip device adjustable 64% to 110% time setting for overload adjustable current setting for short circuit protection and adjustable current and time setting for earth fault protection.

No. of poles - 4
or 3

Rated insulation voltage – 1000
Rated short circuit breaking - 50 KA – (AC – 415V)
Rated making capacity AC – 105KA
Rated short time withstand current – 50KA
Total making time – 30 millisecond
Total Breaking time – 38 ms.
Motorised mechanism – 220/240V
Under voltage released AC – 150/(66)VA
Opening line delay – 20 – 30 MS
System protection – overload, short circuit,Earthfault
Overload protection – adjustable current settings

ariation

50% to 100%
Short circuit protection – adjustable pickup level
Earth fault protection – relay shall have sensitivity of

adjustable

Between 10% to 30%

of ACB

rating

Air circuit Breaker shall be fitted with following

- Heavy duty switch having not less than 4 No. + 4 N C - contacts
- Built in resin cast current Transformer
- Auxiliary contacts
- Shunt and under voltage tripping device
- Neutral CT for earth fault protection
- ACB shall be suitable for locking the breaker in various positions. Provision of door locking with requisite end termination lug and sockets. Terminal bars for connecting more than one terminal.

10 Moulded case circuit breakers

The Moulded case circuit Breakers shall have overload, and Short-circuit protective elements. The contact system shall be designed to have minimum wear and also energy loss. Arc extinguishing device shall be provided. The MCCB shall have 'ON' – 'OFF' or 'Trip' indicators. The interrupting capacity of the breaker shall be 35KA – 50 KA at 415V. The MCCB shall be tested as per IS 2516.

The container shall be of non-conducting materials and withstand high temperature, and flame retardant.

11 Miniature Circuit Breakers

Miniature circuit breaker working on residual current device having 6000A short circuit breaking capacity and 30 milli amp. sensitivity and 30 millisecond tripping time conforming to IS 12640 trip free mechanism operating for rated leakage at nominal 10 Volts. Earth leakage circuit breaker also may be provided wherever necessary instead of MCB.

11.1 Fuse Switch Units.

The fuse switch unit shall be suitable for 415/430V operation and conform to IS 13947 (Part 3) and IEC 947-3.

The switch shall conform to following Technical specification

Rated operational voltage	- 415V
Rated insulation voltage	- 660V
Rated Thermal current	- 125A/160A/250/400A
Number of Poles	- Three (TPN) isolate
Rated operational current	- as required
Rated making capacity	- 10 times the rated current
Rated fuse short circuit making capacity at 415V	- 176 KA
Rated fuse short circuit withstand capacity	- 80 KA

11.2 Indicating Instruments

All electrical indicating instruments shall be digital square type of size suitable to the panel. These shall be suitable for flush mounting with only flanges projecting on vertical panel. Instrument dial shall be white with black numerical lettering.

Instrument shall conform to IS 1248 and shall have accuracy class 1.00 or better. The current coil and potential coil of Ammeters and Voltmeters respectively, shall withstand 120% of rated current and voltage, without loss of accuracy.

The meters shall have external zero adjustments. The ammeters fitted in the motor circuits shall have suppressed scale to indicate the maximum starting current. The instrument shall be provided with glass cover to avoid the possibility of measurements due to static charge.

The three phase three wire trivector meter shall comprise of KWH meter and KVAH meter mounted together with KVAH meter in one case with special summator mounted between them to register correct KVAH at all power factors.

All the factors shall have respective maximum demand indicators to record the average power over a period of half an hour. The trivector meter shall conform to relevant IS.

11.3 Under Voltage Relays

The induction disc type, single pole under voltage relay shall have inverse time voltage characteristics on all taps. The relay shall be designed to develop maximum torque at supply frequency and shall be insensitive to the voltage at harmonic frequencies.

The operating time shall be adjustable by time setting multiplier. Selection of the required voltage setting shall be possible by means of a plug setting bridge having an insulated plug. The relay shall conform to IS-3231.

12 Protective Relays

Relays shall be rectangular in shape, flush mounting type, having dust tight covers, removable from front, and shall be equipped with externally reset, positive action operations indicators. The relay shall have auxiliary units of either series connected or shunt connected type. All auxiliary relays shall be non-draw out type and protection relays shall be draught type with test facilities.

Test plug shall be supplied loose. All relays shall conform to the requirements of IS - 323 or relevant IEC in general and IS - 3231 in specific.

Relays shall be provided with adequate number of potential free self reset/hand reset output contacts as required. Provision shall be made for easy isolation of trip circuits of each relays for the purpose of testing and maintenance. Current transformer short circuiting arrangement shall be provided in case of draught type relays.

Voltage relays shall have sufficient thermal capacity for continuous energisation using external resistance, if necessary.

No control relay, which will trip a circuit breaker when relay is de-energized, shall be used.

13 CABLES

13.1 1100V/660V Grade cables shall be PVC insulated, PVC sheathed, G1 strip armoured, Aluminum conductor.

The control cables and cables for lighting system shall be with PVC insulated, multi stranded copper conductors. Cables in general shall conform to IS 694, IS 1554 part I & II, and cross section 25,16, 10, 6, 4, 2.5 and 1.5 sq.mm.

13.2 Laying of cables

Cables shall be laid directly buried on earth, in conduits along walls, ceiling etc. The cable installation shall conform relevant ISS.

- Cable inside the Sub-station/Building shall be laid in the prepared trench. If any hole or breaking of wall is required for cable laying work, it shall be done by the contractor and the wall shall be closed after completion of the work as original.

- The cable trench dimensions inside the Sub-station and the route shall be indicated to the civil contractor well in advance while Sub-station civil work is in progress, depending upon the cable entry, and location of different equipments, transformers, panels, etc.

- Laying of underground cables outside the building shall be done by excavating a trench covered by brick and sand of 0.75 metre depth for HT and LT cable and protecting each run of cable by sand and earth filling.

- The HT and LT cables shall be taken through the cable duct provided on the ground floor roof as shown in the sketch, by properly clamping.

- Fixing of cable on the wall by clamping the cable, using suitable GI clamps with wooden saddles. The distance between two clamps shall not be more than 750mm. The cables shall also be taken through PVC pipes on the wall. The cable route on the walls shall be decided with the Engineer in site. The cables shall be covered with GI plates, trays or wooden covering. Sharp bending, twisting and Kinking of cables shall be avoided. Suitable cable duct shall be provided in the wall connecting all switch rooms of Railways and Commercial Complex.

14. Distribution Boards

All the switch Boards, Panels shall be neatly wired using 1100/660V PVC insulated stranded copper cable of minimum 2.5 sq.mm. Copper Bus Bars also may be provided to suit the requirements.

Each wire shall be identified at both ends with cable marker.

Distribution Boards shall be housed in metal clad case or board conforming IS 4237. The Sub-distribution Boards shall be equipped with rigidly fixed miniature circuit breaker complying IS8828 in the phase leads with over load and short circuit protection. The MCBs shall have adequately sized terminals for the outgoing leads. The distribution boards shall have adequately rated phase and neutral bus bars of high conductivity copper. Earth bus bar with the necessary number of terminals for connecting the earth continuity conductors.

Each SDB shall have circuit schedule pasted or permanently fixed inside the cover stating the details of circuit controller and rating of MCB. Non-flammable insulating shields shall be provided to prevent fire hazards during operation of MCBs.
The Sub-Distribution Boards shall not be mounted at a height exceeding 180CM from ground level.

Main Distribution Boards shall be surface mounted. Main Distribution Boards shall be erected in each switching room, and sub-distribution boards shall be located according to the distribution of load and the equipments to be connected and its location.

15. Lighting System

15.1 Point Wiring

Point wiring shall include all work necessary to complete wiring from switch circuit of any length from the tapping point on the distribution circuit switchboard to the following:

- Ceiling rose for fans, lighting etc.
- Socket outlet (in the case of socket outlet points)
- Lamp holder (in the case of wall brackets, batten points, bulk head and similar fittings).
- Call bell buzzer (in the case of the works “via the ceiling rose/socket outlet or bell push where no ceiling rose/socket outlet is provided”).

15.2.1 Circuit wiring

Circuit wiring shall mean the length of wiring from the distribution board upto the tapping point of the nearest first points of that circuit, viz., upto the nearest first switchboard measured along the run of wiring. Such wiring shall be measured on linear basis.

16 Electric Motor

Type : Squirrel case induction motor suitable for continuous duty.
Standards : Performance - IS 325, IEC 34 Dimensions - IS 1231, IEC 71
Site condition : Ref. Ambient -45□C Max humidity - 100%
Cast iron body with integral feet and frame. The stator core shall be that of high grade carlite insulated low loss silicon steel lamination stacked together and fully

tightened. The rotor shaft made of high grade forged/rolled steel. A spacious terminal box to be provided to accommodate aluminum conductor cables.
Technical Particulars: Rated voltage: 415V+110%
Frequency: 50Hz+3%
Temperature rise of 75oC over ambient of 45oC
Enclosure: IP 55
Type of cooling: Totally enclosed fan cooled
Acceptable makes Siemens, NGEF, CGL, KEC

16.1 Auto transformer starter

Automatic auto transformer starter shall be assembled in 14 SWG sheet steel, floor mounted with following accessories

- Oil immersed auto transformer with 50%, 65% and 80% tapping including first filled oil.
- Bimetallic overload relay
- Timer on delay and off delay.
- Ammeter with CTS and selector switch.
- Voltage with selector switch.
- No voltage release
- Indicating lamp, Power On, Trip
  (Single phasing current sensing preventor with protection CTS)
- Thermo stat for oil temperature.(Optional)

17 Earthing

- Earthing in general shall comply with C.P.(Code of Practice) 3043 of Indian Standards.

- Earth electrode either in the form of pipe electrode or plate electrode should be provided at all premises for providing earthing system.

- As far as possible, all earth connection shall be visible for inspection and shall be carefully made.

- Except for equipment provided with double installation all the non-circuit carrying metal parts of electrical installation are to be earthed properly. All metal conduit trunking cases. Sheets, switch gears, distribution fuse boards, lighting fittings and all other parts made of metal shall be connected to an effective earth electrode.

- The main earth electrode should be a G.I perforated pipe driven into the soil as per standard practice. continuous looped eathing should be provided with adequate size G.I. wire /feat. Earthing work should conform to I.E. Rules.

- The electrodes shall be situated at a distance not less than 3.0 m from the building fencing structure and equipment foundations. The earth pit shall conform to IS: 3043 and GI earth electrodes of not less than 100 mm external dia shall be driven to a depth of at least 3 ma in the ground below the ground level. The surrounding the electrodes, soil shall be treated up with salt, coke and charcoal.

- Earth electrodes shall be installed near the main supply point and shall comprise a copper/GI earth of appropriate diameter and driven to depth of 3 metres below ground level,. or to a greater depth, if so required to obtain a sufficiently low earth resistance value. Alternatively copper plate mach be used as the main earth electrode conforming to IS: 3043. The electrodes shall be driven at least 3 m away from the building or any other earth station.

Minimum requirement of earth pits as per I.E. rules are as under:

- Two numbers independent for transformer body

- Two numbers independent for transformer neutral

- Two numbers independent for four pole structure

- One number for lightning arrestors.

- Two numbers of L.T. panel at sub-station and at pump house.

  the main earth electrodes after being driven into the ground shall be protected at the top by constructing a concrete or block masonry chamber of size 300 mm x 300 mm x height 300 mm. and shall be provided with CI cover. The resistance of any point in the earth continuity system of the installation to the main earth electrode shall not exceed 1.0 ohm. The remaining space in the borehole shall be filled with bentonite. The bentonite will hold the earth rod in position. The neutral conductor shall be insulated throughout and shall not be connected at any point to the consumers earthing system.

- An earth continuity conductors shall run continuously from the farthest part of installation to the main earth electrode and shall be connected by branch conductor to all metal casing and sheating housing electrical apparatus and/or wires and cables. all branch shall be connected to earthing. The earth continuity conductors shall have a cross-sectional area at least half to the size of the phase conductor and in no case less than 1.5 sq.mm of copper/GS.

- All earth wires and earth continuity conductor shall be galvanized M.S flats of appropriate size. Interconnections of earth continuity main conductors and branch wires shall be brazed properly, ensuring reliable,. Permanent and good electrical connections. The earth lead run on structures must be securely bolted. Neutral earth leads shall be run on separate supports without touching the body of the transformers. Earth wires shall be protected against mechanical damage and possibility of corrosion particularly at the junction points of earth electrodes and earth wire interconnections. Earth electrodes shall be connected to the earth conductors using proper clamps and bolt links.

- It shall not be allowed to use the armour of the incoming feeders cable to the sub-distribution board as the only earthing system.

- Sheathed lugs of ample capacities and size shall be used for all underground conductors for sizes above 3 mm2 whenever they are to be fitted on equipment of flat copper conductor.

- The lugs shall be fitted on equipment body to be grounded or flat copper only after the portion on which it is to be fixed is scrubbed, cleaned of paint or any oily substance on a subsequently tinned.

- No strands shall be allowed to be cut in case of stranded ground round conductors. G.I embedded conduits shall be made eclectically continues means of good continuity fixing and also be rounding copper wires and approved copper clamps.

17.1 Earthing of Lighting Poles

All external poles are to be looped together with continuos 8 SWG GI earth wire clamped at dollies provided on every fuse box of poles and looped onwards to the other pole. Every fifth pole shall be connected to earth through an earth electrode.

17.2 Earthing for Lighting Installation

This shall be common grid system, the main grounding conductor laid and embedded in concrete being grounded at earth pits outside the buildings at approved locations or other places. The earthing of L.T. panels shall be connected to two main grounding conductors each of which along with main cables shall run with cables to distribution boards in which floor. This shall run along with th4 cable and at the top floor be connected same section completing the grid.

17.3 Sizes of Earthing Conductors

S No	. System	Earthing conductor size and Material	
		Buried in ground/ Above ground concrete	
-	Main earthing grid	40 X 10 mm Copper	---------
	22 kV outdoor sub-station and 22 kV switchgear	40 X 10 mm Copper	50 X 6 mm GS
-	415 V switchgear, transformer, DG set, Control Panel	suitable to its	Suitable to its rating.
-	Battery charger	-	25 X 3 mm GS
-	415 VLT Motors		

-	Valve motors	10	SWG GS wire
-	0 - 15 HP	8	SWG GS wire
-	15 - 40 HP	4	SWG GS wire

-	40 - 50HP	25 X3 mm GS flat
-	50 HP and above	25 X6 mm GS flat
-	Lighting distribution Board, 30 V DC Tripping Unit.	25 X 3 mm GS flat
-	Local Push Button stations, Junction Boxes.	14 SWG GS wire
-	Lighting and receptacle system	12 SWG GS wire
-	earth Electrode	50 mm dia. 3000 mm long heavy duty GI Pipe electrode
-	Street lighting Poles	8 SWG GS wire

Notes: 1. Conductors above ground shall be galvanized steel to prevent atmospheric corrosion.

2. Conductors buried in ground or embedded in concrete shall be mile steel.

3 Drawings; The typical earthing details are shown on drawing.

17.4 Battery, Battery Charger & DC Distribution Board

- The charger and DC distribution board shall be enclosed on a common sheet steel enclosure with necessary compartment for each incoming and outgoing feeder.

- Complete information regarding battery layout, space requirement for locating battery, wall painting of battery room floor, ventilation, method of lighting etc. shall be supplied by the Contractor. The battery room shall preferably be located inside MCC room as shown,. The battery room shall have acid proof tiles as flooring and upto 4 ft. level. Also there shall be an exhaust fan of appropriate capacity to extract vapours from the room.

17.5 Tests

- Batteries and battery chargers shall be routine tested before despatch,in accordance with Indian Standards. Capacity test shall be carried out on the batteries at site after installation.

18. Street Light

Street Light fixtures shall be complete with 35 Watts DIE CAST Aluminium LED Light Fittings.

19. Street Light Poles

Street Light Poles shall be of 6 mtr GI Coated Spiral Pole Shaft (size 70x130x3mm. Effectively 5.50 mtr mounting height of the luminaries & total height - 6 mtr),Base

plate-200x200x12 mm,PCD-200 with Two coat Polyurethane Anti Corrosive Paint over a base coat and its accessaries.(including Supply of foundation Bolt (M16x500-4 Nos) template and base plate-200x200x12 mm,Bracket- Single,packing and forwarding charges and all taxes and duties etc complete.(for STP Campus lighting) A suitable MS box to have 5A control switch, 16A fuse unit with suitable frame work shall be fitted in the street light mast with door and locking arrangements.

A terminal box with fuse shall be fixed in all the poles.

20. Capacitor

To improve the power factor capacitor shall be provided in the LT bus bar in the sub station.

- The capacitor shall be as per ISS 2834 and IS 2544.
- The capacitor shall be all polypropylene film capacitors. The film shall be oriented bi-axially.
- The oil used for impregnation under vacuum shall highly purified non- toxic.
- Low loss discharge resistance, to reduce the residual voltage to 50V or less within one minute after the capacitor is disconnected.
- The capacitor container shall be painted with epoxy-based paint, to prevent corrosion/rusting.
- 4 stage switching ON/OFF shall be provided to match with the load.
- Automatic Power Factor Correction Unit shall be provided if necessary.

21. Safety

The following minimum safety equipments shall be supplied and installed in the Sub-Station switch rooms and Diesel Generating rooms.

- Portable chemical fire extinguishers conforming to IS 935 or its latest version shall be supplied and installed at the Sub-Station, Switch rooms and Diesel Generating Stations.
- Fire buckets with M.S. angle stand each consisting of 4 Nos. round bottom fire buckets painted with red and marked fire and filled with clear dry river sand shall be supplied and installed at a convenient locations at the proposed Sub-Station.
- First-Aid boxes equipped fully with required materials, shall be supplied and kept at a convenient place in the Switchgear room so that the same is easily accessible.
- Shock Treatment chart.
- Rubber matting of not less than 25 mm. thick and 600 mm width and standard lengths, shall be provided in from of all the switch gear panel, Transformer, Control cubicles, etc.
- Rubber gloves tested for 15 KV about 4 sets shall be supplied.

22. Diesel Generating Equipment

Supply delivery erection Testing and commissioning of Silent Outdoor Generator set of following capacities with complete enclosure with lock and key arrangement mounted on suitable concrete pedestal as per standard specification and model with suitable Diesel Engine, water cooled, developing required BHP, electrical starting arrangements, coupled with alternator of capacity 400 KVA with silent proof eco friendly Genset of reputed make 3 phase 415V 1500rpm with AMF Panel, base frame, fuel tank, radiator, battery with lead with other std accessories with powder coated canopy designed like box structure and acoustic enclosure silencer mounted inside/out side canopy lockable doors ,fuel filling arrangements externally accessible emergency stop button and temperature raise inside canopy maintained with 5 to 7 degree etc., complete with central pollution control board approved type with ISI marking and third party inspection certificate etc., complete including erection and commissioning complete with cables conforming to TNPCB Norms. DG SET AMF PANEL Specifications: The control cubical shall be of fabricated construction made of best quality sheet metal and is of the free standing/floor mounting type.It shall be provided with removable side panels and s hinged front panel for easy accessibility.Suitable provisions for connecting incoming and outgoing loads are made on the control panel.The standard instruments to be incorporated in the AMF Panel are as follows

1.AC Voltmeter - 1 No.

2.Voltmeter selecter switch- 1 No.

3.AC ammeter suitably scaled with Selecter Switch.

4.Battery charging set cinsisting of.- 1 No.

a)Transformer/Rectifier

b)DC Ammeter-

c) Charging rate selecter switch OFF/TRICKLE/OFF BOOST

d) DC VOLTMETER

5.Main supply contacter (3pole)-1 No.

6.Current Transformers- 3 Nos

7.Low voltage high rupturingcapacity fuses for shortcircuitprotection of the main supply-1 set

8. Alternator Contactor-1 No.

9. 3 Pole bimetal release for overload protection of alternator.-1 No.

10.Main voltage monitor - 1 No.

11.Set of DC control relays incorporating engine ,start,stop,three attempts starting facility and failure to start ,lockout.-1 No

12.Selector switch. AUTO / MANUAL. - 1 No

13.Push Button " Start".- 1 No.

14.Push Button "Test"- 1 No.

15.Push Button " Stop". - 1 No.

16.Signal Lamp for indicating " LOAD ON SET "- 1 No.

17.Signal Lamp for indicating " LOAD ON MAINS "- 1 No.

18.Signal lamp for indicating "SET FAILS TO START"

19. 4 pole Double brake fuse switches with mechanical interlock. - 2 Nos

22.1 General

-Electrical power supply for each pumping station will be availed from nearby TNEB supply point. According to the load requirement HT at 11KV/22KV or LT at 415V - 3 Phase will be availed from TNEB.

- One Diesel driven alternator set of capacity as specified shall be provided to permit operation of the Pumping Station in the event of failure of the TNEB electricity supply, complete with all equipments like. The equipment shall conform to the latest relevant ISS or BS.

- Control gear, circuit breakers, cabling, synchronising equipment etc.

- The engine alternator sets shall be designed such that the starting power peak shall not exceed 10 per cent of the continuous engine rating and the voltage dip shall not exceed 15 per cent whilst starting the connected load under the worst conditions.

- The Contract Drawings show the building, floors and other details as they will be constructed and the space allocated for the generating plant, control gear and circuit breakers. If any departures from the proposed layout are necessary the Contractor shall show the modifications on the drawings submitted with his Tender, and shall can attention to these suggested alterations.

- Tenderers attention is specifically drawn to the operating conditions where by generator sets could be running at little or no load due to the intermittent and differing flow rates and pump capacities.

- A system using dummy loads to maintain a safe minimum working level is envisaged and the Tenderer is required to comment upon this or any other proposed system at the time of Tender submission together with supporting documentation and calculations.

23 Statutory Approval

The Contractor shall be totally responsible for obtaining statutory approval from the electrical inspector or any other statutory authority for the entire installation carried out by him unless otherwise specified and agreed. Necessary test reports shall be submitted by him to electrical inspector. This will be an integral part of the contract and shall not be paid for separately. However fees payable to statutory authorities shall be borne by the tenderer.

24 Acceptance of Installation

On completion of the work the Engineer, together with the Contractor, will carry out an inspecting of the installing. The Engineer will issue a completed copy of the Purchaser's Acceptance of Electrical Installation to the Contractor as confirmation that the work has been accepted, subject to any matters noted on the form being attended to.

B. PUMP SETS AND ACCESSORIES

1 General

1.1 All the Materials used shall confirm to the relevant BIS and should be delivered at site of work. The Contractor is responsible for safe custody of machinery and other equipments under this contract till handing over to the employer.

1.2 The rates should include all the minor items of civil works, if any required for installation complete.

1.3 All necessary civil works for erection of all equipments and accessories offered by the contractor under this contract should be done by the contractor

1.4 Test certificates for machinery and equipments should produced along with supply

1.5 The bidder should enclose the performance curve duly indicating the duty point for the size of the impeller selected (family curve should not be furnished). The Performance curve should furnish complete range of operation and the curve should be authenticated by the manufacturer or his authorized dealer. In the event of non compliance the offer shall be summarily rejected.

1.6 The contractor shall make necessary arrangements to get supply of electricity from TNEB for operating the machinery and equipment. Necessary payment to be made to the EB shall be borne by the employer

1.7 Before supply of machinery, equipments and other accessories prior approval of the Engineer should be obtained giving the name of makes and other details required.

1.8 Obtaining approval of electrical layout diagram for the installation of all the equipments (transformers, generators, pumpsets and other accessories) and obtaining safety certificates on completion of work from Chief Electrical Inspector to Government of Tamil Nadu should be arranged and got approved by the contractor at his cost.

1.9 All the materials should be supplied as per BOQ and should be of standard makes mentioned below:-

Sl No	Description	Make
1	Submersible Pump and motor	KSB/ Calama/Waterman/Atlanta or equivalent
2	Make of Motor	Jyothi/ NGEF/ GEC/ Crompton & Greeves/ Siemens or equivalent
3	Make of Transormer	Kirloskar/ GEC/ Indo TECH/ Hidustan or equivalent
4	Diesel Generator	Kirloskar/GEC or equivalent
5	Starter	L&T/ Cutler Hammer/ Siemens/ Siemens/MEI or equivalent
6	Switch Fuse and circuit breaker	L&T/ Cutler Hammer/ / Siemens,/MEI or equivalent
7	Cables	Finolex/ Unista/ Uniflex, or equivalent
8	Valves	Kirloskar/Venus/ Upadyaya CALSONS/ or equivalent

1.10 The right of choosing the make among the makes offered by the contractors rest with the employer only

1.11 The submersible pumps centrifugal pumps, turbine pumps, submersible motors, motors for turbine and centrifugal pumpset transformer, generators, Panel Boards, to be supplied by the firm will be inspected by the Inspecting Agency fixed by the Employer at the manufacturers premises and test certificate will be issued. The contractor should make necessary arrangements for the inspecting staff at his own cost for testing the above pumpsets.

1.12 If the complete plant or any portion thereof is found to be defective the Engineer shall give the contractor a notice in writing to verify such defects. If the contractor fails to rectify the defects within the specified period the Engineer will rectify the defects at the contractor's risk and cost.

1.13

2(a) SUBMERSIBLE PUMP

The pump shall be of latest standard designed to give maximum efficiency when operated under most exacting condition at speed 1500/3000 rpm. The equipment shall confirm to the following specifications as per IS 8030 – 1996.

I. PUMP BOWL

The pump bowl shall be manufactured to offer resistance to corrosion. The bowls may be equipped with replaceable bearing.

The bowl assembly shall bear a name plate giving the following information.

a. Name of the manufacturer or trade mark

b. Serial Number of the pumpset

c. Pump type

d. Number of stages

e. Total head

f. Capacity

g. Speed

II. IMPELLERS

The impellers shall be open or closed or semi closed type. They shall be turned and accurately finished and balanced on their own pump shaft for maximum lifting capacity without over loading the prime mover irrespective of water level fluctuations. The impeller may be of the enclosed or semi enclosed type and shall be properly balanced. Dynamic balancing is recommended. Enclosed impellers may be equipped with sealing rings on their hubs.

III. PUMP SHAFT

The pump shaft shall be stainless steel of ample size and stiffness to transmit maximum power without strain or vibration. The pump shaft shall be guided by bearings provided

below and above the impeller shaft assembly. The shaft without protecting sleeves shall have a surface finish of 0.75 micron.

IV. BEARING SLEEVE

The bearing sleeve shall be of leaded bronze

V. DISCHARGE CASING

The discharge casing shall be manufactured to offer resistance to corrosion

VI. SUCTION CASING

The suction casing shall be manufactures to offer resistance to corrosion

The opening in the suction case of the entrance shall be of proper size and shape to reduce loss.

The suction case shall be fitted with a strainer made of corrosion resistant materials.

Suitable guard shall be provided just above the suction case bearing to prevent the entry of foreign matter into the suction case.

VII. COUPLING

A suitable coupling arrangements shall be provided in case of directly coupled pumpsets.

VIII. NON RETURN VALVE

Non return valve shall be provided above the pump discharge case.

9.CHARACTERISTIC CURVES;

The performance curves for the full range of operation indicating the head in metre, efficiency and BHP absorbed at the pump shaft against the output in litres per minute shall be furnished.

2(b) SUBMERSIBLE MOTORS

I. TYPE

The submersible motor shall be wet type, squirrel cage induction motor suitable for operation on 360/440 Volts. 3 phase 50 Cycles AC supply and capable of developing the required HP at a speed 1500/3000 RPM. The motor windings and the bearing bushes of the rotor shaft shall be lubricated by pure water or oil, filled in the motor before erecting the pumpsets. The motor shall confirm to IS 9283 – 1979

The motor shall be connected by means of cable glands rubber seals etc., from inside of bore well to arrest the entry of sand and other foreign matter.

The motor shall be provided with a breathing attachment like bellows diaphragm etc., to compensate the Volumetric variation due to changes in the temperature. The motor shall be made of corrosion resisting materials or suitable treated materials to resist corrosion under normal condition.

II. BEARINGS

The thrust bearing shall be of adequate size to withstand the weight of all rotating parts as well as the imposed hydraulic thrust. These shall be lubricated suitably. The thrust bearing housing shall be provided with a drain plug to empty the oil pure water filled into thrust bearing housing rotor.

III. MOTOR

The motor shaft shall be provided with shaft protective sleeves having a surface finish of 0.75 micron.

IV. EARTHING ARRANGEMENT

The earthing of motor shall comply with IS;3043-1966 Code of practice for earthing provision shall be made for double earth copper connection. Two separate lead should be taken to two separate earth pits located outside the pump house.

V. V) TEMPERATURE RISE

The insulation should be perfect so as to limit the temperature rise in windings.

VI. OUTPUT

The motor shall be capable of developing the Mechanical output for the required conditions and shall have continuous normal rating to suit the maximum load when operated at the pump speed.

VII. TECHNICAL DATA

The motor HP shall be such that to safety take the load when the total head is reduced by the rise of water level.
The H.P.of the motor offered shall have a Margin above the H.P. absorbed by the pumpset at duty point and also above the maximum BHP absorbed by the pumpsets at duty point and also above the maximum absorbed by the pumpset offered.

VIII. OVERLOAD CAPACITY

The motor shall be capable of withstanding the over load specified in the relevant condition of BIS.

IX. STARTING

The motor shall give full load torque when taking 1 to 1.5 times full load current. The motor shall have a name plate giving the following information.

a. Induction motor

b. Name of manufacturer.

c. Manufacturers number & frame reference

d. Type of enclosure

e. B.H.P.

f. Rated voltage and winding connections.

g. Rated output in K.W.

h. Number of phases

i. Frequency in HZ

j. Current approximate in amperes at rates output

k. Speed in revolutions per minute at rates output

STARTERS

The Starters shall suitable for the Motor offered. This should have single phasing preventor, mounted on Ammeter, suitable capacity fuses etc., with all the standard safety devices such as no volt coil, over load releases with time lag arrangements dry running preventor suitable inter locking devices, cable entries , name plates and earthing facilities etc.,

These starters to be supplied should be of DOL upto a range of 5 HP, Star delta starter upto the range of 15 HP and Auto transformer starter above range of 15 HP.

SWITCH BOARD

The switch board shall complete with all necessary internal connections and accessories as mentioned in the BOQ and as per latest IE Rules and CEIG regulations. This switch Board should contain all equipments house in cubicle, the bus bars should have ample current carrying capacity for connected load and painted with powder coated painting.

CABLES

The cables shall be supplied as mentioned in BOQ with ISI mark, Laying and jointing of cables shall be as per IE Rules. The cable should have current carrying capacity to withstand over load due to low voltage drop. Cable jointing should be done in such manner that there is adequate bondage strength and safety to equipments and operators.

EARTHING

Twin copper earthing of the plant and equipments shall be done as per IS 3043/1966 and IE Rules 1996 and amended from time to time. Two separate lead should be taken to two separate earth pits located outside the pumphouse.

PUMPHOUSE, WIRING AND LIGHTING

Pump house wiring and lighting shall be carried out, as per IE Rules with sufficient no of light points, lamps and other accessories (to be supplied by the contractor) as prescribed in the BOQ and shall be of standard make.

LAYING AND JOINTING

The items of laying and jointing of pipes, specials and valves should include the necessary clamps, supports, trenches, wherever necessary.
Supporting studs, bolts, nuts, washers, necessary jointing materials together with spare bolts and nuts and jointing materials shall also be supplied free of cost.

ERECTION AND TESTING

The contractor shall provide a skilled Engineer and skilled labour for the entire execution of the work and final testing of the plants at sites.

All erection tools including spanners, diesets, etc., shall be supplied by the contractor and the contractors representatives shall have full and uninterrupted access to the site during erection.

The employer may be depute any officer under his control to visit the work at any time during the stage of erection for inspection. The plant shall be tested by employer. Post/ delivery inspection by the third party inspection agency in the presence of the firm's engineer or any other representative to ensure performance and all testing equipments as may be reasonably required shall be provided by the contractor.

Installation testing and commissioning should be in accordance with relevant ISS. The pre delivery inspection certificate for the pumpsets, panel board and other equipments and TNEB. Test certificate for transformer to be obtained by the bidder.

SPARE PARTS

Supply of spares and Tools shall be made as per the list prescribed in BOQ with index card.

TOOLS

Standard tools for the maintenance of the equipments shall be supplied as detailed.

D/E Spanners	1 set
Ring spanners	1 set
Bearing puller	1 No.
Grease gun	1 No
Hand Gloves tested for Electrical operation	1 pair
Ball Peen hammer	1 No
Screw drivers	1 set
Electrical tester	1 No
Electric megger	1 No

3. Submersible Sewage pump

Non clog submersible pump set

General

The submersible sewage pump shall be mono-block type of non-clog design. It shall be suitable for pumping raw unscreened sewage containing sludge, long fibers, plastic pieces, cigarette butts, etc. The pump shall be able to pass through soft solids of minimum 100 mm

dia and capable of dealing with sewage / sludge with specific gravity of 1.05. Pumps shall be of 960 rpm for high duty pump and 960/1450 rpm for low duty pumpsets.
Impellers shall be of single / double vane non-clog design. Additionally, a special contra-block cutting and tearing system should also be incorporated on the suction side of the pump for disposing off soft material which would otherwise clog the pump.
Maintenance free antifriction, permanently grease filled ball bearing shall be provided and this shall take care of all the axial and radial forces at any point of operation. The weights of the revolving parts of the pumps including the unbalanced hydraulic thrusts of the impellers shall be carried by thrust bearings provided in each pump assembly.
The pump installation design shall be such as to facilitates automatic installation and removal of the pump without having to enter into the sewage pit. Profile gasket shall be provided in automatic coupling system so to avoid metal to metal contact between the pump and delivery bend to ensure leak-proof joint.
Pump Constuction
Pump Casing
Pump casing shall be of CI as per IS 210 Gr FG 200 with 2.0% to 3.0% nickel. The internal surfaces shall be free of rough spots. The casing shall have centre line discharge.
The high capacity pumps at New Pumphouse shall work in parallel two at a time to discharge peak flow. Third pump will be stand by.
Impellers
Impellers shall be of stainless steel (CF8M) construction. Impeller shall be of single/double vane non clog design. Additionally, a special contra-block cutting and tearing system should also be incorporated on the suction side of the pump for disposing off soft material which would otherwise clog the pump.
Pump Shaft
The pump shaft shall be of stainless steel (SS-410) as per manufacturer's standard. The shaft shall be of one piece construciton.

D/E spanners	1 set
Ring spanners	1 set
Bearing puller	1 No
Grease gun	1 No
Hand gloves tested for electrical operation	1 Pair
Ball peen hammer	1 No
Screw Drivers	1 set
Electrical tester	1 No
Electric megger	1No

4.TESTING OF PLANT:

General

The requirements for testing shall be as specified below.

Pumps, valves and pipework and general purpose machinery

Off-site inspection and testing

(a) Pumps

Pumps shall be individually tested in accordance with Relevant IS Code and the tests shall be with clean water. Site conditions shall be simulated as nearby as possible including the NPSH condition. Pumps shall be tested with their own prime movers. Where it is

impracticable to include the full length of the connecting shaft, the Contractor shall state the allowances to be made for the losses incurred by its omission and shall demonstrate the accuracy of the allowances to the satisfaction of the Engineer. Pumps shall be tested at the guaranteed duty point and over the full working range from the closed valve condition to 20 percent in excess of the quantity when a single pump runs alone at minimum head. The tests shall provide information for performance curves to be drawn for head/quantity, efficiency/quantity, power absorbed/quantity and net positive suction head/quantity. Readings shall be taken at a minimum of seven points in addition to shut-off condition. Each pump shall also be run at its duty point for at least 30 minutes.

Positive displacement pumps shall be tested in accordance with BS EN ISO 9906.

For eccentric helical rotor pumps the tests shall provide information for performance curves to be drawn for pump speed/flow, input power absorbed/flow differential pressure/flow and pump efficiency/flow.

Pump casings shall be subject to a pressure test at 1.5 times the pressure obtained with the delivery valve closed. The positive suction head when installed shall be taken into account in determining this pressure. During the test, the casing and joints shall show no signs of leakage, distortion or defect.

In addition to confirming the specified hydraulic performance of the pumpset, the test shall demonstrate that vibration is within the specified limits, the mechanical performance is satisfactory and the noise level is within the specified limit.

Additionally chemical dosing pumps shall be tested in accordance with API standard 675 and the specified flow linearity, steady state accuracy and flow rate shall be demonstrated.

(b) Gate valves

Gate valves shall be tested in accordance with relevant IS Codes or equivalent whichever applies, valve seat tests shall be made under open-end conditions, the test pressure being applied to each face of the valve in turn.

(c) Butterfly valves

Butterfly valves shall be tested in accordance with IS Codes or equivalent. The seat test shall be for tight shut-off and low leakage. Valves shall be tested under maximum unbalanced water test pressure in either direction.

(d) Air valves

Air valves shall be water tested for drop-tightness at all pressures from 0.2 bar in steps of 2 bar up to the specified pressure. The valve body shall be water tested at 1.5 times the specified pressure, at which pressure no damage or permanent deformation of the valve body, ball or seat shall occur.Two valves of each type and size incorporating large orifices shall be tested for exhaust of air at a differential pressure up to 1 bar in steps of 0.1

bar and for inflow of air at a differential pressure up to 0.5 bar in steps of 0.1 bar. During the tests the air flow rates shall be measured by orifice plates in accordance with BS 1042. Pressures (positive or vacuum) shall be measured by Bourdon tube gauges or by mercury-in-glass manometers. The temperature of the flowing air shall be measured in accordance with relevant parts of IS Code or equivalent. The barometric pressure shall also be measured.

If the manufacturer provides results of independently witnessed air flow tests similar to those specified and these are accepted by the Engineer, the specified airflow tests shallbe deemed to be completed.

(e) Pressure and flow control valves

Pressure and flow control valves shall be tested hydrostatically as follows:-

Body strength:	closed-end test, valve open, test pressure 1.5 times working pressure;
Valve element strength:	open-end test, valve closed, test pressure of 1.5 times working pressure applied to each end;
Leak tightness:	open-end test, valve closed, test pressure of the working pressure applied to inlet end, no visible leakage permitted.

(f) Pipe work

Pipe work shall be tested in accordance with the appropriate IS Codes or equivalent.

(g) Castings

Castings shall be tested hydrostatically to 1.5 times the maximum working pressure for a minimum period of 1 hour.

(h) Surge vessels

Surge vessels shall be tested in accordance with the relevant IS Codes or equivalent.

Electric motors

Off-site inspection and testing

Motors shall be inspected and tested to show that they are compliant with the Specification and approved drawings.

Tests shall be in accordance with the relevant IS Codes or equivalent..

For low voltage standard production motors for general use, the tests shall be routine checks. For high voltage and low voltage motors for main drive application, the tests shall be duplicate. If the test to determine the locked rotor current of cage induction motors is carried out at reduced voltage, allowance shall be made for the effect of saturation when adjusting

for rated voltage. The estimated value of locked rotor current at rated voltage shall be stated on the test certificate.

A Polarisation Index test shall be carried out for high voltage motors.

The requirement for "basic" or "special" tests shall be as specified.

Individual Tests

Each motor shall be inspected prior to site testing for:-

- Absence of damage during transportation and erection;
- Absence of moisture or other contamination;
- Ventilation openings and drain holes are free of debris;
- Cable glanding and core terminations for tightness and identification;
- Free rotor rotation;
- Free movement of brush gear;
- Remote start/stop/E.stop control box wirings and arrangement;
- Starting interlocks

Unless otherwise specified the following tests shall be carried out on each motor before energising:-

- Winding insulation resistance;
- Polarisation Index for high voltage motors;
- Insulation resistance between motor and heater windings and ancillary devices;
- Calibration of winding and bearing temperature monitoring devices and the operation of alarm and trip initiating contacts;
- Continuity and resistance of winding thermistors;
- Bearing insulation integrity;
- Brush pressure.

Any other tests recommended by the manufacturer or stipulated in the the relevant IS Codes or equivalent. On the satisfactory completion of the inspection and tests listed above, motors shall be energised to check for correct direction of rotation, noise and the vibration levels are within the specified limits. The tests shall be carried out with the motor uncoupled from the driven plant.

Transformers

Off-site inspection and testing

Transformers shall be inspected and tested to show that they are fully compliant with the Specification and approved drawings and shall include the following tests as a minimum:-

- Routine tests;
- Measurement on winding resistance;
- Ratio, polarity and phase relationship;

- Impedance voltage;
- Load loss;
- No-load loss and current;
- Insulation resistance;
- Induced over voltage withstand;
- Separate source voltage withstand;
- Magnetic circuit voltage withstand
- Transformer tank oil leakage test (1 kg/cm2 for 24 hours);
- Transformer noise level measured in accordance with methods and procedures detailed in IEC 551 -Noise level shall not exceed 65dBA;
- Tap changer switching, mechanical and electrical tests according to BS4571;
- Zero sequence impedance measurement;
- Type tests;
- Impulse voltage withstand test;
- Temperature rise test;
- On load tap changer panels;
- Operational tests;
- Sequence tests.

Unless otherwise stated by the Engineer at the time of placing the order, evidence of records of satisfactory type test carried out on identical transformers to those ordered will be accepted in lieu of actual tests on transformers manufactured under this Contract for impulse voltage withstand test. Temperature rise test shall be carried out on one transformer of each size and type. The guaranteed no-load and load losses of each transformer shall be verified at the manufacturer's works. The positive tolerances stipulated in BS 171 shall not be accepted. The Board reserves the right to reject any transformer which does not achieve its declared guaranteed values.

Individual Tests

The Site inspections and tests to be carried out are as follows:-

- Ratio, polarity and phase relationship;
- Impedance voltage;
- Insulation resistance;
- Oil and winding temperature gauges shall be calibrated and tested;
- Pressure gauges and oil level indicator relays shall be tested with pilot cables connected by mechanical operation of contacts;
- Tap changer equipment including protective devices shall be tested to ensure correct operation;

• Oil tests;

Samples of insulating oil shall be taken and subjected to dielectric strength tests. If the insulating oil fails the site test, the Contractor shall carry out the drying of oil to remove the moisture content or replace the oil and then carry out the oil tests again to comply with the relevant IS Codes or equivalent.

5. COMPLETION PLANS

The successful bidder shall be requested to furnish completion plans in triplicate within one month from the date of the first testing of the plants. The plan should show the entire layout of the plant executed. Five copies of plan should be supplied to the Employer and one to be framed and suspended in the Head works. The contractor shall in addition to the above furnish detailed specifications of the equipment provided to the Employer with all technical data.

6. MAINTENANCE MANUAL

The periodical maintenance schedules for each equipment shall be given with reference to the hours of operation. Detailed information about the spare parts (part name, identification number etc.) should be given. The copies of the manuals should be furnished within one month from the date of commissioning.

7. The contractor should supply one set of tools for the pumpset maintenance of the machinery and equipments supplied by them under this contract.

8. .General

8.1 Cable lengths given are only approximate and payment will be made for the actual lengths of cable laid.

8.2 The contractor has to make necessary arrangements to get supply of electricity from TNEB for operating the machinery and equipments. The necessary service connection and S-D charges will be paid by the Board.

8.3 The Contractor should obtain all approvals for the installation and commissioning of machineries and accessories offered by them from the respective inspecting authorities such as GEIG or CIFG etc. Fees if any, to be paid to the inspecting authorities will be reimbursed by the Board.

8.4 Before supply of the machinery equipments and other materials, prior approval of the Engineer should be obtained giving the name of maker and other details required.

9 Electrical Wiring and installation of fittings

9.1 The materials used for conforms to the relevant I.S.S wherever applicable. The make and other details of materials to be used should be furnished along with the tender.

9.2 Continuous earth connection are to be made with 14 SWG T.C. wire.

9.3 The wiring work done shall be neat, true to line, level etc. and in such a way that it gives an impressive and aesthetic appearance to the building.

9.4 The actual location and number of points for lights, fans power plugs etc. may be altered at the time of execution by the Engineer.

9.5 Entire wiring and cabling work should be done as per IE rules.

9.6. Any damages or breakages, chipping etc. caused by the electrification works to the structures have to be rectified by the contractor at his cost to the satisfaction of the Engineer.

9.7. The Contractor has to test and every point after completion of wiring to the entire satisfaction of the Engineer by taking temporary supply from the existing service.

9.8. Wiring to light point (both internal and external) and fan point will be treated as complete only when supply as well as connection upto the ceiling rose is completed.

9.9. Whenever conduit pipe wiring is done, cover for switch boards containing switches, plugs, etc. should be of hylam sheet or other specified sheet only.

C.PUMPSETS AND ACCESSORIES (Non-Clog)

1 General

1.1 All the Materials used shall confirm to the relevant BIS and should be delivered at site of work. The Contractor is responsible for safe custody of machinery and other equipments under this contract till handing over to the employer.

1.2 The rates should include all the minor items of civil works, if any required for installation complete.

1.3 All necessary civil works for erection of all equipments and accessories offered by the contractor under this contract should be done by the contractor

1.4 Test certificates for machinery and equipments should produced along with supply

1.5 The bidder should enclose the performance curve duly indicating the duty point for the size of the impeller selected (family curve should not be furnished). The Performance curve should furnish complete range of operation and the curve should be authenticated by the manufacturer or his authorized dealer. In the event of non compliance the offer shall be summarily rejected.

1.6 The contractor shall make necessary arrangements to get supply of electricity from TNEB for operating the machinery and equipment. Necessary vouchers in original for the payment made to the EB shall be produced to the employer by the contractor which shall be reimbursed by the employer.

1.7 Before supply of machinery, equipments and other accessories prior approval of the Engineer should be obtained giving the name of makes and other details required.

1.8 Obtaining approval of electrical layout diagram for the installation of all the equipments (transformers, generators, pumpsets and other accessories) and obtaining safety certificates on completion of work from Chief Electrical Inspector to Government of Tamil Nadu should be arranged and got approved by the contractor at his cost.

1.9 All the materials should be supplied as per BOQ and should be of standard makes mentioned below:-

Sl No	**Description**	**Make**
1	Non-Clog Submerssible Pump	Kirloskar/Kishore/KSB/Grundfos / Aqua .
2	Make of Motor	Jyothi/NGEF/GEC/Crompton & Greeves/ Siemens
3	Make of Transormer	Kirloskar/GEC/Indo TECH/Hidustan
4	Diesel Generator	Kirloskar/GEC
5	Starter	Built by any CPRI approved panel builder
6	Switch Fuse and circuit breaker	L&T/Cutler Hammer/Siemens/Schnider
7	Cables	Finolex/Unista/Uniflex, or equivalent ISI branded
8	Valves	Venus/Upadyaya/CALSONS/Durga

1.10 The right of choosing the make among the makes offered by the contractors rest with the employer only

1.11 The submersible pumps centrifugal pumps, turbine pumps, submersible motors, motors for turbine and centrifugal pumpset transformer, generators, Panel Boards, to be supplied by the firm will be inspected by the Inspecting Agency fixed by the Employer at the manufacturers premises and test certificate will be issued. The contractor should make necessary arrangements for the inspecting staff at his own cost for testing the above pumpsets.

1.12 If the complete plant or any portion thereof is found to be defective the Engineer shall give the contractor a notice in writing to verify such defects. If the contractor fails to rectify the defects within the specified period the Engineer will rectify the defects at the contractor's risk and cost.

2 Submersible Sewage pump

Non clog submersible pump set

General

The submersible sewage pump shall be mono-block type of non-clog design. It shall be suitable for pumping raw unscreened sewage containing sludge, long fibers, plastic pieces, cigarette butts, etc. The pump shall be able to pass through soft solids of minimum 100 mm dia and capable of dealing with sewage / sludge with specific gravity of 1.05. Pumps shall be of 960 rpm for high duty pump and 960/1450 rpm for low duty pumpsets.

Impellers shall be of single / double vane non-clog design. Additionally, a special contra-block cutting and tearing system should also be incorporated on the suction side of the pump for disposing off soft material which would otherwise clog the pump.

Maintenance free antifriction, permanently grease filled ball bearing shall be provided and this shall take care of all the axial and radial forces at any point of operation. The weights of the revolving parts of the pumps including the unbalanced hydraulic thrusts of the impellers shall be carried by thrust bearings provided in each pump assembly.

The pump installation design shall be such as to facilitates automatic installation and removal of the pump without having to enter into the sewage pit. Profile gasket shall be provided in automatic coupling system so to avoid metal to metal contact between the pump and delivery bend to ensure leak-proof joint.

Pump Construction

Pump Casing

Pump casing shall be of CI as per IS 210 Gr FG 200 with 2.0% to 3.0% nickel. The internal surfaces shall be free of rough spots. The casing shall have centre line discharge.

The high capacity pumps at New Pump house shall work in parallel two at a time to discharge peak flow. Third pump will be stand by.

Impellers

Impellers shall be of stainless steel (CF8M) construction. Impeller shall be of single/double vane non clog design. Additionally, a special contra-block cutting and tearing system should also be incorporated on the suction side of the pump for disposing off soft material which would otherwise clog the pump.

Pump Shaft

The pump shaft shall be of stainless steel (SS-410) as per manufacturer's standard. The shaft shall be of one piece construction.

Pump Bearings

Pump bearings shall be of the antifriction type. The bearings shall be able to take normal thrust loads due to unbalanced hydraulic loads on the impellers plus the weight of all

rotating parts of the pumps. Pump bearings shall be designed with a minimum life of 40,000 hours. The bearings shall be grease lubricated for life, and shall be maintenance free.

Guide Rail Assembly

The assembly shall have CI pedestal, bracket, delivery bend, MS Galvanized guide rail pipe of 50 mm NB of Class C, upper guide rail holder, etc. The pedestal and bracket shall provide automatic coupling between pump delivery flange and discharge bend (standard bend / duck foot bend). Alternatively, the guide system can be with wire rope and pedestal cast integrated with discharge bend.

Mechanical Seals

Double mechanical seal shall be provided to prevent pumped liquid entering into the motor winding. The seal shall be situated in oil chamber to ensure proper lubrication. The seals shall be fail proof at the depth of submergence involved in each case.

The face combination of lower mechanical seal shall be silicon carbide. Vs. Silicon Carbide and upper mechanical seal shall be Carbon Vs Chrome Steel.

Moisture Sensor

Moisture sensor (seal monitor) shall be provided in the oil chamber to detect the failure of the mechanical seal.

The sensor will trip the pump-motor in the event of ingress of moisture into the oil chamber.

Lifting Chain

Each pump shall be provided with carbon steel lifting chain of adequate strength. The chain shall have rings of same size, fixed at an interval of about 1M for engaging the hook of the chain pulley block.

Foundation Nuts and Bolts

S.S. foundation nuts and bolts shall be provided

Protective Coating

The pumps shall be epoxy painted

Pump Balance

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

Submersible Motor

Motor shall have integral cable entry port and cable entry shall be properly sealed. It shall have provision for preventing reverse rotation.

Each phase of the motors shall be provided with thermic switches with bimetallic electromechanical temperature detectors. The motor shall operate satisfactorily at all operating levels in wet well.

Motor shall be sealed against entry of liquid being pumped by using two mechanical seals.

Submersible Motor Cable

Each pump shall be provided with submersible cables as specified in BOQ both for power and control cables.

Special Condition

The make of the submersible pump offered by the tenderer should be of known performance in Metrowater / TWAD.

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

The submersible pumps shall be suitable for pumping contaminated effluents, industrial waste water, storm water, sewage etc.

The pump shall be vertical spindle type, having duties as specified below. The pumps shall be capable of handling 100 mm size solids. The impeller shall be non-clog and semi-open type.

Double mechanical seals shall be provided. Pumpsets shall have double bearing between pump and motor. Pumps shall be provided with automatic coupling device and all necessary fixings for guiding the pumps during lifting/lowering. The pump shall not exceed 960rpm. Casing shall be of cast iron with 2%-3% nickel Impeller: SSCF8M, shaft SSAISI 410. Guide rail system – CI/SGI.

Motor to be of appropriate rating for the proposed pump duty. Submersible squirrel cage induction motor suitable for coupling with the pump without overload conforming to specifications. Starting current shall not exceed 200% of rated full load current. Protection against increase in stator winding temperature (155 deg C) shall be provided. Class of insulation shall be F. The degree of protection shall be IP68 as per IS 4691. Motors shall be suitable for continuous operation in fully submerged condition.

The motor shall be supplied wit 25 metres of round submersible pre-insulated copper cable of appropriate capacity. The pumpset shall be supplied with guide rail system with guide pipe of length suitable to the system, duck foot elbow suitable for delivery nozzle and non return valve, dismantling joint etc. Including control panel with automatic start and automatic stop controlled by sewage levels in the suction well. Manual control shall also be provided.

Painting may be done as per relevant Bureau of Indian Standard Specifications.

TECHNICAL SPECIFICATION
FOR NON-CLOG SUBMERSSIBLE GRIT PUMP

MECHANICAL SPECIFICATION

General

The submersible grit pump shall be mono-block type with non-clog design. It shall be provided with agitator connected to the extended shaft to keep the silt in suspension. Pump shall be suitable to handle silt particles with specific gravity of 1.05. Pumps shall be of max. 1450 rpm. For ease installation, pump shall be provided with skirt base arrangement Submersible Motors have to be designed with maximum factor of safety to ensure non-overloading, while handling silt particles.

Impellers shall be of single/double vane non-clog design. Additionally, a special contra-block cutting and tearing system should also be incorporated on the suction side of the pump for disposing off soft material, which would otherwise clog the pump.

Maintenance free antifriction, permanently grease filled ball bearings shall be provided and this shall take care of all the axial and radial forces at any point of operation. The weights of the revolving parts of the pumps including the unbalanced hydraulic thrusts of the impellers shall be carried by thrust bearings provided in each pump assembly.

The reverse rotation prevention system shall be incorporated in the pump design to ensure that the pump does not start rotating in the reverse direction due to wrong electrical connection.

Pump Construction :

Pump Casing :

Pump casing shall be of CI as per IS 210 Gr FG 200 with 2.3% Nickel. The internal surfaces shall be free of rough spots. The casing shall have centre line discharge.

Impellers :

Impellers shall be of Stainless Steel (CFBM) construction. Impellers shall be of single/double vane Semi-open non-clog design. Additionally, a special contra-block cutting and tearing system should also be incorporated on the suction side of the pump for disposing off soft material, which would otherwise clog the pump.

Pump Shaft :

The pump shaft shall be of stainless steel (SS 410) as per manufacturers standard. The shaft shall be of single piece construction.

Pump Bearing :

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

Mechanical Seals :

Double mechanical seal shall be provided to prevent pumped liquid entering into the motor winding. The seal shall be situated in oil chamber to ensure proper lubrication.

The face combination of lower mechanical seal shall be Silicon Carbide Vs Silicon Carbide and upper mechanical seal shall be Carbon Vs Chrome Steel.

Moisture Sensor :
Moisture sensor (seal monitor) shall be provided in the oil chamber to detect the failure of the mechanical seal.

The sensor will trip the pump-motor in the event of ingress of moisture into the oil chamber.

Lifting chain :
Each pump shall be provided with carbon steel lifting chain of adequate strength. The chain shall have rings of same sizes as chain, fixed at an interval of about 1M for engaging the hook of the chain pulley block.

Foundation Nuts and Bolts :
S.S. Foundation nuts and bolts shall be provided.

Protective coating :
The pumps shall be epoxy painted

Pump Balance :
All rotating parts shall be statically and dynamically balanced as per the relevant standards.

Electrical Specifications :

Submersible Motor :
The submersible motor shall be dry, squirrel cage type, suitable for three phase supply, continuous duty, with class 'F' insulation. Winding of the motor shall be impregnated by resin. Motor shall have integral cable entry port and cable entry shall be properly sealed.

The pump motor may often requires starting after intermittent clogging. The motor should therefore incorporate aluminium die cast rotors only to ensure better starting torque characteristics. The enclosure for motor shall be IP-68. Each phase of the motors shall be provided with Thermic switches or bimetallic electromechanical temperature detectors. The motor shall operate satisfactorily at all operating levels in wet well.

Motor shall be sealed against entry of liquid being pumped by using two Mechanical seals.

3 MOTOR

3.1 TYPE OF MOTORS

The motors (suitable for submersible pump) shall be 415V AC squirrel cage induction motor with drip proof screen protected continuous rating. The motor shall be capable of working in the range of (380-440V) 3 phase 50 cycles at the speed of 1500 RPM.

OUTPUT OF MOTORS
The motor shall be capable of developing the mechanical output for the required conditions, shall have continuous normal rating to suit the maximum load when operated at the pump speed. The efficiency and power factor shall be to start the wide range of load conditions and shall be designed and manufactured in accordance with relevant BIS.

The motor HP shall be such that is should safely take the load when the total head is reduced by the rise of water level in rived during flood conditions in the rives.
The HP of motor of offered shall have a margin 10% above the BHP absorbed by the pumpset at duty point and also above the maximum HP absorbed by the pump offered.

4. SPARE PARTS

Supply of spares and tools shall be made as per the list prescribed in BOQ with index card.

5. TOOLS

Standard tools for the maintenance of the equipments shall be supplied as detailed.

D/E spanners	1 set
Ring spanners	1 set
Bearing puller	1 No
Grease gun	1 No
Hand gloves tested for electrical operation	1 Pair
Ball peen hammer	1 No
Screw Drivers	1 set
Electrical tester	1 No
Electric megger	1No

6. COMPLETION PLANS

The successful bidder shall be requested to furnish completion plans in triplicate within one month from the date of the first testing of the plants. The plan should show the entire layout of the plant executed. Two copies of plan should be supplied to the Employer and one to be framed and suspended in the Head works. The contractor shall in addition to the above furnish detailed specifications of the equipment provided to the Employer with all technical data.

7. MAINTENANCE MANUAL

The periodical maintenance schedules for each equipment shall be given with reference to the hours of operation. Detailed information about the spare parts (part name, identification number etc.) should be given. The copies of the manuals should be furnished within one month from the date of commissioning.

8 The contractor should supply one set of tools for the pumpset maintenance of the machinery and equipments supplied by them under this contract.

9 The contractor has to operate and maintain the pumpsets and other machinery and equipments for a period of 30 days to the entire satisfaction of the Engineer, free of cost, unless otherwise specified. Fuel lubricants and power supply if required will be supplied free of cost, for operation and maintenance during that period.

10. For machinery and equipments, the payment will be made at 75% of the value of equipments brought to the site. The balance payment for these items will be made after erection and commissioning. In each of these cases 5% of each bill amount will be withheld as retention money as mentioned in clause 54 of section II Part I General stipulations and conditions.

11. The contractor should supply immediately after commissioning three sets of operations and maintenance manuals for all equipments and machinery supplied under this contract.

12 General

12.1 Cable lengths given are only approximate and payment will be made for the actual lengths of cable laid.

12.2 The contractor has to make necessary arrangements to get supply of electricity from TNEB for operating the machinery and equipments. The necessary service connection and S-D charges will be paid by the Board.

12.3 The Contractor should obtain all approvals for the installation and commissioning of machineries and accessories offered by them from the respective inspecting authorities such

as GEIG or CIFG etc. Fees if any, to be paid to the inspecting authorities will be reimbursed by the Board.

12.4 Before supply of the machinery equipments and other materials, prior approval of the Engineer should be obtained giving the name of maker and other details required.

13 Electrical Wiring and installation of fittings

13.1 The materials used for conforms to the relevant I.S.S wherever applicable. The make and other details of materials to be used should be furnished along with the tender.

13.2 Continuous earth connection are to be made with 14 SWG T.C. wire.

13.3 The wiring work done shall be neat, true to line, level etc. and in such a way that it gives an impressive and aesthetic appearance to the building.

13.4 The actual location and number of points for lights, fans power plugs etc. may be altered at the time of execution by the Engineer.

13.5 Entire wiring and cabling work should be done as per IE rules.

13.6. Any damages or breakages, chipping etc. caused by the electrification works to the structures have to be rectified by the contractor at his cost to the satisfaction of the Engineer.

13.7. The Contractor has to test and every point after completion of wiring to the entire satisfaction of the Engineer by taking temporary supply from the existing service.

13.8. Wiring to light point (both internal and external) and fan point will be treated as complete only when supply as well as connection upto the ceiling rose is completed.

13.9. Whenever conduit pipe wiring is done, cover for switch boards containing switches, plugs, etc. should be of hylam sheet or other specified sheet only.

IX. ANNEXURES

IX. ANNEXURES

I. Pump characteristics

II a) Submersible pump (Non Clog)

b) Motors for submersible pump (Non Clog)

III Starters

(The above annexures as applicable should be filled in and duly signed and enclosed with the Technical Bid – Cover I)

Note: The make of the pumping machineries and accessories should be as specified in Chapter VIII Pump set and accessories part 10. If the said makes are not available, then only equivalent should be considered with prior approval of the Executive Engineer concerned.

ANNEXURE – I

PUMP CHARACTERISTIC

Sl. No.	Description	Technical Details	Remarks
a.	Capacity in LPM (Discharge)		
b.	Total head in metres		
c.	Net positive suction head required		
d.	HP absorbed by the Pump i) at duty point ii) at max BHP point given in the range of curve furnished.		
e.	HP of the motor offered		

Note :

1. The motor must not get over loaded, at Positive low head Conditions due to Maximum W.I. Conditions in Bore well/well.

2. The make of the pumping machineries and accessories should be as specified in Chapter VIII Pump set and accessories part 10. If the said makes are not available, then only equivalent should be considered with prior approval of the Executive Engineer concerned.

ANNEXURE - II (a)

Submersible Pumpsets (Non-clog)

01. Name of the Manufacture :

02. Type of pump and Model :

03. Number of sages :

04. Material of strainer :

05. Delivery Branch dia (in mm) :

06. Total discharge in LPM :

07. Materials of casing :

08. Type of impeller :

09. Materials of impeller :

10. Material of impeller shaft :

11. Type of bearing :

12. Are the bearings external or internal :

13. Materials of bearing :

14. Maker's name and code number of bearings :

15. Whether moving parts are balanced :

16. If so type of balancing :

17. BHP of the pump :

18. Efficiency of the pump :

19. Weight of the pump :

20. Diameter of the pump :

21. Pump speed :

22. Are the characteristics curves of the pumps attached :

23. Total head :

24. Does the pump confirm to BIS specification :

25. Specification reference :

26. What is the nature of the drive :

27. Type of the coupling :

28. Weight of the heaviest part of the pump :

29. Weight of the pump complete :

ANNEXURE – II (b)

Motors for Submersible Pumpsets (Non-clog)

1.	Name of the manufacturer	:		
2.	Type of Motor	:		
3.	Brake Horse Power of the motor	:		
4.	Number of phases	:		
5.	Cycles	:		
6.	System Voltage	:		
7.	Frequency	:		
8.	Speed at full load	:		
9.	Full load current			
	a) Normal full load	Amps		
	b) Maximum starting	Amps		
10.	Efficiency	Load	Percent	Tolerance as per BIS
		Full		
		3 / 4		
		1 / 2		
11.	Overload capacity			
	a. 25%			
	b. 50%			
	c. 100%			
12.	Power factor	Load	Percent	as per
		Full		
		3 / 4		
		1 / 2		

13. HP of the Motor :

14. Number of poles :

15. Type of enclosure :

16. Type of Rotor :

17. Bearing manufacturer :

18. Type, number and size of bearing (Driving end) :

19. Size of coupling and its type :

20. Does the Motor conform to BIS specification :

21. If so state the No. :

22. Weight of Motor :

23. Total weight of pump and Motor :

24. Diameter of the Pumpset :

25. Overall efficiency of the pumpset :

Note: The make of the pumping machineries and accessories should be as specified in Chapter VIII Pump set and accessories part 10. If the said makes are not available, then only equivalent should be considered with prior approval of the Executive Engineer concerned.

ANNEXURE –III

Starters

1. Name of Manufacturer :

2. Type of starter :

3. Type of cooling :

4. Over load relay :

5. No Volt coil :

6. No. of starters permitted in one hour :

Note: The make of the pumping machineries and accessories should be as specified in Chapter VIII Pump set and accessories part 10. If the said makes are not available, then only equivalent should be considered with prior approval of the Executive Engineer concerned.

X. TESTING, ERECTION, TRIAL RUN, COMMISSIONING AND ACCEPTANCE

.1 General

This part deals with specifications for - Erection, testing, recommissioning, commissioning and acceptance.

1.1 Test Instruments

The contractor shall satisfy the Engineer as to the accuracy of all the instruments used for tests and if required shall produce recent calibration tests, otherwise have them calibrated at his own expense by an independent authority.

2 Test Certificate

Copies of certificates of all works hydraulic tests shall be provided as details.

The contractor shall obtain and submit to the Engineer and to other parties as may by directed, certificates of test of all times, certifying that they have been satisfactorily tested and giving full particulars of such tests.

3 Hydraulic Test

All equipment subject to water pressure including casting, pressure vessels, pumps, pipes, fittings, and valves, shall be hydraulically tested to the pressure specified or in accordance with the applicable standard or to at least 1.5 times the maximum working pressure, whichever shall be the greater. Hydraulic test shall be given at the manufacturer's works.

Any of the hydraulically tested items shall be subject to the Engineer's inspector's random item proof re-test and notice of testing dates shall be submitted to the engineer.

Unless otherwise specified hydraulic tests to 1.5 times the maximum working pressure shall also be applied at site to all pipe work installed by the contractor.

4 Manufacturer's works inspection tests and guarantees

All schedules of particulars shall be completed and the guaranteed particulars and the efficiencies of the equipment offered at the duties specified will be binding and may not be varied except with the consent in writing of the Engineer.

The Engineer shall be provided with the facility for inspection of all equipment and material and shall be given at least 30 days notice when such equipment or material is ready for inspection of works test.

Full witness testing to the relevant standards and to prove guarantees given will be required for the following items:

i. All pumps
ii. Electric motors
iii. All control panels
iv. All circuit breakers
v. All transformers

vi. All lifting equipment
vii. Cables
viii All process control and indicating instruments
xi. All electrical measuring instruments and meters
x. Flow measuring equipment and gauges.

In addition all other items of equipment not subject to witness testing shall be temporarily erected at the manufacturer's works and tested for satisfactory operation and shall be offered for inspection. Copies of manufacturer's test readings shall be submitted to the Engineer, all prior to packing for shipment .such inspection, examination, or testing, shall not release the contractor, manufacturers or supplier of any item from any obligation under the contract.

Certified copies of manufacturer's test readings of all items shall be submitted to the engineer within 7 days of the satisfactory completion of the test.

Whilst the engineer shall be provided with facilities for witness testing and/or inspection of all items of equipment at the manufacturer's works. He may at his discretion advise that the test shall proceed in his absence. These test shall be made as if in his presence, and duly certified copies of test readings shall be submitted.

Where items of equipment are of identical sizes and duty it may be required, at the Engineer's discretion, that a reduced number of the items be subjected to witness test; however this shall not relieve the manufacturer from the requirement of carrying out the performance tests on all items prior to offering a witness testing.

If after inspecting, examining or testing any material or equipment, the Engineer shall decide that such items or any part thereof is defective, or not in accordance with the specification or performance requirements, he may reject the said items or part thereof, giving to the manufacturer within a reasonable time, notice in writing of such rejection, stating therein the ground upon which the said decision is based. All re-testing shall be at the contractor's expense.

5 Site Testing

The Contractor shall arrange for the full site testing of all items of equipment and shall include Provision of:

a. All skilled and qualified operating and test staff for the testing of all equipment.

b. Provision and disposal of all services, lubricants, and fuels other than electricity

c. All measuring and testing instruments to demonstrate equipment operates to the fulfillment of the works test

d. All loading weights for the load testing of all lifting equipment

All test shall be carried out by the contractor to the approval of the Engineer.

The Contractor shall be responsible for co-ordinating the programme of site testing of all items and to ensure that all parties concerned are present during any tests to obligate their responsibilities.

Manufacturer's Works Tests

6 Pumping Plant

Pumping plant shall be tested as follows:

1. Each pump shall be tested individually in accordance with part I of BS 5316. Site conditions shall be simulated as near as possible particularly the minimum site NPSH condition.

2. Each pump shall be tested complete with all shaft bearings, thrust bearings and directly driven auxiliaries or, where this is impracticable, the contractor shall state what allowances shall be made for losses incurred by these items, and shall demonstrate the accuracy of these allowances to the satisfaction of the Engineer.

3. Each pump shall be tested with its own motor wherever feasible. It shall be tested particularly at the guarantee performance duty point and over its full working range where possible from its closed value condition to 30% in excess of the guaranteed quantity or minimum head. Head/quantity curves and overall efficiency/quantity curves shall be plotted to demonstrate that the plant will be capable of meeting the full range of operating conditions at site.

4. Pump casings shall be subject to pressure test at. 1.5 times the maximum pressure obtained with the delivery value closed. The positive suction head shall be taken into account in determining this pressure.

7 Cranes

All cranes lings and lifting beams shall be tested at the manufacturer's works with a load 25% in excess of the rated load. Tests shall include measurement of deflection and speed of lifting etc.

The test shall be repeated at site when erection is complete using test weights to be provided under the contract.

Certificates shall be provided for both tests.

8 Valves

All valve bodies shall be hydraulically tested closed ended to 1.5 times the rated pressure. Isolating value sate shall be tested to the maximum working pressure, at which pressure they shall be drop tight.

9 The contractor shall include for all necessary tests as laid down in the specification and those required in order to comply with the relevant Indian standards as follows:

a. Power Transformers

i. Measurement of winding resistance

ii. Ratio polarity and phase relationship

iii. Impedance voltage

iv. Load Losses

v. No-Load losses and no-load current

vi. Insulation resistance

vii. Induced over voltage withstand

viii. Separate source voltage withstand.

Type test:

i. Impulse voltage withstand both chopped and fullwave

ii. Temperature rise.

Unless otherwise stated by the Engineer, evidence of type of tests carried out on identical transformers to those being provided under the contract will be accepted in lieu of actual tests.

b. Circuit breakers and control gear

i. Routine tests including H.V. pressure test, mill-volt drop (Doctor) test;

ii. To ensure operation of the closing child and satisfactory closing of the circuit breaker with the voltage on the coil down to 80% of its rated voltage, and that mal-operation does not occur with a voltage on the coil of 120% of the rated voltage.

iii. To ensure the satisfactory trip operation of the circuit breaker at no load conditions with the trip coil energized at 50% of its rated voltage.

iv. The test figures for heat-run tests performed on identical panel types shall be made available.

c. Protection and control circuits

Based on the completeness of the circuits in the final manufactured form within the manufacturer's works, the following tests shall be carried out:

i. Primary in injection test to ensure correct operation of the current operated protection relays and direct acting coils over their full range of setting.

ii. balanced earth fault stability tests by primary current injection. Care must be taken to reproduce accurately the burdens of interconnecting cables. A further test to ensure correct polarity must be made after assembly.

With differential pilot wire schemes it may not be possible to apply primary injection testing. In this case the circuits shall be proved by secondary injection. Current transformer characteristics and calculations associated with the above tests shall be available for inspection by the engineer.

iii. Tests on auxiliary relays e.g. Buchlolz auxiliary, at normal operating voltage by operation of associated remote relays.

iv. Correct operation of control circuits at normal operating voltage by operating voltage by operation of local control switches, and simulation of operation from remote control positions.

d. Motors

Motors over 22 KW site rating shall be subject to full performance test which may be witnessed by the engineer at the motor manufacturer's works.

Motors of 5.5 KW to 22KW site rating shall be subject to performance tests but will not be witnessed.

Motors under 5.5 KW site rating shall be subject to type test standards.

Type test certificates which shall include the following shall be provided for all motors;

i. Manufacture to BIS/IS.

ii. Class of insulation

iii. Type of cable fittings.

iv. Type of bearing size and lubricant.

v. Type of and rating of motor heaters.

Motor testing shall be carried out in accordance with the requirements of BIS .

e. Instruments and Meters

Tests to ensure operation of all ammeters, voltmeters and transducers and checks for correct calibration. Kwh meter shall be changed for correct rotation and creep test shall be carried out to ensure that the meter is inoperative with voltage along, of the secondary of the current transformer is left connected with the primary Corinthian erupted.

10 Test on Cables During Manufacture

All cables supplied under the contract shall be subject to routine tests in accordance with the relevant British standard. Cables will not be accepted on site for installation until certificates giving proof of compliance with the specification and date of tests have been received and approved by the Engineer. A certificate shall be applicable to each drum.

The tests to be carried out on every drum at manufacturer's premises shall include:

a. High voltage A.C. insulation pressure test between cores, each core to earth metallic sheath or amour as applicable

b. Insulation resistance test

c. Core continuity and identification

d. Conductor resistance test.

11 Process Control and Indicating Instruments

All flow, level process measurement controllers, transmitters, recorders, indicators, vacuum and pressure gauges shall be subject to routine in accordance with BIS.

Test certificate shall be provided against each item of equipment.

12 Electrical measuring Instruments and Meters

Test to ensure accurate operation of all meters, voltmeters and kwh. Meter shall be undertaken in accordance with IS:9319.

13 Alarm systems

The contractor shall be responsible for testing all items of equipment comprising the works alarm system for correct operation and sequence action.

14 Site Tests

Leakages tests at the test pressure shall be carried out aeon all enacted pipe work and values immediately after erection and before being built in. The contractor shall advise the Engineer when these tests are to be carried out.

15 Tests on Cables During Installation

During the period of site installation the Engineer will carry out inspection of the works tonsure the standards of workmanship meet the specification and are to his satisfaction. In the event of any part of the cabling installation failing to meet these requirements the contractor shall remedy the deficiency to the satisfaction of the Engineer.

After completion of various parts of the installation the contractor shall provide a test engineer, labor and materials to demonstrate to the engineer that the cables have been correctly installed

The contractor shall inform the Engineer prior to the testing of cables and shall be responsible for liaison with any other contractor to whose equipment the cables may be terminated to ensure all parties concerned are aware of the impending tests, to guarantee safety of personal and that isolation of any particular equipments has been completed. Any special isolation or preparation required to be carried out

before cable testing will be completed by the contractor responsible for that equipment. The contractor to the satisfaction of the Engineer shall carry out all tests.

16 Pump Sets

Tenderers shall complete the schedule of particulars and guarantees and shall state therein, inter alia, the guaranteed efficiencies of the pumps and motors offered, and the overall guaranteed rates of energy consumption of the complete pump sets at the duties specified.

The contractor's guarantees given when tendering in respect both of performance and efficiency shall be binding and considered part of the contract.

The fulfillment of these guarantees shall be verified at the works test and at site trials in accordance with the procedure given in Indian standards specification etc.

The site trails shall be carried out under the control of the contractor's staff to the satisfaction of the engineer. The contractor shall provide all the necessary labor and instrumentation to conduct the tests. The discharge from the pumps shall be measured using a portable ultrasonic flow meter.

17 Electrical plant

After all the deficiencies apparent during the installation inspection have been rectified to the engineer's satisfaction, the following tests shall be carried out:

a. Power transformers
   i. Dielectric tests on insulating oil to IS: 566.

b. Circuit breakers and control gear
   i. Routine tests, including H.V.pressure tests

c. Protection and control circuits

   Tests at 8.9(a), (b) (c) with the addition of satisfactory operation of all inter-tripping circuits in connection with other items of plant.

18 Tests on Cables after Installation

Every cable shall be subject to the following tests after installation: -
High voltage pressure tests:

The following D.C.test voltages shall be applied at full value: -

1.	PLYSWS	11,000 volt grade cable
	Between cores	Between any cores and armour
	30,000 volts	17,500 volts
2.	XLPESWAPVC.C	3,300 Vet grade cables
	Between cores	Between any core and armour
	10,000 v	5,8000v
3.	XLPESWAPVC or PVCSWAPVC	1,100 volt grade mains cable
	Between cores	Between any core and armour

3,000 v 3,000 v

Witnessed high voltage pressure tests shall not be carried out on PVCSWAPVC control cables, but it shall remain the responsibility of the contractor to test the insulation of these cables both between core and between cores and earth during installation with a 'Meager' 500 volt hand generator.

The contractor shall test all cables after installation to ensure correct phasing out of cores, continuity of cores sheath and amour over the whole length of the cable.

19 Earthling system Tests

The contractor shall demonstrate to the Engineer that the resistance of the electrodes to earth and the earth conductor continuity is in accordance with the specification. The tests shall be made on completion of the installation.

The test shall be performed for each major item of plant, by using an Earth Meager and auxiliary return conductor.

20 Testing pipelines

General

Pipelines shall be tested in lengths between manholes or valve pits or such shorter lengths as the Engineer may direct or permit.

Pipelines shall be tested in the presence of the Engineer.

Fittings required for temporarily closing openings in pipelines to be tested shall be properly designed for this purpose and shall be adequately strutted to withstand the test pressure specified.

The arrangements for testing a pipeline shall include provision for the surging of air from the pipeline prior to a water test.

The contractor shall keep a record of all tests in a book which shall be available for inspection and handed over to the Engineer on demand.

21 Testing pressure pipelines

Each pressure pipeline shall be tested after completion with the exception of any backfilling not necessary for the stability and safety of the work.

Prior to the testing of a pressure pipeline valves shall be checked and sealed. The pipeline shall then be filled with water and the air released. After having been filled the pipeline shall be left under operating pressure for at least 24 hours so as to achieve conditions as stable as possible for testing.

The pressure in the pipeline shall them be raised steadily until the test pressure of 50% excess of the maximum working pressure is reached in the lower part of the pipeline and the pressure shall be maintained at this level by pumping if necessary for a period of one hour. The pump shall them be disconnected and no further water shall be allowed to enter the poplin for a period of one hour. At the end of this period the original test pressure shall be restored by pumping and the loss measured by drawing off water from the pipeline unit the pressure as at the end of the one hour test period is again reached.

The permissible loss for pressure pipelines under test shall not exceed 20 liters per mere nominal bore per kilometer length per bar of pressure (Calculated as the average pressure applied to the pipeline) per 24 hours.

Gauges used for testing pressure pipelines shall have a dial diameter of not less than 150 mm and a full-scale reading not greater than twice he specified test pressure. before any gage is used the contractor shall arrange for it to be checked independently and data certificate of its accuracy shall be provided for the Engineer.

The contractor shall make his own arrangements for the supply and disposal of water used for testing which shall be obtained from a source approved by the engineer.

22 Test on Instruments

The contractor shall carry out on-site pre calibration test to demonstrate the accuracy of all level, pressure at rate of flow instruments, the transducers, buffers, displays amplifiers, recorders, integrator and transmitters incorporated in the works over a range of flow from the minimum to the maximum anticipated design range in the plant as required by the specification and that the accuracy obtained at the manufacturer's works tests can be obtained on site. The contractor shall supply sets of calibration curves of weirs, flow meters, metering pumps and the like.

23 Other tests

The contractor shall carry out all other tests required either by himself and or the engineer to prove the plant, and to comply with the requirements specified.

These tests shall embrace all instrumentation, alarms, control systems and processes, all pumps, chemical metering devices, feeders, robes, gages and other components of the plant over the full range of operating conditions.

If, in the pinion of the engine, any item of plant is irreparable or insufficient for its purpose or function the contractor shall, without delay, replace the item with another satisfactory item or better unit all at this own cost, paying if necessary, air freight charges to expedite prompt delivery.

24 Erection - General

a. The contractor's staff shall include at least one competent erection engineer with previous, suitable, privacies experience on similar contracts to supervise the erection of the works and sufficient skilled, semiskilled and unskilled labor to ensure completion of the works in time. The contractor shall not remove any representative, erector or skilled labor from the site without the prior approval of the Engineer's Representative.

b. One erection engineer who shall be deemed to be the contractor's representative shall be conversant with the erection and commissioning of the complete works. Should there be more than one erector, one shall be in charge and contractor shall inform the Engineer's Representative in writing which erector is designated as his representative and he is in charge. Erection engineer is to report to Project manager.

c. The contractor's erection staff shall arrive on the site on date to be agreed by the engineer's Representative before the proceed to the site, however, the contractor shall first satisfy himself, as necessary, that sufficient plant of his

(or his subcontractor's) supply has arrived on site so that there will be no delay on this account.

d. The contractor shall be responsible for setting up and erecting the plant to the line and levels of reference given by the engineer in writing, and for the correctness (subject as above mentioned) of the positions, levels dimensions and alignment of all parts of the works and for provision of all necessary instruments, appliances and labor in connection therewith. The checking of setting out of any line or level by the engineer or engineer's representative shall not in any way relive the contractor of his responsibility for the correctness thereof.

e. Erection of plant shall be phased in such a manner to as not to obstruct the work being done by other contractors or operating staff who may be present at the time. Before commencing any erection works the contractor shall check the dimension of structures where the various items of plant are to be installed and shall bring any deviations from the required positions, lines or dimensions to the notice of the Engineer. Plant shall be erected in a neat and workmanlike manner on the foundations and at the locations shown on the approved drawings. Unless otherwise directed by the Engineer, the contractor shall adhere strictly to the aforesaid approved drawings. If any damage is caused by the contractor during the course of erection to new or existing plant or buildings or any part thereof, the contractor shall, at no additional cost to the employer, make good, repair or replace the damage, promptly and effectively as directed by the Engineer and to the engineer's satisfaction.

f. During erection of the Plant the Engineer will inspect the installation from time to time in the presence of the contractor's site representative to establish conformity with the requirements of the Specification. Any deviation and deficiencies found or evidence or unsatisfactory workmanship shall be corrected at instructed by the Engineer.

25 Leveling and grouting of Machinery

a. Contractor shall check the civil works, where the plant is to be installed sufficiently in advance. For their conformity to the approved drawings for installing the plant with respect to lines, levels and accuracies of position embedment, anchorage pockets, cutouts etc. and he shall record all measurements and deviation in prescribed control formats. He shall proceed with the works, with the Engineer's approval of civil works for undertaking of installation of the plant consequent to such preparatory inspection or work.

b. Contractor shall mark precisely the centerline and datum reference on the civil works. Where the plant is to be installed with reference to bench marks, using indelible means of marking.

c. He shall undertake sufficiently in advance chipping of any unevenness of concrete on foundations, anchor bolt pockets, cutouts etc. to achieve uniform level of reference for erection.

d. All concrete surfaces receiving grout shall be hacked at 35 required to ensure better bonding with grouting.

e. Contractor shall undertake the inspection of all components to be erected sufficiently in advance to check their soundness and conformity to drawings and the inspection records shall be signed by the engineer as approval for undertaking the installation of the components. Any damage, shortfalls etc. Shall be made good to the satisfaction of the engineer.

f. All grout for equipment shall be carried out using non-shrinkable continuous grout materials with suitable from work of at least 12 mm thickness. Surfaces to receive the grout be hacked and roughened and laitance shall be removed by wire brushing or blast of air. Concrete surface shall be blown off by compressed air before commencing grouting. Grouting shall be done in one continuous operation from one side such that grout flows in a single ware until grout reaches all confined spaces with no air pockets and air from all confined spaces is expelled. A hydrostatic head of 150 mm shall be maintained during grouting operations. All grouting shall be carried out in the presence of the Engineer's Representative. All manufacturer's recommendations. All lines levels shall be checked up after grout is set, block outs shall be closed using cement concrete of the same grade as that of the parent structure.

26 Completion of Erection

a. The completion of plant under erection by the contractor shall be deemed to occur, if all the units of the plant are structurally and mechanically complete and will include amount other such responsibilities the following:

i. Plant in the scope of the contractor has been erected, installed and grouped as per specification.

ii. Installation checks are completed and approved by the engineer.

iii. The erected plants are totally ready for commissioning checks.

b. At the stage of completion of reaction, the contractor shall ensure that all the physical, aesthetic and workmanship aspects are totally complete and the plant is fit and sound to underage commissioning check/test on completion.

c. Upon achieving the completion as described above, the contractor shall notify the engineer by a written notice intimating such mechanical completion of units and notify the engineer for inspection and acceptance of mechanical completion. The engineer/Engineer's Representative shall proceed with the inspection of such units within 14 days of such a notice thereafter:

i. The Engineer shall certify completion when there are no defaults in the works and the plant is acceptable or

ii. The Engineer shall inform the contractor list of deficiencies for rectification hereinafter referred as punch list and the contractor shall complete the rectification work within a jointly agreed period before tests on completion and obtain the Engineer's acceptance or approval of the same before proceeding with the tests of completion or

iii. The Engineer may inform the contractor that the works are accepted with the `punch' list(Items which do not hamper operability, safety or maintainability) and allow the contractors to proceed with the pre-

commissioning checking following by test on completion when the contractor under takes to complete such outstanding works within an agreed time during defects liability period.

d. Taking over shall be based on rectification of all deficiencies as advised by punch lists.

e. The erection period indicated by the contractor would be deemed to cover all the activities upon completion as stipulated in previous paragraphs, notice of completion by the contractor, inspection by the Engineer for completion, and contractor rectification of all deficiencies as noticed by the deficiency/punch list, and acceptance by the Engineer of such rectification's, prior to test on completion.

f. Minor defects, which in the opinion Engineer which do not hamper operability and main ability will not be taken into account for deciding mechanical completion. Such defects shall be rectified concurrent to commissioning checks before tests on completion. However, the engineer's decision in this regard is final.

g. The commissioning period as notified by the contractor shall be deemed to occur beyond the date of completion and shall include all periods of pre-commissioning, trails and tests on completion.

h. It is in the contractor's interest to offer the sections/units/systems, progressively under identified milestones within overall erection period, duly completed for inspection by the Engineer's Representative, obtain his "punch" list, for rectification of any deficiencies pointed out by the Engineer and to achieve mechanical completion before undertaking the tests on completion within the specified erection period. The engineer also reserves a right to withhold the cost as estimated to be equivalent to the rectification of deficiencies pointed out to the contractor until such a time such deficiencies are rectified to the satisfaction of the engineer.

27 Installation Inspection

a. In additional to the progressive supervision and inspection by employer the contractor shall offer for inspection to Engineer, the completely created plant/part of plant on which tests are to be carried out. After such inspection by engineer, each equipment/sub system shall be tested by the contractor in accordance with the applicable standards in the presence of Engineer. Such tests shall include but not be limited to the test specified in following clauses.

a. Pumps, Piling and Valves

i. The erected pipe work shall be subjected to a hydraulic test at 1.5 times the maximum pressure of twice the working pressure which ever is higher to test the soundness of the joints, provision of the necessary pumps, gages, blank flanges, tapping etc. for carrying out these tests shall be included in the contract.

ii. Leakage test shall be carried out on all erected pipe work, pumps and values immediately after erection and where possible before being built in.

iii. Operating tests shall be conducted on valves.

iv. The pump set shall be tested for satisfactory operation. The vibration and noise level shall be checked to be within the specified limits.

b. Pump motors

Condition of winding insulation be tested and Insulation valves shall be restored to required level by suitable heating arrangements locally.

c. Cranes and hoists

The crane and lifting tackle shall be tested to 125 % of the safe working load. The contractor shall arrange the test load.

d. Screen

After erection, the screen shall be tested for its performance for checking its capability to handle stringy materials. Clearance between the dead plate and tiles shall be checked.

e. Sluice Gate

i. The contractor shall perform leakage test after installation of the sluice gates.

ii. Under the design, seating head and unseating head the leakage shall not exceed the limit specified an AWWA 0501/IS; 13319, class I for shop testing.

f. Instrumentation and control system

Performance of the instrumentation system and function of logic control system shall be checked as per the design requirements.

28 .Recommissioning Trials, Tests

a. Start up:

On completion of erection of the equipment and before start-up, each item of the equipment shall be thoroughly cleaned and them inspected jointly by the Engineer and the contractor for correctness, completeness of installation and acceptability for start up, leading to initial pre-commissioning test at site. The Engineer and contractor shall as mutually agree the list of pre commissioning tests to be performed.

b. Trial Operation

The contractor shall prepare a Trial operation report comprising of observations and recordings of various parameters to be measured in respect of the above trial operation. This report, besides recording the details of the various observations during trial run shall also include dates of start and finish of the trial operation and shall be signed by the representatives of both the parties. The report shall have sheets, recording all the details of interruptions occurred, adjustments made and any minor repairs done during the trial operation. Based on the observations, necessary modifications /repairs to the plant shall be carried out by the contractor to the full satisfaction of the engineer to enable the latter to accord permission to carry our performance and guarantee tests on the plant. However, minor defects, which do not

endanger the safe operation of the equipment, shall not be considered as reasons for withholding the aforesaid permission.

29 Commissioning

i. The plant shall then be on trial operation of One Hundred and Eighty days during which period all necessary adjustments shall be made while operating, over the full load-range enabling the plant to be made ready for performance and guarantee tests. The contractor shall provide necessary staff.
The trial Operation shall be considered successful, provided that each item of the equipment can operate continuously at the specified characteristics, for the period of Trial Operation.

ii. During the contractor's commissioning/start-up engineers specifically identified as far as possible, shall be responsible for carrying out all the pre-commissioning tests. On completion of inspection, checking and after the pre-commissioning tests are satisfactorily, over, the complete plant shall be placed on initial operation during which period the complete equipment shall be operated integral with sub-systems and supporting equipments as a complete plant.

iii. Any special equipment, tools and tackles required for the successful completion of the performance and guarantee the contractor free of cost shall provide Tests.

iv. The contractor during these performance and guarantee tests shall provide the guaranteed performance figures of the equipment's. Should the results of these tests show any decrease from the guarantee values, the contractor shall modify the equipments as required to enable them to meet the guarantees. In such case, performance and guarantee tests shall be repeated within one month from the date the equipment is ready for re-test and costs for modifications including labor, materials and the cost of additional testing to prove that the equipment meets the guarantees, shall be borne by the contractor.

Performance and guarantee tests shall make allowance for instrumentation errors as per specification.

30 Acceptance

a. The employer will certify no item of plant for acceptance unless it has successfully passed the entire test called for under the contract. If nevertheless the employer uses only
b. part of the works, that part which is used shall be deemed to have been accepted at the date of such use.
c. An acceptance certificate for plant shall not be issued unless the following documentation are duly compiled and submitted in final formats in duly bound volumes.

i. A compilation of all shop inspection results/reports of the plant/machinery with due attestation that the plants have been manufactured to specified standards (6 copies).

ii. All erection/ construction quality control checks in appropriate approved formats for all installation works with attestation that installation has been carried out as per acceptable/stipulated standards (6 copies)

On completion of the trial operation, it is the sole responsibility of the contractor to maintain the entire project successfully for the maintenance period of 12 months.

XI. MINIMUM ENVIRONMENTAL MANAGEMENT MEASURES

The EIA and EMP is to be adhered during construction and Operation and maintenance period by the Contractor

Environmental Assessment

1. Objectives and Need

Objectives of this assignment are to:

establish the environmental baseline in the study area; identify and assess the adverse environmental impacts; and provide requisite measures to address these impacts; identify the opportunities for environmental enhancements in the project area and provide requisite guidance/plans in this regard; wherever relevant integrate the measures (mitigation and enhancement related) in the project planning and design; and develop appropriate management plans and codes of practices for implementing, monitoring and reporting of the environmental mitigation and enhancement measures suggested.

The EA shall be carried out in line with the Government of India (GoI)'s regulations (EIA Notification), the World Bank's EA guidelines and TNUDF's ESF.

The EA comprises: Environmental Screening, Project EA and the Environmental Management Plans (EMPs). The EA shall be carried out in a consultative manner through "Stakeholder Consultations", at various stages, with the affected communities, NGOs, selected government agencies and other stakeholders.

2. Scope of Work

The following are the tasks to be performed by the contractor while conducting Environmental Assessment for the STP including nature, scale and magnitude of impacts that the project is likely to cause on environment.

Task 1 Description of Project

A succinct description of the proposed project shall be provided.

Task 2 Review of Earlier Studies

The contractor shall review various earlier studies such as feasibility and detailed project reports, etc., of the project and understand the project and various aspects associated with the same. This shall provide a base to formulate the environmental surveys necessary for the project and assessing impacts of the same.

Task 3 Legislative and Regulatory Considerations

A review of the legal and regulatory provisions applicable for the project shall be carried out in this task. The objective of the review is to bring out the legal and policy issues to be addressed in the project at various stages of project development such as design, execution and operation. Also the contractor should review the environmental laws such as EP Act, Water Act, Air Act, as well as the applicable operational policies / directives of The World Bank. Besides, the contractor shall also provide a complete list of regulatory formalities required for the project and various clearances required from different regulatory agencies.

Task 4 Preparation of Environmental Profile

An environmental profile of the project influence area shall be prepared, based on appropriate primary & secondary surveys and field investigations. The objective of this profile is to establish existing environmental conditions of the project area, in terms of air, water (surface & ground), noise, soil and other environmental parameters, which should form the basis for prediction of impacts due to proposed project activities. As part of this, the environmentally sensitive land uses (protected natural areas, areas of ecological value, sensitive receptors like schools, hospitals etc.) would also be identified and plotted on a map to scale.

The extent and duration of surveys shall be judiciously decided by the contractor as per requirements of the environmental regulations applicable in India and guidelines of international funding agencies. The profile prepared shall be adequate enough to predict impacts of the project and shall cater to the requirements of obtaining necessary environmental clearances from the authorities.

The profile shall essentially include all physical, ecological and socio-economic components of the project environment and bring out the salient and sensitive features of the same. Important aspects such as reserve forests, national parks, major water bodies, structures of archaeological / historic importance, and other environmental resources (if any) shall be identified and salient features of the same shall be presented.

Task 5 Determination of Potential Impacts

Based on the environmental profile of the project area prepared above and the proposed project activities discussed under task 1, the contractor shall carry out environmental screening to determine the nature of impacts and level of Environmental Assessment to be carried out (refer Section 3 for the details to be carried out under Environmental Screening).

In case of low or insignificant level of environmental impacts, where an EMP will suffice, the contractor shall review the recent versions of generic EMPs available with TNUDF and carry out necessary changes to suit the project requirements.

As part of screening, if medium to high impacts, requiring a detailed EA and stand alone EMP is required, the contractor shall carry out detailed impact analysis. The contractor shall predict environmental impacts of the project components, activities and sub-activities on various environmental attributes (bio, geo and physical) through appropriate analytical tools and techniques such as modelling techniques, over lays, etc. Significant or insignificant, permanent or temporary, reversible or irreversible, negative or positive impacts shall be categorised separately and presented for each phase of project development.

All identified impacts shall be summarised in an easily understandable format and the magnitude and significance of each impact shall be explained in detail.

An analysis of various project alternatives, including the ‘Project’ and ‘No Project’ scenario shall be analysed and impacts shall be analysed for each scenario. Based on the above analysis the best alternative that causes minimum or no impact shall be recommended for implementation.

Task 6 Social Assessment

Magnitude of social impacts due to loss of land, structures, income, livelihood etc shall be assessed .Significant findings of census and social economic survey of PAPs along with a brief account of proposed mitigation measures using the ESF guidelines, budget shall be

brought out in the report. Institutional arrangements with resettlement implementation plan shall be provided where required.

Task 7. Stakeholder Consultations

The contractor shall carry out consultations with Experts, NGOs, forest department officials (if applicable) and other selected Government Agencies and other stakeholders to (a) collect baseline information, (b) obtain a better understanding of the potential impacts and (c) appreciate the perspectives/concerns of the stakeholders, and (d) secure their active involvement during subsequent stages of the project as appropriate .

Consultations shall be preceded by a systematic stakeholder analysis, which would (a) identify the individual or stakeholder groups relevant to the project and to environmental issues, (b) include expert opinion and inputs, (c) determine the nature and scope of consultation with each type of stakeholders, and (d) determine the tools to be used in contacting and consulting each type of stakeholders. A systematic consultation plan with attendant schedules will be prepared for subsequent stages of project preparation as well as implementation and operation, as required. Where community consensus is required in respect of proposed mitigation measures for impacts on community assets including water bodies, places of worships etc., specific plan for modification/relocation etc have to be disclosed and consensus obtained.

Task 8 Environmental Management Plan

The contractor using outputs of the above tasks shall prepare an implementable Environmental Management Plan (EMP) for the project. Preparation of Environmental Management Plan is detailed under Section 4 below.

3. Environmental Management Plan

The EMP should suggest ways / options for mitigating negative impacts of the project, the preventive measures necessary. Where required, EMP shall include community consensus for the mitigation measures proposed. The EMP shall identify the means / agency responsible for implementation of the same and recommend suitable monitoring mechanism for the EMP. The EMP shall be implemented fully by the Contractor.
The above referred activity shall be applicable for Generic EMPs as well as specific EMPs developed as an outcome of detailed EAs
The contractor shall prepare a detailed EMP covering the measures to mitigate and/or minimize the negative impacts, including the implementation arrangement and a monitoring plan for the same with site specific requirements. EMP shall cover the following details:
Mitigatory measures: For each of the significant negative impact the contractor should recommend measures to eliminate or mitigate the impact. In case any impact is non-mitigable, the cost of damage shall be estimated. The cost (capital and recurring) of all the mitigation measures and the responsible parties for implementation should be clearly identified. The mitigatory measures should necessarily contain conceptual designs wherever necessary. The contractor should also specify neighbourhood committees to supervise effective implementation of the proposed mitigatory measures.
Landscape plan: Wherever necessary (especially STP sites), the Landscaping plan should be prepared considering the project area as a whole and shall meet project specific requirements. Considering the nature of the project area, the EA should provide a conceptual landscape plan for all the project components while considering the special environmental and social needs.
Monitoring Plan: The contractor should specify the types of monitoring needed for potential environmental impacts during construction and operation. As in the case of the mitigation plan, requirements should be specific as to what is to be monitored, how and by whom along

with reporting formats and recommendations if any Cost estimates are necessary and where monitoring reports are to be prepared, the recipient responsible for review and any corrective action should be identified. The monitoring plan should be supplemented with a detailed schedule of implementation of EMP measures.

Institutional Arrangement to Manage Environment Impacts Effectively: The contractor shall identify institutional/organizational needs to implement the recommendations of the project EA and to propose steps to strengthen or expand, if required. This may extend to new agency functions, inter-sectoral arrangements, management procedures and training, staffing, operation and maintenance, training and budgeting.

4.0 Public Disclosure

The contractor is to provide support and assistance to the Client in meeting the disclosure requirements, which at the minimum shall meet the World Bank's policy on public disclosure. The contractor will prepare a plan for in-country disclosure, specifying the timing and locations; translate the key documents, such as the EA Summary in local language; draft the newspaper announcements for disclosure; and help the client to place all the EA reports in the client's website.

The contractor shall prepare a non-technical EA Summary Report for public disclosure.

5.0 Review Committee

The review committee comprising of representatives from TWAD/CMWSSB, TNPCB, CMA and TNUIFSL will review and clear the EIA report. Payment will be made after approval of the EIA by the review committee.

6.0 Pre Construction Phase Impacts

`	**Potential Negative Impacts**	**Mitigation Measures**	**Time frame**	**Responsible agencies**
	PRE-CONSTRUCTION STAGE			
1	Clearances	All clearance required for Environmental aspects during construction shall be ensured and made available before start of work.	Before construction	ULB / TWAD/ Concerned Departments & agency / Contractor
2	Tree Cutting	i) Try to save the trees by adjusting the plant layout or the alignment of sewage intake structures, sewer mains, pumping stations, etc ii) Provide adequate protection to the trees to be retained with tree guards (e.g. Masonry tree guards, Low level RCC tree guards, Circular Iron Tree Guard with Bars) as required. ii) Identify the number of trees that will be affected with girth size & species type along the sewer mains, pumping / lifting station sites and sewerage treatment plant	Pre-construction & construction phase	Contractor / TWAD

		site. The details to be indicated on map to scale and/or a a strip map as may be appropriate. Prepare tree cutting schedule to facilitate clearance requirements iii) Trees identified for cutting shall be removed from the construction sites before commencement of construction with prior permission from the concerned department. iv) Undertake tree plantation (not less than three rows inside and along the boundary of STP, and compensatory plantation as per the tree cutting clearances). v) Compensatory plantation by way of Re-plantation of at least twice the number of trees cut should be carried out in the project area.		
2	Tree Cutting	i) Try to save the trees by adjusting the plant layout or the alignment of sewage intake structures, sewer mains, pumping stations, etc ii) Provide adequate protection to the trees to be retained with tree guards (e.g. Masonry tree guards, Low level RCC tree guards, Circular Iron Tree Guard with Bars) as required. ii) Identify the number of trees that will be affected with girth size & species type along the sewer mains, pumping / lifting station sites and sewerage treatment plant site. The details to be indicated on map to scale and/or a a strip map as may be appropriate. Prepare tree cutting schedule to facilitate clearance requirements iii) Trees identified for cutting shall be removed from the construction sites before commencement of construction with prior permission from the concerned department. iv) Undertake tree plantation (not less than three rows inside and along the boundary of STP, and compensatory plantation as per the tree cutting clearances). v) Compensatory plantation by way of Re-plantation of at least twice the number of trees cut should be carried out in the project area.	Pre-construction & construction phase	Contractor / TWAD

3	Utility Relocation	i) Identify the common utilities to be affected such as: telephone cables, electric cables, electric poles, water pipelines, public water taps, etc ii) Affected utilities shall be relocated with prior approval of the concerned agencies before construction starts. iii) provide advance notice (not less than 10 working days) to affected parties. The advance notice shall be in the form of written notice and a grievance redressal cell shall be established for timely addressing of grievances	Pre-construction & construction phase	TWAD/ Concerned departments
4	Baseline parameters	Adequate measures shall be taken and checked to control the Baseline parameters of Air, Water and Noise pollution. Base line parameters shall be recorded and ensured conformance till the completion of the project. The monitoring requirements, at minimum shall comply with consent conditions by the pollution control board	Pre-construction, construction and post-construction phase	Prospective contractor / TWAD
5	Planning of temporary Traffic arrangements	i) Temporary diversion will be provided with the approval of the engineer. Detailed traffic control plans will be prepared and submitted to the engineers for approval, at least two weeks prior to commencement of works. ii) The traffic control plans shall contain details of temporary diversion, details of arrangements for construction under traffic, details of traffic arrangement after cessation of wok each day, SIGNAGES, safety measures for transport of hazardous materials and arrangement of flagmen. iii) Any accidents and/or risk of inconveniences caused to the community shall be borne by the contractor	Pre-construction & construction phase	Prospective contractor / TWAD
6	Disposal of treated waste water.	i) The construction activities at STP shall be initiated only after consent to establish certificate is secured from the TNPCB ii) STP operations shall take place only after Consent to Operate	Pre-construction & construction phase	ULB/TWAD

		certificate is accorded by the TNPCB and the treated water quality shall comply with the consent conditions stipulated by TNPCB or at minimum shall meet the discharge standards depending on the type of receiving waterbody (stream / nullah /open land /irrigation purposes, etc.) iii) performance standards shall always be maintained, Ensuring efficient working condition of treatment plant.		
7	Storage of materials	The contractor shall identify the site for temporary use of land for construction sites /storage of construction materials, etc. These sites shall be operated only after prior approval of the engineer.	Pre-construction & construction phase	Prospective contractor / TWAD
8	Construction of labour camps	Contractor shall follow all relevant provisions of the Factories Act, 1948 and the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction and maintenance of labour camp. The location, layout and basic facility provision of each labour camp will be submitted to Engineer prior to their construction. The construction will commence only upon the written approval of the Engineer. The contractor shall maintain necessary living accommodation and ancillary facilities in functional and hygienic manner and as approved by the Engineer. All temporary accommodation must be constructed and maintained in such a fashion that uncontaminated water is available for drinking, cooking and washing. The sewage system for the camp must be planned. Adequate health care is to be provided for the work force. The layout of the construction camp and details of the facilities provided should be prepared and shall be approved by the engineer. The construction camp shall not be located within 1000m from the nearest water	During the construction	Prospective contractor

		stream, residential areas and/or any sensitive land uses like schools, hospitals, etc.		

3.	CONSTRUCTION STAGE			
	Construction of Sewerage Treatment Plant			
3.1	Compensatory plantation of trees	Compensatory plantation of atleast twice the number of trees felled should be done in line with competent authority guidelines.	Pre-construction and Construction	Prospective contractor / ULB/TWAD
3.2	Protection of top soil & Environmental enhancing	The top soil to be protected and compacted after completion of work. Top soil from the STP area should be stored in stock piles and that can be used for gardening purposes at WTP site which will be an environmental enhancing measure.	During construction	Prospective contractor / TWAD
3.3	Disposal of construction debris and excavated materials.	A suitable site should be identified for safe disposal, in relatively low lying areas, away from the water bodies, residential and agricultural fields etc., and got approved by the Engineer. Care should be taken that dumped material does not affect natural drainage system.	During construction	Prospective contractor / TWAD
3.4	Pollution from Fuel and Lubricants	i) The contractor shall ensure that all construction vehicle parking location, fuel/lubricants storage sites, vehicle, machinery and equipment maintenance and refueling sites will be located at least 500 m from rivers and irrigation canal/ponds. ii) All location and lay-out plans of such sites shall be submitted by the Contractor prior to their establishment and will be approved by the Engineer. iii) Contractor shall ensure that all vehicle/machinery and equipment operation, maintenance and refueling will be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. iv) Contractor will arrange for collection, storing and disposal of oily wastes to the pre-	Construction and operation.	Prospective contractor / TWAD

		identified disposal sites (list to be submitted to Engineer) and approved by the Engineer. All spills and collected petroleum products will be disposed off in accordance with MoEF and state PCB guidelines. v) Engineer will certify that all arrangements comply with the guidelines of PCB/ MoEF or any other relevant laws.		
3.5	Contamination of ground water quality	i) Groundwater quality may get contaminated due to leaching of waste water. So, the treated water quality shall comply with the standards laid down by the PCB for disposal onto land, water body or for irrigation use. ii) Regular monitoring is required for the treated sewage quality and also the ground water quality in the near by areas and ensures compliance with PCB standards.	During construction and operation	Prospective contractor / TWAD
3.6	Water Pollution from Construction Wastes	The Contractor shall take all precautionary measures to prevent the wastewater generated during construction from entering into streams, water bodies or the irrigation system. All waste arising from the project is to be disposed off in the manner that is acceptable by the Engineer.	During Construction	Prospective contractor / TWAD
3.7	Impact of surrounding areas	To avoid the problems of foul smell polluted air, insects, noise pollution and other problems buffer zones to be provided in the form of green belt around the STP site, this has to be strictly ensured.	During Construction	Perspective contractor / TWAD
3.8	Informatory Signs and Hoardings	The contractor shall provide, erect and maintain informatory/safety signs, hoardings written in English and local language, wherever required or as suggested by the Engineer.	During construction	Prospective contractor / TWAD
3.9	Risk from Electrical Equipment(s)	The Contractor shall take all required precautions to prevent danger from electrical equipment and ensure that -	During construction	Prospective contractor

		i) No material shall be stacked or placed as to cause danger or inconvenience to any person or the public. ii) All necessary fencing and lights will be provided to protect the public in construction zones. All machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, will be free from patent defect, will be kept in good working order, will be regularly inspected and properly maintained as per IS provision and to the satisfaction of the Engineer.		
3.10	Disposal of treated waste water.	i) The treated water quality shall comply with the standards of TNPCB before let out into the stream / nullah /open land /irrigation purposes, and necessary permission to be obtained from the concerned department. ii) Ensure efficient working condition of treatment plant. iii) Prevent the pollution of stream water and other water bodies receiving STP discharge.	Pre-construction / construction and operation stage.	TWAD / ULB Prospective contractor
3.11	Disposal of sludge	A suitable site should be identified for the safe disposal of sludge generated at the STP site and got approved by the Engineer. Prepare a sludge disposal plan and adheres to the same.	Pre-construction, construction and operation.	Prospective contractor ULB/TWAD
3.12	Labour camp & facilities	Setting up of labour camps needs to be done as per the procedures. Adequate potable water facilities, sanitation and drainage etc., in conformity with the Indian labour laws shall be ensured. The contractor shall also guarantee the following: i) The location, layout and basic facility provision of each labour camp will be submitted to Engineer prior to their construction. ii) The construction will	During Pre-construction and construction	Perspective contractor / TWAD

		commence only upon the written approval of the Engineer. iii) The Contractor shall construct and maintain all labour accommodation in such a fashion that uncontaminated water is available for drinking, cooking and washing. iv) Supply of sufficient quantity of potable water (as per IS) in every workplace/labor camp site at suitable and easily accessible places and regular maintenance of such facilities. v) The sewage system for the camp are designed, built and operated in such a fashion that no health hazards occurs and no pollution to the air, ground water or adjacent water courses take place. Ensure adequate water supply is to be provided in all toilets and urinals.		
3.13	Safety Aspects	i) Adequate precautions shall be taken to prevent the accidents and from the machineries. All machines used shall confirm to the relevant Indian standards Code and shall be regularly inspected by the PIA. ii) Where loose soil is met with, shoring and strutting shall be provided to avoid collapse of soil. iii) Protective footwear and protective goggles to all workers employed on mixing of materials like cement, concrete etc. iii) Welder's protective eye-shields shall be provided to workers who are engaged in welding works. iv) Earplugs shall be provided to workers exposed to loud noise, and workers working in crushing, compaction, or concrete mixing operation. v) The contractor shall supply all necessary safety appliances such as safety goggles, helmets, safety belts, ear plugs, mask etc to workers and staffs. The contractor will comply with all the precautions as required for ensuring the safety of the	During construction	Prospective contractor

		workmen as per the International Labor Organization (ILO) Convention No. 62 as far as those are applicable to this contract. The contractor will make sure that during the construction work all relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996 are adhered to. The contractor will not employ any person below the age of 14 years for any work and no woman will be employed on the work of painting with products containing lead in any form.		
3.14	First Aid	The contractor shall arrange for : i) A readily available first aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules in every work zone ii) Availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital	During construction	Prospective contractor

4.0	Environmental enhancement and special issues		Implementing Agency	Location
4.1	Flora and Fauna Chance found	The contractor will take reasonable precaution to prevent his workmen or any other persons from removing and damaging any flora (plant/vegetation) and fauna (animal) including fishing in any water body and hunting of any animal. If any wild animal is found near the construction site at any point of time, the contractor will immediately upon discovery thereof acquaint the Engineer and carry out the Engineer's instructions for dealing with the same. The Engineer will report to the near by forest office (range office or divisional office) and will take appropriate steps/ measures, if required in consultation with the forest officials.	Project area	Prospective contractor
4.2	Chance Found	All fossils, coins, articles of value of	Project area	Prospective

	Archae-ological Property	antiquity, structures and other remains or things of geological or archaeological interest discovered on the site shall be the property of the Government and shall be dealt with as per provisions of the relevant legislation. The contractor will take reasonable precautions to prevent his workmen or any other persons from removing and damaging any such article or thing. He will, immediately upon discovery thereof and before removal acquaint the Engineer of such discovery and carry out the SC's instructions for dealing with the same, waiting which all work shall be stopped. The Engineer will seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence the work in the site.		contractor
4.3	Monitoring of environment parameters	The contractor shall undertake seasonal monitoring of air, water, noise and soil quality through an approved monitoring agency. The parameter to be monitored, frequency and duration of monitoring plan shall be prepared	Project area	Prospective contractor
4.4	Sensitive Areas	The sensitive areas like Schools, hospitals to be provided with suitable noise barriers and safety measures, prior to the start of work in order to minimize the dust and noise impacts due to vehicle movement during construction and their effectiveness to be checked during operation phase .	Project area	Prospective contractor
4.5	Clearing of construction of camps and restoration	Contractor to prepare site restoration plans for approval by the engineer. The plan is to be implemented by the contractor prior to demobilization. On completion of the works, all temporary structures will be cleared away, all rubbish cleared, excreta or other disposal pits or trenches filled in and effectively sealed off and the site left clean and tidy, at the contractor’s expenses, to the entire satisfaction of the engineer.	Corridor of Impact	Prospective contractor
4.6	Tree Protection,	Giving due protection to the trees that fall in the shoulders /corridor of impact shall be the prime focus	Corridor of Impact	Prospective contractor

	Tree Planting,	during Construction/post construction Masonry tree guards, Low level RCC tree guards, Circular Iron Tree Guard with Bars, use of plate compactors near trees may also be considered where necessary Re-plantation of at least twice the number of trees cut should be carried out along the project road. Since the major portion of the project road may pass through open lands, planting of trees along the entire stretch of the road is recommended as an enhancement measure. Growth and survival of trees planted shall be ensured and monitoring done at least for a period of 3 years .Survival status shall be reported on monthly basis to Engineer incharge.		

7. Environmental Monitoring Plan

To monitor the extent of environmental impact of the proposed project, the contractor has to periodically monitor the ambient environmental quality along the proposed project area. The monitoring requirement for the different environmental components is presented in table below

Air Quality Monitoring	
Project stage	Pre Construction , Construction & operation period (as agreed)
Parameter	SPM, RPM, SO_2, NO_x, CO and Pb
Sampling Method	Use method specified by CPCB for analysis
Standards	Air (Prevention and Control of Pollution) Rules, CPCB, 1994
Frequency	Once before start of work & once every season of the year during construction period & upto 18 months (operation Period)
Duration	Continuous 24 hours / or for 1 full working day
Location	Sensitive locations along the pipe laying work, pumping / lifting station locations, STP site.
Measures	Wherever air pollution parameters increase above specified standards, additional measures as decided by the engineer shall be adopted
Implementation	Contractor through approved monitoring agencies
Supervision	Implementing agency
Water quality Monitoring	
Project stage	Pre Construction & Construction
Parameter	pH, BOD, COD, DO, TDS, Pb, Oil & Grease and Detergents for Surface water. Water pH, TDS, Total hardness, Sulphate, Fluorides,Chloride, Fe, Pb for groundwater.
Sampling Method	Grab sample collected from source and analysis as per Standard Methods for Examination of water and Waste

	water
Standards	Indian standards for Inland Surface Water (IS; 2296, 1982) and for Drinking water (IS; 10500,1991)
Frequency	Twice a year (pre monsoon and post monsoon seasons) during the construction period
Duration	Grab sampling
Location	Locations to represent residential, agricultural, surface water quality and vicinity of the construction site.
Measures	At locations of increased in water pollution, all inflow channels shall be checked for pollution loads and channel delivering higher pollution loads and channel delivering higher pollution load shall be terminated from disposal into the water source and other methods of disposal shall be adopted
Implementation	Contractor through approved monitoring agencies
Supervision	Implementing agency

Noise Level Monitoring	
Project stage	Pre Construction , Construction & operation period (as agreed)
Parameter	Noise level on dB (A) scale noise levels on dB (A) scale
Special guidance	Free field at 1 m from the equipments whose noise level are being determined. Equivalent noise levels using an integrated noise level meter kept at a distance of 15m from edge of pavement
Standards	MoEF Noise Rulers, 2000
Frequency	Once every seasons (except monsoon) for each year of construction
Duration	Reading to be taken at 15 seconds interval for 15 minutes every hour and then averaged
Location	Wherever the contractor decides to locate the equipment yard. At sensitive location such as school, hospitals etc
Measures	Incase of noise levels causing disturbance to the sensitive receptors, management measures as suggested in the EMP shall be carried out.
Implementation	Contractor through approved monitoring agencies
Supervision	Implementing agency
Soil Quality Monitoring	
Project stage	Pre Construction & Construction
Parameter	Monitoring of Pb, SAR and Oil & Grease
Sampling Method	Sample of soil collected to be acidified and analysed using absorption spectrophotometer
Standards	Threshold for each contaminated set by IRIS database of USEPA until national standards are promulgated
Frequency	During the pre monsoon post monsoon seasons each year for the entire construction period
Duration	Grab sampling
Location	At productive agriculture lands abutting traffic detours, pumping / lifting station locations and STP site.
Measures	At location of increased in pollution levels, source shall be identified and shall be diverted from future disposal
Implementation	Contractor through approved monitoring agencies
Supervision	Implementing agency

Apart form the above mentioned monitoring requirements, any major accidents /spillage during bulk transport of hazardous materials. Depending on the type of spillages / accidents the parameters to be monitored will be decided by the engineer and should be carried out by the contractor through approved monitoring agencies and supervised by the Implementing agency at their own cost.

8. FORMATS FOR REPORTING:
Formats for reporting / monitoring the progress / parameters achieved will be finalized in consultation with the successful bidder.

9. Environmental Compliance Report
The contractor shall submit a monthly progress report as per the reporting format approved by the engineer, on the status of the implementation of the EMP, and get it duly approved by the engineer for its compliance and for proceeding with the work. The Engineer and the Environmental and Social Safeguard (ESS) Manager, who will have access and authority to monitor the status based on the same and for which necessary facilities shall be made by the contractor.

10. Environmental Protection Work

10.1 The Contractor shall have to take following measures during construction and commissioning of works for protection of environment as under to avoid environmental impacts on air, water and land.

10.2 Site Clearance

The site clearance shall be done with minimum damage to existing structures flora and fauna, electricity and telephone lines and other infrastructure service.

10.3 Earth Work and Excavation

The Contractor shall inform the local authorities / government if any fossils, coins artifacts of value or antiquity, structures and other remains of geological or archaeological interests and excavation shall be stopped until identification of cultural relics by the authorised institution is completed.

The Contractor shall dispose off surplus / waste material at identified sites approved by the Engineer. The Contractor shall ensure that there is minimum hindrance to normal activities and business. The Contractor shall avoid damage to permanent structures and shall avoid loss of standing crops along the road.

10.4 Replantation

The Contractor shall carry out Replantation on areas / on the periphery of construction sites to minimize visual impact and soil erosion. The Contractor shall pay special attention to the type of trees to be replanted to prevent fouling of water through falling leaves and bird droppings. A list showing the type of trees to be replanted will be got approved before replanting any trees.

10.5 Soil Erosion and Water Quality

The Contractor shall ensure that earth and stone do not silt up existing irrigation /drainage systems.

The Contractor shall take suitable measures to prevent direct discharge of polluted waters form construction activity into lakes/rivers/irrigation channels.

The Contractor shall minimize exposure of soil types susceptible to wind and water erosion.

The Contractor shall control run-off and erosion through proper drainage channels and structures.

10.6 Soil Compaction

The Contractor shall restrict traffic movements and use low ground pressure machines.

The Contractor shall preserve topsoil to be replaced after completion of construction activity.

The Contractor shall avoid wet soils.

10.7 Social Disruption

The Contractor shall minimize interruptions to utility services through proper planning and scheduling of activities.

The Contractor shall provide temporary roads and diversions as may be necessary for smooth flow of traffic.

The Contractor shall preferably use local labour / Skilled persons during construction.

10.8 Dust / Air Pollution

The Contractor shall provide effective dust control through sprinkling / washing of construction sites and access roads.

The Contractor shall cover / water stockpiles and storage areas to prevent dust pollution.

The Contractor shall cover trucks transporting construction materials to minimize spills.

The Contractor shall have a preventive maintenance program for construction equipment and vehicles to meet emission standards.

10.9 Noise Pollution

The Contractor shall normally undertake construction work during daytime only (between 6.92.30 to 18.00 hrs) and when authorized to work beyond these hours adopt suitable noise control methods during such works.

The Contractor shall maintain machines and trucks to keep them with low noise.

The Contractor shall install sound barriers and plant tree as appropriate during construction.

10.10 Construction Camps

The Contractor shall take adequate measures such as provision of septic tank/pit latrines at construction site / camps.

The Contractor shall provide crèches to working women labour.

The Contractor shall provide drinking water conforming to IS: 10500

The Contractor shall provide garbage cans at suitable fixed place and have the garbage disposed off regularly.

10.11 Aesthetic Improvement

The Contractor shall through proper house keeping enhance aesthetic appearance of construction sites.

The Contractor shall dispose-off construction wastes at approved disposal sites.

The Contractor shall repair pavements immediately following construction pipeline and appurtenant structures.

The Contractor shall remove after completion of construction, all temporary structures and restore the project and surrounding areas nearest possible to the pre construction condition.

10.12 Conservation of Ecological Resources

The Contractor shall not use farmland and forest belts as materials borrow sites.

The Contractor shall not select arable land as material borrows site. In case excavation in arable land is unavoidable, topsoil layer (30 cms. depth) shall be saved and returned after construction work is completed so as to minimize impacts on ecosystem, agriculture and animal husbandry.

The Contractor shall educate construction workers to protect natural resources, wild plants and animals.

10.13 Risk Of Accidents

The Contractor shall provide efficient lighting equipment and safety signs on temporary roads during construction and shall adopt and implement adequate traffic regulation.

The Contractor shall take effective safety and warning measures to reduce accidents.

The Contractor shall provide suitable temporary crossings to facilitate normal life and business.

10.14 Responsibility For Accidents, Damages Etc.

The care of the whole of the permanent work until their completion and the whole of the temporary work until their removal shall remain with the Contractor who shall be responsible for all accidents or damages from whatever cause arising and chargeable for anything that may be stolen, removed, destroyed or damaged to whomsoever belonging and

also for making good all defects and damages to the said Works or to any property adjoining or any cause whatever, whether such damage or defects where occasioned by the negligence of the Contractor or not or may be or might have been discovered during the progress of the works or in consequence thereof, or shall appear to be known after the completion whereof or whether payment may wholly or partially have been made or the Works approved as supposed to have been properly done, and no certificate or approval of any works by any officers or members of the Employer shall effect

10.15 Noise Monitoring

a. Monitoring Frequency:

a) During construction period: 12 times a year each time including day and night.

b) During Commissioning period: 4 times ad hoc monitoring will be taken.

c.) During construction period: Near construction sites, factory sites and sensitive areas.

XII.MAINTENANCE OF SEWERAGE SCHEME

GENERAL

On completion of the construction, trial operation and commissioning of all the components of the project, the same shall be taken over by the employer and the same shall be handed over back to the Contractor, for Operation and Maintenance for a period of 60 months at contractor cost.
It is the sole responsibility of the contractor to successfully operate and maintain the entire project comprising sewage collection system, pumping station, pumping main for the maintenance, period .
The following measures are to be taken essentially by the contractor
Necessary maintenance crew with supervisory staff shall be deployed as specified. The entire strength of maintenance crew with the supervisory personnel should be available from the first day of the maintenance period.
The staff to be deployed shall be adequately qualified for the performance of the job and trained in operation of electrical equipments, pumps, etc and also capable of identifying and managing trouble shooting of faults and attend minor repairs.
The contractor should keep all spares required for replacements at the sewer line, pumping stations, pumping main, sewage treatment plant, etc as recommended by the respective manufactures readily available to ensure proper functioning of the sewerage system.
All the equipments that go out of order during the course of the maintenance period shall be rectified/ replaced within a week's time or such longer time as approved by the employer, to ensure uninterrupted operation of me plant.
The contractor is responsible for the incidence of any theft, malpractice etc within the project area during the maintenance period and the contractor shall keep the Employer indemnified.
On completion of O&M period of 60 months, the contractor shall hand over to the employer in good working condition all the components of the project taken over by him as mentioned in para 1 above.

One set of as laid plans of all the components of the project - Architectural, mechanical, instrumentation, piping drawings, sections details charts etc., with modifications as carried out (with the approval of employer) shall be supplied. Operating and maintenance manuals supplied by manufacturer and Step by step procedures for all operation requirements and adjustments required shall be given.

The contractor shall carry out the works observing all safety precautions. The owner shall be indemnified for any accidents that may occur at the site.

The contractor shall follow all the rules and regulations of statutory authorities Government agencies etc. The owner shall be indemnified against any failure.
The contractor shall take necessary insurances for the properly and labour etc., The owner shall be indemnified against any failure.

The contractor shall pay all the fines, penalties etc., imposed by various agencies for non performance / non adherence to rules in connection with his work. The owner shall be indemnified.

1. ENERGY CONSUMPTION

The electrical energy consumed for the operation of the pumpsets and other pumping station accessories shall be paid by the employer direct to the TNEB.
The Contractor shall ensure strict economy in electricity usage for lighting and as well as for pumping sewage by using high duty pumps only when the rate of flow to the pumping station cannot be handled satisfactorily by low duty pumps. All level controls shall be maintained in operating condition always.
Any diversion of electricity from the sewerage project installations for unauthorized purpose will invite severe penal action as directed by the Engineer.

In the pumping stations where the HT supply has been availed, maximum demand in KVA is to be controlled. The operator should ensure that the maximum demand in KVA does not shoot up in any case than the contractual maximum demand, since any excess over the contractual maximum demand invites double the cost per KVA to be paid to TNEB. The maximum demand shall be fixed with reasonable margin by the Employer. The contractor shall train persons in all aspects and post suitable persons. In case of any excess over the fixed KVA as in the electric consumption statement for the maximum point of full designed capacity appended the excess amount to be paid to TNEB has to be borne by the contractor.

The power factor should be maintained at 0.95 and pumpsets shall operate at the efficiency specified by the manufacturer. Any excess consumption of electricity for not adhering to be above, the contractor has to bear the cost. The low power factor compensation charges levied by the TNEB has to be borne by the contractor. Diesel oil required for operation of pumping plants shall be paid for by the contractor.

2) SAFETY PRECAUTIONS

Traffic Control

a. Place easily readable and clear warning signs well ahead of work area.
b. Barricade the space around the manhole for placing equipment and deposition of silt removed.
c. Place barricades or signs to channelise the traffic, if possible.
d. Use a flagman at the two ends for controlling flow of traffic from each, direction and to avoid a traffic jam, if the road is narrow and only one lane of traffic is possible.

Safety Equipment

The various safety equipments that are normally required in sewer maintenance work are gas masks, oxygen breathing, apparatus, portable lighting equipment, non-sparking tools, portable air blowers, safety belts, inhalators and diver's suit.
The use of the particular safety equipment is governed by the detection of various gases and oxygen deficiency.
A knowledge of the type of gases, in the atmosphere and of the working location becomes essential for the selection of the right type of safety equipment. Simple tests for detection of various gases and oxygen deficiency Should be furnished to the workmen.

a. Gas Masks

General purpose gas masks are used for respiratory protection from low and moderately high concentrations of all types of toxic gases and vapors present in the atmosphere, in which there is sufficient oxygen to support life.
Persons using gas masks should practice regularly with them in order to become proficient in putting them on quickly and breathing through them.
Gas masks cannot be used in Oxygen deficient atmosphere, in unventilated locations or areas where large concentrations of poisonous gases exist.

b. Breathing Apparatus
This is designed for respiratory protection from atmosphere that contains very high concentrations of toxic gases and vapours or mat are deficient in oxygen.

c. AirHose Respirator
This is used where a source of fresh air is available within a distance of 50 m from me working location. It is essential that the supply of air is obtained from an un contaminated source.
Purified air is used where a source of fresh air is not available within 50 m to permit the use of an air hose respirator or in situations where an air hose would encumber me worker.

d. Portable Lighting Equipment
The equipment normally used are portable electric hand lamps of either 24 V or 110 V grade or permissible types, electrical cap lamps and explosion proof flash lights.

e. No sparking Lighting Equipment
These are made of an alloy (containing atleast 80 percent of copper) that will ' net spark when Struck against other objects and metals and yet retains the necessary strength and resistance to wear.

f. Portable Air Blowers
Forced ventilation of manholes, pits and tanks can he provided by. portable air blowers. Special precautions should be taken to ensure that the blowers do not serve as a source of ignition for inflammable gases.

g. Safety Belt
This consist of a body belt with a bucket and a shoulder harness. The life line is of high grade spliced manila rope, nylon rope or a steel cable anchored with rings on each side of the bell and provided with safely straps for anchoring or securing to a stable support. The life line should be about 15 m in length and the overall assembly should be capable of withstanding a tensible load of 2000 kg. The safety belt and the life line should be tested by lifting the wearer clear of ground before each day's use.

h. Inhalators
Approved inhalators employing a' mixture, of oxygen and carbon dioxide are used for resuscitating victims of gas collapse, drowning or electric shock.

i. Diver's Suit
A good quality diver suit should be provided to the diver whose services are very necessary while plugging the sewer line or removal of some hard blockage due to stone etc at the mouth of the pipe in the manholes. Depending upon the site condition, 'suit should have provision to conned an air line with compressor or oxygen cylinder.

Precautions against Electrical Shocks

a. Only qualified and specially trained personnel should be allowed to operate and maintain electrical equipment at the pumping stations.
b. All electrical controls should be kept dry and in good condition.
c. No metal ladders or metal tapes should be used around electrical equipment.
d. Insulated rubber mats should be provided before all electrical control panels and they should be kept dry.
e. Always test wires for current before working on any electrical item.
Use tools with insulated handles and rubber gloves.
f. All precautions to be taken as per statutory regulations are to be adhered to.

III. Sewage Treatment Plant

a. Where chemicals are used, the required precautions as prescribed during storage and handling of chemicals are to be taken.

b. Safety measure like using of safely helmets, safety belts, gum boots safety slices, goggles, gloves, etc are to be ensured depending on the operations performed.

c. All safety precautions connected with work on electrical and mechanical installations to be followed.

3) RECORDS TO BE MAINTAINED BY CONTRACTOR

The following record are to be maintained by the Contractor. The format for the records are to be approved by the Engineer/employer.

1. Pumping Main

• Details of Installation

• Record of Inspection - leaks noticed, bursts and action taken

4) INSURANCE

The contractor shall without limiting his or the employer obligation and responsibilities insure the works together with materials and plant for incorporation therein to the full replacement cost (term cost in this context shall include profit)

The contractor's Equipment and other things brought on to the site by the contractor for a sum sufficient to provide for their replacement at the site.

The firm/contractor shall provide risk insurance at their/his cost against loss or damages to the construction and to their workmen to cover from the start date to the end of the Defects liability period, for the following events.

• Personal injury or death

• Loss of or damage to the works, plant, material

• Loss of or damage to Equipment

• Loss of or damage of property (except the works, plant, materials, and equipment) in connection with the contract.

policies and certificates for insurance shall be delivered by the contractor to the Engineer for the Engineer's approval before the Start Date. All such insurance shall provide for compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred. The contractor will not be eligible for any payment on this account.

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

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

XIII . Reference to Specifications / Code of Practice

Description	BIS No.
Ordinary Portland Cement (33 Grade)	269 – 1976
43 Grade Ordinary Portland Cement	8112 - 1989
Pozzolona Portland Cement	1489 - 1991
Hydrophobic Portland Cement	8043 - 1978
Rapid Hardening Portland Cement	8041 - 1990`
Low Heat Portland Cement	12600 - 1989
Sulphate resisting Portland cement	12330 – 2001
Standard sand for testing of cement	650 – 1966
Methods of Test for Pozzolonic Materials	1727 - 1967
Methods of sampling and test for water & waste water (Physical & Chemical)	3025 - 1984 (Part I to 37)
Methods of Sampling hydraulic Cement	3535 - 1986
Methods of Physical tests for hydraulic cement	4031 - 1988 (1 to 14)
Methods of chemical analysis of hydraulic cement	4032 - 1985
Aggregates coarse & Fine from Natural resources for concrete	383 – 1970 4082/1977
Sand for Masonry Mortar	2116 - 1965 1542 / 1977
Methods of tests for aggregates for concrete	2386 - 1963 (Part 1 to 8)
Part I - Particle size and shape	2386 - 1963 (Part-I)
Part - II - Estimation of deleterious Materials & Organic impurities	2386 - 1963 (Part - II)
Part III – Soundness	2386 - 1963 (Part - III)
Methods of sampling of aggregates for concrete	2340 - 1986
Specifications for test sieves Part I - Wire cloth test Sieves	460 – 1978 (part - I)
Common Burnt clay building bricks	1077 - 1976
Mild Steel and Medium tensile steel bars and hard	432 – 1982
Drawn steel wire, concrete reinforcement, Part I Mild Steel & Medium Tensile Steel Bars Part II Hard drawn steel wire	
High Strength deformed steel bars and wires for Concrete reinforcement	1786 - 1985
High Tensile Steel for PSC Pipes	1784 - 1986 (Part I)
Bending and flexing of bars for concrete reinforcement	2502 - 1969
Recommendation for detailing of reinforcement In reinforced concrete works	5525 - 1969
Methods for tensile testing steel wire	1521 - 1972
Methods of test for determining modulus of elasticity	2854 - 1964
Glossary of terms relating to cement concrete	6461 - 1972 (Part 1 to 12)
Methods of test for strength of concrete	516 – 1959
Methods of sampling and analysis of concrete	1990 - 1959
Methods of testing bond in reinforced concrete pull out test	2770 -1967

Methods of test for permeability of cement Mortar and concrete	3085 - 1965
Methods of test for splitting tensile strength of concrete cylinders	5816 - 1970
Methods of tests for determining setting time of concrete by penetration resistance	8142 - 1976
Code of practice for construction of Pile foundations (concrete piles) Driven cast-in-situ concrete piles Bored cast -in-situ piles Driven pre-cast concrete piles Bored pre-cast concrete piles	2911 (Part (I) Sec 1 - 1979 Sec 2 - 1979 Sec 3 - 1979 Sec 4 - 1984
Code of practice for construction of raft foundation	2950 - 1981
Design Aids for reinforced concrete	SP 16 - 1980
Explanatory Hand Book on codes for earthwork Engineering	SP 22 - 1982
Explanatory Hand Book on IS Code 456 – 1976	SP 24- 1983
Hand Book on causes and prevention of cracks in buildings	SP 25 - 1984
Hand book on concrete reinforcement and detailing	SP 34 –1987
Brick Masonry	2212 –1962
Construction of Stone Masonry	1957 – 1967
Asbestos cement pressure pipes	1592 – 1989
Concrete pipes with and without reinforcement	458 – 1988
P.S.C. pipes (including fittings)	784 – 1978
Methods of tests for concrete pipes	458 – 1988 3597 – 1985
Materials for M.S. Specials	226 – 1976 & 2062 – 1980
Specification for M.S. Specials for P.S.C. Pipes	
Specification for Steel cylinders reinforced concrete pipes	1916 – 1989
Methods of tests for concrete pipes	3597 - 1985
Special for steel cylinders reinforced concrete pipes	3597 – 1985
Cast iron specials for asbestos cement pressure Pipes for water, gas & Sewage	5531 – 1988
Methods of test for asbestos cement products	5913 – 1989
Dimensional requirements of rubber sealing ring for CID joints in asbestos cement pipe	10292 – 1988
Centrifugally Cast (Spun) Iron pressure pipes for Water, gas and sewage including fittings	1536 – 2001
Specification for Centrifugally Cast (Spun) D.I. Pipes for Water, Gas and Sewage	8329 – 1990
D.I. fittings for pipes for water gas & Sewage	9523 – 2000
Dimensional requirements of rubber gaskets for mechanical joints and push on joints for the use with C.I., D.I. Pipes	12820 – 1986
C.I. Specials for Mechanical and push on flexible joints for pressure pipe lines for water, gas & sewage	13382 – 1992
Horizontally cast iron double flanged pipes for water, Gas and Sewage	7181 – 1986
Cast iron fittings for pressure pipes for water, gas and	1538 – 1976

sewage	(Part 1 to 24)
Cast iron detachable joints for use with asbestos cement pressure pipes	8794 – 1988
Rubber rings for jointing C.I. pipes, RCC Pipes & AC Pipes	5382 – 1969
Rubber rings for jointing P.S.C. Pipes	5382 – 1985
Rubber rings for jointing AC pipes with AC couplings	10292 – 1985
Pig lead (caulking lead)	782 – 1978
Hemp yarn	6587 – 1966
Rubber insertion to be used in jointing CIDF Pipes	638 – 1979
Bolts & Nuts to be used in jointing CIDF Pipes	1363 – 1967
Unplasticized PVC Pipes for potable water supplies	4985 – 2000
Injection moulded PVC socket fittings with Solvent cement joints for water supplies	7834 – 1987 (Part I to 8)
Fabricated PVC fittings for potable water supplies	10124 – 1988 (Part I to 13)
Methods of test for unplasticized PVC pipes for potable water supplies	12235 – 1986 (Part I to 11)
Sluice valves for water works purposes (50 to 300mm Dia size)	780 – 1984
Sluice valves for water works purposes 300 to 1200mm Dia size)	2906 – 1984
Surface boxes for sluice valves	3950 – 1979
Manhole covers for sluice valves	1726 – 1974
Laying of Asbestos Cement Pressures Pipes	6530 – 1972
Laying of concrete Pipes	783 – 1985
Laying of Cast – Iron Pipes	3114 – 1985
Laying of PSC Pipes	126 of APSS & 783 – 1985
Laying of DI Pipes	12288 – 1987
Laying and Jointing of unplasticized PVC Pipes	7634 – 1975 (Part 3)
Batch type concrete mixer	1791 – 1968
Sheep foot roller	4616 – 1968
Safety code for excavation works	3764 – 1966
Safety code for scaffolds and ladders Part I – Scaffolders Part II – Ladders	3696 – 1966 (Part I) 3696 – 1966 (Part II)
Safety code for piling and other deep foundations	5121 – 1969
Safety code for working with construction machinery	7293 – 1974
Tamil Nadu Building Practice	Volume – I Volume – II
Government of India Manual on Water Supply and Treatment	May 1999 (Revised)
Gravel for packing	4091 – 1967
Hard drawn steel wire	1785 – 1983 (Part I and II)
Structural Steel	226 – 1975
Hand rolled mils steel for concrete	1139 – 1966
Hard drawn Steel Wire	1566 – 1982
American Society for Testing of materials	
British Standard	2494 – 1955Part I
Welding Electrodes	814 – 1970

Steel Sheets	225 – 1975
Guniting	7322 – 1994
Welding Joints	3589 – 1966 and 2041 – 1962
Tensile Test	223 – 1950
Mechanical and Electrical works	
Turbine Pump	1710 – 1972
Submersible Pump	8030 – 1976
Submersible Motor	9283 – 1979
Earthing	3043 – 1966
Transformer	1180 – 1964
Generator	2253 – 4722
HDPE Pipes	4984 - 1995
UPVC pipes	15328-2003
Laying of MS pipes	5822-2000

TAMIL NADU WATER SUPPLY AND DRAINAGE BOARD
31, Kamarajar Salai, Chepauk, Chennai - 600 005.

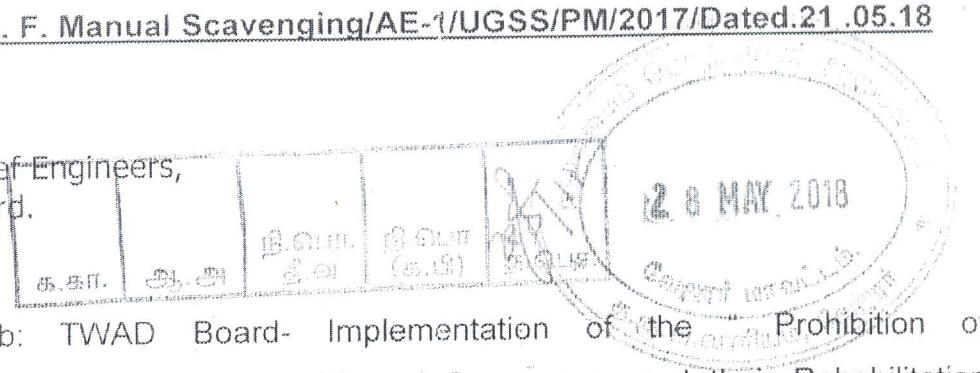
Dr.C.N.Mahesvaran,I.A.S.,
Managing Director.

003032

Lr. No. F. Manual Scavenging/AE-1/UGSS/PM/2017/Dated.21 .05.18

To

The all Chief Engineers,
TWAD Board.



Sir,

Sub: TWAD Board- Implementation of the "Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013"- Amendments to the existing UGSS contract and include condition in the tender newly to be called for and tenders finalization- Action Taken Report- Requested- Reg.

Ref: MD/TWAD Board, Lr.No. F.Manual Scavenging/ PM/UGSS/AE-1/2018/dt.29.01.2018

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The kind attention of the Chief Engineers are invited to the above reference cited. Wherein, it has been requested to issue necessary amendments to include the following conditions in the tender document to the existing UGSS contract and in the tender newly to be called for and tenders under finalization.

1) Should follow the orders given in the G.O.Ms.No.293/MA&WS(MW),Dept/dated 26.11.2010.

2) The contractor would be responsible to pay a compensation of Rs.10.00 Lakhs in the event of death of Workmen in the manhole/sewer system while cleaning it without safety gear and devices.

In this connection, the Chief Engineers are requested to send the Action Taken Report on the above to this office immediately.

21/05/2018

For Managing Director,
TWAD Board,Chennai-5

TENDERER

CHIEF ENGINEER/TWAD/VELLORE

ABSTRACT

Ban on entry of workers into the Sewerage system and Septic Tanks – Orders – Issued.

Municipal Administration and Water Supply (MW) Department

G.O.(Ms) No.293 Dated: 26.11.2010

Read:

1. Orders of the Hon'ble High Court, Madras Dated 20.11.2008 in W.P.No.24403 of 2008.
2. Government Letter No. 37007/MW 2/2008-3, dated. 05.12.2008.
3. G.O Ms.No.49 Municipal Administration and Water Supply (MW) Department dated. 26.03.2009.
4. Rural Development and Panchayat Raj Department . Letter(1D) No.581, dated: 06.10.2009.
5. Rural Development and Panchayat Raj Department Letter(R.Dis.) No.126, dated: 10.11.2009.
6. Government Letter No.1505/MA 2/2009-2 dated. 04.02.2009.
7. Government Letter No. 35805/MA2/2010-1 dated. 28.01.2010.
8. Letter from Managing Director, CMWSSB and Director of Municipal Administration, in Roc No.CMWSSB/O&M/SE(S)/Spl/2010, dated, 25.11.2010.

ORDER:

The Honorable High Court of Madras . in its order dated 20.11.2008 W.P.No.24403 of 2008 had directed that the entry of sanitary workers into the sewerage system under the guise of removing the blocks should be prohibited except under exceptional circumstances mentioned in that order. The High Court had also banned the manual cleaning of septic tanks and had observed that by virtue of the provisions contained in the Employment of Manual Scavengers & Construction of Dry Latrines (Prohibition) Act, 1993, such entry of sanitary workers is impermissible in law and strict penal provisions should be enforced wherever such violations take place.

2. In compliance with the directions of the Hon'ble High Court of Madras, the Government of Tamil Nadu has issued various instructions/orders in the references 2 to

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7 cited for the effective implementation of the ban on entry of workers into sewer systems and mechanization of the sewerage cleaning and maintenance. 71 Jet-rodding machines (used for removing the blocks in the sewer lines) and 73 Desilting machines (used for removing the silt from the manholes) were procured under various sources of funding, including the Member of Legislative Assembly Constituency Development Scheme (MLACDS). Orders have been placed for 19 more Jet-rodding machines and 7 more Desilting machines and these are under delivery. All cities which have an underground sewerage system will have one or more sets of these machines, and orders have been placed in advance even for cities where the implementation of underground sewerage schemes is nearing completion. Safety equipment and gadgets have been procured. Information, Education and Communication (IEC) campaigns have been undertaken across the State to create awareness among the general public including school children about the indignity and hazards associated with manual scavenging, and how the public can help prevent the occurrence of blocks in the sewer lines. Swift action has been taken against the erring officials/contractors whenever violations of the ban order were brought to the Government's notice. Thus, the Government of Tamil Nadu has made serious and earnest efforts to put an end to the obnoxious practice of manual scavenging and to enforce safety measures while cleaning manholes/sewer lines.

3. Despite the Government's best efforts, in the recent past there have been stray incidents where innocent lives have been lost due to the carelessness of the contractors, with some of the deaths occurring in private premises which engage private sanitary workers to clean their septic tanks/sewer lines and with the urban Local Bodies having no knowledge of such private transactions. Most private establishments and the general public at large are not aware of the fact that the cleaning of a septic tank or sewer line can release toxic fumes and can be hazardous. Sustained efforts to create awareness among the general public about the indignity and hazards associated with manual scavenging are required in order to eradicate this evil practice. The Hon'ble High Court of Madras has taken a serious note of some of the recent violations. With a view to tightening the enforcement of the ban, the Managing Director, Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB) and the Director of Municipal Administration, in the reference 8th cited, have requested the Government of Tamil Nadu to issue a comprehensive Government Order (based on the Hon'ble High Court's directions dated 20.11.2008) reiterating the prohibition of the entry of sanitary workers (barring certain exceptional circumstances) into the public sewerage system or into the sewerage system within private premises, and emphasizing the need to resort to mechanical cleaning systems instead, and recasting/improving the contractor liability clauses in cases where the cleaning of manholes/sewer lines/septic tanks has been outsourced to private contractors.

4. The Government, after a careful consideration of the said proposal, and with a view to further tightening the enforcement of the ban on manual cleaning of sewerage systems (including septic tanks) in both public and private establishments, issue the following orders:

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TENDERER

a. The entry of sanitary workers, whether public or private, into public sewerage systems or into the sewerage systems within private premises, on any pretext, is totally prohibited except under the exceptional circumstances mentioned in the orders dated 20.11.2008 of the Hon'ble High Court of Madras in W.P. No. 24403 of 2008, and reproduced in **Annexure-1** to this G.O. This ban will also apply to entry into septic tanks belonging to public as well as private establishments. The Cleaning and maintenance in all such cases shall be done mechanically with the aid of Jet-rodding machines, Desilting machines, mobile mechanical pumps or such other mechanical devices as the case may be.

b. The Urban Local Bodies, CMWSSB, TWAD Board, and private establishments as the case may be shall arrange for the provision of safety gadgets to all the sanitary workers whose services are availed of by them either directly or through their contractors whenever and wherever they are directed to enter the sewerage lines for those permissible occasions indicated in **Annexure-1** to this order, and all such operations should be done only under the supervision of a qualified staff.

c. The Urban Local Bodies and CMWSSB are directed to ensure that the institutions and enterprises like hotels, marriage halls, cattle yards, educational institutions, and other establishments construct diaphragm chambers to prevent entry of solid waste into the sewerage system.

d. In cities where underground sewerage systems exist, the urban Local Bodies/CMWSSB are directed to take necessary steps to identify individual sewer connections which have been unauthorisedly connected to with the storm water drains and reconnect the same to the sewerage system.

e. The Urban Local Bodies/CMWSSB should create awareness among the general public about (i) the fact that cleaning of a septic tank or manholes or sewer lines can release toxic fumes and can be hazardous; (ii) the ban on entry of workers into septic tanks, manholes and sewer lines; (iii) the availability of mechanical options for cleaning and maintaining the same; and (iv) the bad consequences of throwing solid waste into the sewerage system.

f. The Urban Local Bodies, CMWSSB, TWAD Board, and private establishments as the case may be shall, while engaging a contractor for the cleaning and maintenance of sewerage systems including septic tanks, compulsorily get an undertaking from the contractor as per the format in **Annexure-2** about the duties cast upon him by the High Court directions dated 20.11.2008 and this Government Order and the penalties for violation, if any. Such an undertaking shall also be obtained in respect of all existing contracts even if they had been entered into prior to the date of the High Court directions (20.11.2008).

g. Whenever and wherever the cleaning and maintenance of sewerage systems (including septic tanks) is outsourced to a contractor, the urban Local Bodies, CMWSSB and TWAD Board shall incorporate among others the conditions

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indicated in Annexure-3 to this G.O as part of the bid documents as well as the agreement entered into with the contractor.

h. Staff of Urban Local Bodies, CMWSSB and TWAD Board found violating any of the provisions of this G.O shall be liable for stringent disciplinary action.

5. The Government of Tamil Nadu reiterates its policy of 'zero tolerance' towards any violations of the ban imposed on manual scavenging and the entry of sanitary workers into sewerage systems (including septic tanks). The Director of Municipal Administration, the Director of Town Panchayats, the Managing Director, CMWSSB, the Managing Director, Tamil Nadu Water Supply and Drainage Board are requested to ensure strict compliance of these orders.

(BY ORDER OF THE GOVERNOR)

K. ASHOK VARDHAN SHETTY
Principal Secretary to Government.

To
The Managing Director, Chennai Metropolitan Water supply and Sewerage Board, Chennai-2.
The Director of Municipal Administration, Chennai – 5.
The Managing Director, Tamil Nadu Water Supply and Drainage Board, Chennai – 5.
The Managing Director, Tamil Nadu Slum Clearance Board, Chennai-5.
The Commissioner, Chennai Corporation, Chennai – 3.
The Director Town Panchayats, Chennai 600 108.

Copy to:
The Secretary to Hon'ble Chief Minister, Chennai 600 009.
The Senior P.A. to Hon'ble Deputy Chief Minister, Chennai 600 009.
The Personal Secretary to Chief Secretary to Government, Chennai 9
The Finance (W&M/MAWS/Bud.Co.ord/L & A Cell) Department, Chennai – 9
The Municipal Administration and Water Supply (OP 2) Department, Chennai – 9

/Forwarded by Order/

Tshalcila
26/11/10.
Section Officer.

TENDERER

CHIEF ENGINEER/TWAD/VELLORE

Annexure-1

Exceptional Circumstances permitting use of manual labour with safety gadgets as per the orders of the Hon'ble High Court of Madras in W.P. No. 24403 of 2008.

The Hon'ble High Court of Madras in its order in W.P. No. 24403 of 2008 dated 20.11.2008 has banned entry of sanitary workers into the sewerage system except under four circumstances mentioned in the order as indicated below:

i. For the removal of concrete/FRP manhole door which gets damaged due to the heavy vehicular traffic and often falls inside the manhole causing obstructions/blocks in the sewer and which results in the blockage of sewerage system, and where mechanical equipments cannot be put into operation.

ii. For the purpose of inter-linking the newly laid sewer main with the existing sewer main, where it will be wholly necessary to block the main sewer main in the servicing manhole. Entry of sanitary workers on such occasions has to be necessarily permitted, in as much as it is stated that large size sewer i.e., where the diameter is more than 300 mm, blocking the sewer main from the top of the manhole is not possible and only the sanitary worker has to enter the main hole and that too with necessary safety gadgets for blocking the sewer temporarily.

iii. For the removal of submersible pump sets fixed at the bottom of the suction wells, which goes out of order, for which the sanitary worker has to enter the well again with necessary safety gadgets after emptying the sewage from the well in order to remove the pump set. It is made clear that before allowing any sanitary worker to enter on such occasions, steps should be taken to see that the sewage is totally emptied and thereby further ensure that no poisonous gas remains in the sewage line.

iv. For the reconstruction of the man hole or rectification of the sewer main due to any damage caused by sinking of man hole covers/sewer line when the sewage pipe line gets blocked or gets obstructed, which results in the system getting surcharged. Here again, before allowing any sanitary worker to enter the sewer line, it is essential that sewage line is emptied by blocking the main holes in the system on either side of the sinking man holes/damaged man holes.

Even in the above four instances, the entry can be permitted, only for the workers with safety gadgets under the supervision of qualified engineer.

K. ASHOK VARDHAN SHETTY
Principal Secretary to Government.

/True copy/

Section Officer.

TENDERER

CHIEF ENGINEER/TWAD/VELLORE

Annexure-2

Format of the Undertaking to be given by Contractor in cases where the cleaning and maintenance of Sewerage Systems (including Septic Tanks) is Outsourced

1) I (Name, Age, Father's name and Address of the Contractor) am aware of the directions of the Hon'ble High Court of Madras in its order dated 20.11.2008 in W.P.No.24403/2008, and the orders of the Government of Tamil Nadu in G.O.(MS) No. 293, M.A&W.S(MW) Department, dated 26.11.2010, regarding the ban on manual scavenging and on the entry of sanitary workers into the sewerage system or septic tank. I undertake to abide by the said directions of the High Court and Government Order in this regard.

2) I shall not allow sanitary workers to enter into the sewerage system/septic tank for cleaning or maintenance operations except in the 4 circumstances permitted in the orders of the High Court in W.P.No.24403, dated 20.11.2008. I am aware that even in these 4 circumstances, I should allow the workers to enter only with adequate safety gadgets and under the supervision of a qualified staff, and only after duly observing all safety precautions including testing for the presence of toxic gases.

3) I am aware that violation of the said directions of the Hon'ble High Court and the G.O. will attract punishment under section 14 of the Employment of Manual Scavengers and Construction of Dry Latrines (Prohibition) Act, 1993.

Signature of the
Contractor with date

K. ASHOK VARDHAN SHETTY
Principal Secretary to Government.

/True copy/

Tshakila
26/11/10
Section Officer.

TENDERER

CHIEF ENGINEER/TWAD/VELLORE

Annexure-3

Additional conditions to be included in the Bid Documents as well as the Agreement with the Contractor in cases where the cleaning and maintenance of Sewerage Systems (including Septic Tanks) is Outsourced.

- The contractor shall strictly abide by the directions of the Hon'ble High Court of Madras in its order dated 20.11.2008 in W.P.No.24403/2008, and the orders of the Government of Tamil Nadu in G.O.(MS) No. 293, M.A&W.S(MW) Department, dated 26.11.2010, regarding the ban on manual scavenging and on the entry of sanitary workers into the sewerage system or septic tank. All cleaning and maintenance operations shall be done only through mechanical devices.

- The contractor shall not allow sanitary workers to enter into the sewerage system/septic tank for cleaning or maintenance operations except in the 4 circumstances permitted in the orders of the High Court in W.P.No.24403, dated 20.11.2008 namely:

  i. For the removal of concrete/FRP manhole door which gets damaged due to the heavy vehicular traffic and often falls inside the manhole causing obstructions/blocks in the sewer and which results in the blockage of sewerage system, and where mechanical equipments cannot be put into operation.

  ii. For the purpose of inter-linking the newly laid sewer main with the existing sewer main, where it will be wholly necessary to block the main sewer main in the servicing manhole. Entry of sanitary workers on such occasions has to be necessarily permitted, in as much as it is stated that large size sewer i.e., where the diameter is more than 300 mm, blocking the sewer main from the top of the manhole is not possible and only the sanitary worker has to enter the main hole and that too with necessary safety gadgets for blocking the sewer temporarily.

  iii. For the removal of submersible pump sets fixed at the bottom of the suction wells, which goes out of order, for which the sanitary worker has to enter the well again with necessary safety gadgets after emptying the sewage from the well in order to remove the pump set. It is made clear that before allowing any sanitary worker to enter on such occasions, steps should be taken to see that the sewage is totally emptied and thereby further ensure that no poisonous gas remains in the sewage line.

  iv. For the reconstruction of the man hole of rectification of the sewer main due to any damage caused by sinking of man hole covers/sewer line when the sewage pipe line gets blocked or gets obstructed, which results in the system getting surcharged. Here again, before allowing any sanitary worker to enter the sewer line, it is essential that sewage line is emptied by blocking the main holes in the system on either side of the sinking man holes/damaged man holes.

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Even in the above four instances, the contractor should allow the workers to enter only with adequate safety gadgets and under the supervision of a qualified staff, and only after duly observing all safety precautions including testing for the presence of toxic gases with a gas detector. Naked flame method of testing the presence of poisonous gases is hazardous and should be strictly avoided.

- Even in the non-exceptional circumstances, consideration of safety of the workers shall be paramount and the contractor shall ensure the same.
- The contractor should indemnify the employer for any loss or damage caused by his negligence or by his non-observance/violations of any labour laws.
- The contractor should take out insurance policies under the Workmen's Compensation Act, 1923 for all the workers engaged by him and a photocopy of the insurance policy should be furnished to the employer. The policy should be kept alive till completion of the contract.
- The contractor should impart safety education to all his workers and train them in the use of safety gadgets.

K. ASHOK VARDHAN SHETTY
Principal Secretary to Government.

/True copy/

Tshakila 26/4/10
Section Officer.

TENDERER

CHIEF ENGINEER/TWAD/VELLORE