NEW TIRUPUR AREA DEVELOPMENT CORPORATION LIMITED
(NTADCL)

TENDER REF No. T-06/003/2026

BID DOCUMENT

Name of Scheme: - **Procurement, Construction and Commissioning of Combined Water Supply Scheme for providing 3.5 MLD to SIPCOT Defense Industrial Park, Varapatti, 2.0 MLD to TIDCO Aerospace Industrial Park, Sulur and 3.0 MLD to TIDCO Semi-Conductor Industrial Park, Kethanur from NTADCL Water Distribution Station (WDS 24) Murugampalayam, Tirupur.**

(TECHNICAL BID)

Last date of e-submission: Up to: 15.00 Hours on 17.06.2026

(As per Server time)

Bid Opening: At 15.30 Hours on 17.06.2026.

(As per Server time)

(E - Tendering System)

Name of Scheme: **Procurement, Construction and Commissioning of Combined Water Supply Scheme for providing 3.5 MLD to SIPCOT Defense Industrial Park, Varapatti, 2.0 MLD to TIDCO Aerospace Industrial Park, Sulur and 3.0 MLD to TIDCO Semi-Conductor Industrial Park, Kethanur from NTADCL Water Distribution Station (WDS 24) Murugampalayam, Tirupur.**

LAST DATE OF SUBMISSION OF BID: Up to 15.00 Hours on 17.06.2026 (As per Server time)

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

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.48,90,000/- (Rupees Forty-Eight Lakh and Ninety Thousand only**) to be furnished **through ONLINE MODE only.**

ii) Furnish the details of Bid Security as under

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

ELIGIBILITY / QUALIFICATION CRITERIA

Sl. No	Description	Requirement as per Bid document	Particulars as furnished by the bidder	Page No. with Ref. no.if any, where the particulars are furnished by bidder.
I	**Eligibility/Qualification Criteria**			
A	**(a) Financial Turnover & Cash flow.**			
1.	Annual Turnover in any one of the last five financial years **Rs.48.90 Crore**(2020-21, 2021-22, 2022-23, 2023-24& 2024-25) **(75% of BOQ value of Rs.65.20 Crore)**	**Rs.48.90** Crore		
2	Minimum Cash flow required in **Rs.16.30 Crore** BOQ value x 3 months.=Rs.65.20 Cr x 4.5 Completion period in months18 Months **= Rs. 16.30 Cr**	**Rs.16.30** Crore		
3	**Similar Nature of Work** The bidder should have **100% completed and commissioned** Water supply scheme of value not less than the below mentioned value Rs. In Crore in last five years.			

Sl. No	Description	Requirement as per Bid document	Particulars as furnished by the bidder	Page No. with Ref. no.if any, where the particulars are furnished by bidder.
	i) Either single agreement with 40% of BOQ value **Rs.26.08 Crore (i.e., Rs.65.20 Cr * 0.40 = Rs.26.08 Cr)**	In Single Agt. **Rs.26.08** Crore		
	(or)	(or)		
	ii) Two agreements with 60% of BOQ value **Rs.39.12 Crore (i.e., Rs.65.20 Cr * 0.60 = Rs. 39.12 Cr)**	In Two Agt. **Rs.39.12** Crore		
4. (I)	**Physical (Work Experience)**			
1.	**Minimum Aggregate experience of pipeline in KM**			
a)	**DI/ CI Pipe should have supplied, laid, jointed, tested and completed satisfactorily in last five years**	**Minimum 13.06 KM of DI 450mm dia pipe**		
	50% of Total length of 26.12 KM of DI 450mm dia pipe			
b)	**PVC/ OPVC/ HDPE Pipe should have supplied, laid, jointed, tested and completed satisfactorily in last five years**	**i) 400mm OPVC – 2.73 Km minimum ii) OPVC 315mm/200mm/160mm - 9.622 Km**		
	i) 50% of 400mm OD OPVC length of 5.46 Km ii) 50% of OD OPVC 315mm/ 200mm/ 160mm total length of 19,245 Km			
2.	**RCC Water retaining structures (LL)**	**Not less than 7.20 LL Capacity**		
3.	Minimum Aggregate experience of RCC Water retaining structures (LL) completed and tested for water tightness in last Five Years			
	100% of total requirement in 7.20 LL			
4.	**Pumping Machinery installed (KW)**	**262.50 KW pump set and above**		
	Minimum Aggregate capacity of Pumping Machinery installed (KW), erected, tested and successfully completed in last five years			
	50% total requirement of 525 KW capacity of the Pump set			
5.	**Transformer sub-Station (Nos)**			
	The bidder should also have experience of at least 1 No., turnkey work of transformer substation	**1 No**		
	30% total requirement of 75 KVA for Transformer and 262.5 KW for Pump set & motor with minimum 1 No. of the Highest capacity			
II.	**Bid capacity**			
	Available Bid capacity should be more than the total bid value of **Rs.14.95 Crore**			

Sl. No	Description	Requirement as per Bid document	Particulars as furnished by the bidder	Page No. with Ref. no.if any, where the particulars are furnished by bidder.
III.	**Bid Security**			
	The bidder shall remit bid security through **ONLINE only** in the website https://tntenders.gov.in			**Rs.48.90 Lakh**
IV.	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 & Photographs)			(Yes/No)
V	Whether Annexure - I to XII are all filled up fully and enclosed?			(Yes/No)

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 five 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 equipment 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 component 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 proprietaries 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 Registration certificate	
10	Certificate of performance issued by not less than the rank of Executive Engineer / Responsible person of the organization.	

SIGNATURE OF TENDERER

TENDERER

NEW TIRUPUR AREA DEVELOPMENT CORPORATION LIMITED (NTADCL) INVITATION OF BIDS – TWO COVER – ITEMWAR TENDER SYSTEM (E-Submission)	
IFB No.	T-06/003/2026 Dated. 18.05.2026.
Fund	
Eligibility	Registered Class I Contractors in any of the TWAD / PWD / CMWSSB or any other Nodal Agency of GoTN or GoI.
Tender Invitee	The Chief Technical Officer, New Tirupur Area Development Corporation Limited, Kumaran Commercial Complex, First Floor, Kumaran Road, Tirupur-641601, Tamilnadu Phone: 0421-2486864/ 2481165 Email/ Website: **tirupur@ntadcl.com** / **www.ntadcl.com**
Downloading period	**19.05.2026 to 17.06.2026 up to 15.00 Hours**
Available website	E-Tendering website https://tntenders.gov.in
EMD Payable at	Online mode through e-tendering portal
Pre-Bid meeting	**05.06.2026** at **11.00** Hours at the office of the Tender Invitee
Bid Submission	**17.06.2026** before **15.00** Hours Digitally signed encrypted Tenders through E-Tendering website https://tntenders.gov.in
Bid opening	**17.06.2026** at **15.30** Hours at the office of the Tender Invitee. Digitally signed encrypted Tenders through e-Tendering website https://tntenders.gov.in

Sl. No	Name of work	Approximate value of work (Rs. In Crore including GST @ 18%)	Bid security (Rs.in lakh)
1.	Procurement, Construction and Commissioning of Combined Water Supply Scheme for providing 3.5 MLD to SIPCOT Defense Industrial Park, Varapatti, 2.0 MLD to TIDCO Aerospace Industrial Park, Sulur and 3.0 MLD to TIDCO Semi-Conductor Industrial Park, Kethanur from NTADCL Water Distribution Station (WDS 24) Murugampalayam, Tirupur.	**Rs.65.20**	**Rs.48.90**

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 Technical Officer,
New Tirupur Area Development Corporation Limited,
Kumaran Commercial Complex - First Floor,
Kumaran Road,
Tirupur-641601, Tamil Nadu.

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.

INVITATION FOR BID No..

Name of work: Procurement, Construction and Commissioning of Combined Water Supply Scheme for providing 3.5 MLD to SIPCOT Defense Industrial Park, Varapatti, 2.0 MLD to TIDCO Aerospace Industrial Park, Sulur and 3.0 MLD to TIDCO Semi-Conductor Industrial Park, Kethanur from NTADCL Water Distribution Station (WDS 24) Murugampalayam, Tirupur

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)

NTADCL 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.

NTADCL 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 NTADCL 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 Sales Tax Verification Certificate in currency are enclosed and Registration of GST certificate should also have enclosed.

The Bid Security of **Rs.48,90,000/- (Rupees Forty-Eight Lakh and Ninety Thousand only)** is remitted through **ONLINE** Mode. 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 through ONLINE 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 NTADCL 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 therefore

Dated this day of
Month of

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

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 Technical Officer, New Tirupur Area Development Corporation Limited (NTADCL), Tirupur** (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.

Name of work: Procurement, Construction and Commissioning of Combined Water Supply Scheme for providing 3.5 MLD to SIPCOT Defense Industrial Park, Varapatti, 2.0 MLD to TIDCO Aerospace Industrial Park, Sulur and 3.0 MLD to TIDCO Semi-Conductor Industrial Park, Kethanur from NTADCL Water Distribution Station (WDS 24) Murugampalayam, Tirupur". (Construction Period: 18 (Eighteen) Months and followed by defect liability period up to 12 (Twelve) Months)

Salient Details:

1) **Collection Sump cum Pump House:**

Sump: Two Chambers each of dimension 8.85 m x 7.50 m x 5.50 m

Pump House: 18 m x 7.50 m

2) **Pump sets**

Vertical Turbine Pump sets of duty 213 m^3/h x 171 m- 3 Nos (2 Nos working and 1No. Standby)

3) **Pipeline:**

450 mm DI K9 – 26.16 KM

400 mm OPVC PN 12.5 – 5.46 KM

315 mm OPVC PN 12.5 – 12.255 KM

200 mm OPVC PN 12.5 – 3.60 KM

160 mm OPVC PN 12.5 – 3.39 KM

1.2 **Defect Liability Period (DLP) for the above work for a period of One Year after completion of the work**

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/ tenderer, bid/tender, bidding/tendering etc.,) are synonymous

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1.5 **Downloading the documents from web site (E-Tender)**

The documents can be downloadedfree of cost from the web site https://tntenders.gov.in by the Bidder.Tender should, thereafter, be submitted duly filled and digitally signed along with all required documents to the tender inviting authority through e-tendering method 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 Bidding under this contract shall be done through the electronic bid submission in the web site https://tntenders.gov.in 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 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 relating to the previous financial yearand Goods & Service Tax Registration Certificate and proof of filing the GST latest return.

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.

5.1 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 **05.06.2026 at 11.00 Hours** 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:**

i) For the works costing more than Rs.1.00 crore and up to Rs.20.00 crore, the lead partner with One Joint Venture (1 + 1) as partner may be permitted.

ii) For the works costing more than Rs.20.00 crore, the lead partner with not more than Two Joint Venture (1 + 2) as partners may be permitted.

iii)Joint Venture shall be allowed all work.

iv)Joint Venture may be permitted for value not less than 25% of value of work put to tender and for a value less than 25% subcontracting may be permitted.

v)The Joint Venture partner should collectively satisfy the physical qualification criteria for their participation in the proposed Joint Venture.

v) The Joint Venture partner should separately satisfy the financial qualification criteria for their participation in the proposed Joint Venture

6.5.1 The bid shall include all the information listed in the Bid Document clause 7 Qualification of the Bidder,7.1, General 7.1.2 to 7.1.14

6.5.2 The bid and, in case of a successful bid, the agreement, shall be signed so as to be legally binding on all the partners

6.5.3 One of the partners shall be nominated as the lead partner, and his authorization shall be evidenced by submitting a power of attorney signed by the legally authorized signatories of all the partners

Registration of Joint Ventures

6.5.4 A copy of the Joint Venture Agreement shall be submitted along with the bid. The Joint Venture Agreement entered in to between the Joint Venture Partners should be registered and submitted within 28 days from the date of Letter of Acceptance (LoA) or before concluding agreement whichever is earlier.

Physical Qualification criteria

6.5.5 The Joint Venture partner should collectively satisfy the physical qualification criteria for their participation in the proposed Joint Venture

Financial Qualification criteria

6.5.6 **In respect of Annual Turnover as per clause 7.2.1, any one of the last five financial years**

The lead partner should meet not less than 50% of the qualifying criteria and other partner/ partners should meet individually not less than 25% of the qualifying criteria and all the partners should collectively meet 100% of the qualifying criteria.

In respect of Minimum Annual Turnover as per clause 7.2.2, in any two of last five financial years

The lead partner should meet not less than 50% of the qualifying criteria and other partner/ partners should meet individually not less than 25% of the qualifying criteria and all the partners should collectively meet 100% of the qualifying criteria.

Financial Capacity
The Joint Venture partner should separately satisfy the financial qualification criteria for their participation in the proposed Joint Venture.

6.5.7 In respect of qualification criteria under clause 7.2.4, the bidder on his own or any one of the partner/ partners of the Joint Venture should have completed successfully the works specified, as stipulated in the bid document for which necessary documentary evidence should be produced to the satisfaction of the NTADCL.

6.5.8 The lead Partner shall be authorized to incur liabilities and receive instructions for and on behalf of any and all Partner/Partners of the joint venture and the entire execution of the contract, including payment, shall be done exclusively with the lead Partner. The Employer will have correspondences only with the lead partner.

6.5.9 All the partners of the joint venture shall be liable jointly and severally for the execution of the contract in accordance with the contract terms, and statement to this effect shall be included in the authorization mentioned under 6.5.8 above, and registered authorisation in the Agreement (in case of a successful bidder)

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 five years should be furnished in Annexure – I.

7.1.5 Annual turnover (Civil Engineering works) for the past five financial years (Audited balance sheet for the last five financial years) should be enclosed. Annual turnover (in the form of Annexure II) for the past Five 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.

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 equipment 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 blacklisted, banned or debarred in Central or any other State Government / Union Territory / Public Sector undertaking (State/Central) organization 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 subcontracted 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 subcontract 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 previous financial year (with reference to the year in which the bid is opened)

7.1.14 The Contractor register himself under GST ACT 2017 in the Commercial Tax Department. Proof for Registration certificate and filing the GST return should be furnished.

CONDITIONS TO BE SATISFIED:

7.2 Performance Eligibility

Sl. No	Description	Requirement as per Bid document
I	**Eligibility/Qualification Criteria**	
A	**(b) Financial Turnover & Cash flow.**	
1.	Annual Turnover in any one of the last five financial years Rs.48.90 Crore (2020-21, 2021-22, 2022-23, 2023-24& 2024-25) (75% of BOQ value of Rs.65.20 Crore)	**Rs.48.90** Crore
2	Minimum Annual turnover in any of the two in last five financial years Rs.21.52 Crore (2020-21, 2021-22, 2022-23, 2023-24 & 2024-25) (33% of BOQ value of Rs.65.20 Crore)	**Rs.21.52** Crore
3	Minimum Cash flow required in Rs.16.30 Crore BOQ value x 3 months. = Rs.65.20 Cr x 4.5 Completion period in months18 Months = Rs. 16.30 Cr	**Rs.16.30** Crore
4	**Similar Nature of Work** The bidder should have **100% completed and commissioned** Water supply scheme of value not less than in Rs. In Crore in last five years.	
	i) Either single agreement with 40% of BOQ value **Rs.26.08 Crore (i.e., Rs.65.20 Cr * 0.40 = Rs.26.08 Cr)**	In Single Agt. **Rs.26.08** Crore
	(or)	(or)
	ii) Two agreements with 60% of BOQ value **Rs.39.12 Crore (i.e., Rs.65.20 Cr * 0.60 = Rs. 39.12 Cr)**	In Two Agt. **Rs.39.12** Crore
5. (I)	**Physical (Work Experience)**	
1.	**Minimum Aggregate experience of pipeline in KM**	
a)	**DI/ CI Pipe should have supplied, laid, jointed, tested and completed satisfactorily in last five years**	**Minimum 13.06 KM of DI 450mm dia pipe**
	50% of 450 mm DI total length of Total length of 26.12 KM	
b)	**PVC/ OPVC/ HDPE Pipe should have supplied, laid, jointed, tested and completed satisfactorily in last five years**	**i) 400mm OPVC – 2.73 Km minimum** **ii) OPVC 315mm/200mm/160 mm -9.622 Km**
	i) **50% total length of 400mm OPVC -5.46 Km** ii) **50% of total length of 315mm/ 200mm/ 160mm OPVC-19.244 Km**	
2.	**RCC Water retaining structures (LL)**	
	Minimum Aggregate experience of RCC Water retaining structures (LL) completed and tested for water tightness in last Five Years	**Not less than 7.20 LL Capacity**
	100% of total requirement in 7.20 LL	

Sl. No	Description	Requirement as per Bid document
3.	**Pumping Machinery installed (KW)**	
	Minimum Aggregate capacity of Pumping Machinery installed (KW), erected, tested and successfully completed in last five years	**262.5 KW and above**
	50% total requirement of 525 KW with minimum 1 No. of the Highest capacity of the Pump set (1No of 262.50 KW)	
4.	**Transformer sub-Station (Nos)**	
	The bidder should also have experience of at least 1 No., turnkey work of transformer substation	**1 No**
II.	**Bid capacity**	
	Available Bid capacity should be more than the total bid value of **Rs.65.20 Crore**	

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

b) <u>Bid capacity:</u>

- Bidders who meet the minimum qualification criteria will be qualified only if their available bid capacity should more than the total bid value. The available bid capacity will be calculated as under:

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

  Where **A** = Maximum value of civil engineering works executed in any one financial year during the last three financial years [updated to 2024-25 (current) price level @ 6% 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., **1.50 year (18 Months).**

  B = Value of existing commitments and on-going works to be completed during the **next 1.50 year. (18 Months)** [Updated to 2024-25 (current) price level]

7.3.1 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		
	HSC Centrifugal		
	Submersible Pump		
2	Valves		
	Above 80 mm & above size		
	Pipes		
3	HDPE/PVC pipes		

Pumpset: Pumpset with ISI Specifications of reputed brands, such as Kirloskar, Best & Crompton, Mather and Platt, Worthington, KSB & Flow more or equivalent.

** **Valves:** Valves with ISI Specifications of reputed brands, such as VAG, AVK, Hawle, and Flow Meters 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 remodifying 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 certificate 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.
d) **The documentary evidence of remitting Income tax, TDS deductions on GST, Financial transactions etc., should be furnished.**

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 sublet 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.

In addition to the experience certificate issued by an Engineer, the contractor should produce the copy of sub contract agreement and proof of financial transactions made on the works executed as sub-contractor.

The documentary evidence of remitting Income tax, TDS deductions on GST, Financial transactions etc., should be furnished.

7.4. <u>Disqualification</u>:

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 / <u>blacklisted</u> 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 : Rs.
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 details: -**

Component		Performance
i) In case of Infiltration Well/ 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 supplied, laid, jointed,tested and satisfactorily completed?
iii) In case Service Reservoirs (with capacity of SRs to be clearly mentioned)	:	Whether constructed completed and tested for water tightness satisfactorily?
iv) In case of Water Treatment Plant Capacity in……. MLD – type - Components)	:	Whether completed and commissioned satisfactorily?

Signature of Officer with Seal

C. BID DOCUMENTS

8. Contents of Bid Documents

8.1 The Bid Documents will comprise the following documents & 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

Technical Specifications

Bill of Quantities

Drawings

Forms of Agreement

Indemnity Bond

9. Clarification of Bid Documents.

9.1 A prospective bidder requiring clarification may raise the same at the time of Pre-bid meeting in writing or by mail tirupur@ntadcl.com 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 uploaded in web site: https://tntenders.gov.in as stipulated in Invitation for Bid.

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 Annexures

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

b) Annual Construction Turnover of last five financial years – (7.1.5)**– Annexure-II**

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

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

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

f) List of Equipment 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 NotaryPublic (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 (Scanned copy)– (7.1.9) (Format-VIII)
h) Income Tax Clearance Certificate – (7.1.13)
i) Goods and Service Tax Verification 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)

iv. **Affidavit regarding correctness of information furnished with the bid document** that No alteration or correction should be made under any circumstances in the Bid Documents uploaded by the Employer

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 digitally by the bidder.

12.3 **Submission of Original Document**

The Bidding under this contract shall be done through the electronic bid submission in the web site https://tntenders.gov.in as stipulated in Invitation for Bid.

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.

13.3 The bid value is including of GST @ 18% (or) as per G.O. amended from time to time. The bidder should quote basic price of each item in the Bill of Quantity. The GST amount should be arrived for the Total basic cost of all the items. From every payment made to the firm/Contractor, deduction at source towards GST shall be made for civil work contract subject to issue of amendments from time to time.

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 49.

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** 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 **Rs.48,90,000/- (Rupees Forty Eight Lakh and Ninety Thousand only)** through **ONLINE** only in the website https://tntenders.gov.in.

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 through **ONLINE** not later than 30 days either after the expiration of the period of bid validity or after finalizations 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 bidding under this contract shall be done through the electronic bid submission in the website https://tntenders.gov.in.

a) Detailed guidelines for viewing bids and submission of online bids are given on the website

b) **Procurement, Construction and Commissioning of Combined Water Supply Scheme for providing 3.5 MLD to SIPCOT Defense Industrial Park, Varapatti, 2.0 MLD to TIDCO Aerospace Industrial Park, Sulur and 3.0 MLD to TIDCO Semi-Conductor Industrial Park, Kethanur from NTADCL Water Distribution Station (WDS 24) Murugampalayam, Tirupur** (Construction Period: 18 (Eighteen) Months and followed by defect liability period up to 12 (Twelve) Months) is **published on this website.**

c) Any citizen or prospective Bidder can submit bids online; however, the Bidder is required to have enrolment/registration in the website and should have valid Digital Signature Certificate (DSC) in the form of smart card / e-token.

d) The DSC can be obtained from any authorized Certifying Authority (CA). The following organizations are authorized Certifying Authorities under (CA), GOI:

- Safe scrypt
- e-MudhraCA

e) The Bidder should register in the website www.tntenders.gov.in using the relevant option available.

f) Then the Digital Signature Registration has to be done with the e-token, after logging into the site.

g) After this, the Bidder can login the site through the secured login by entering the password of the e-token & the user id/password chosen during registration.

h) After getting the bid schedules, the Bidder should go through them carefully and then submit the documents as required, otherwise, the bid will be rejected.

19. Pre-Bid Meeting:

19.1 The bidder or his authorized representative, who are desirous, may attend the pre bid meeting which will take place **Office of the Chief Technical Officer, NTADCL, on 05.06.2026 at 11.00 Hours.**

19.2 The purpose of the meeting will be to clarify issues and to answer questions on any matter that 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 https://tntenders.gov.in.

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. Electronic submission of Bids

20.1 Two cover system shall be adopted for submission of bids. The bidder shall submit two separate files through online system (i.e.,) **Part I** and **Part II**.

20.2 Part I - marked as **Part I**: 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 Part II - marked as **Part II**: It contain the Price Bid alone.

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

20.6 Format and signing of Tender

20.6.1 The contents of the Technical Qualification bid and Technical Financial bid shall be as specified in clause 12. All the documents are required to be signed digitally by the Bidder. **After electronic online bid submission, the system generates a unique bid identification number which is time stamped. This shall be treated as acknowledgement of bid submission**.

20.6.2 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.

20.6.3 Cells into which the bidder can enter rates will be left unprotected. The spread sheets already contain formulae.

20.6.4 The Bidder should carry over the Schedule wise Amount in the General Abstract to the **BoQ Sheet** manually. If any difference with General Abstract Amount and the amount in the BoQ sheet the General Abstract amount will be govern.

20.6.5 The Bidder is entirely responsible to ensure that the calculations presented in the Schedule of Prices are correct, and that the Bidder's offer is complete in all respects.

20.6.6 The Tender shall contain no alternations, omissions or additions, except those to comply with instructions issued by the Employer.

20.6.7 Bidders are requested to use the Digital Signature (e- token) for Registration for e-submission through the website https://tntenders.gov.in.

20.6.8 The digital Signature Certificate / e-token may be obtained by bidders at the risk and cost.

20.7 **Clarification on Bidding Documents**

20.7.1 The electronic bidding system provides for online clarification. A prospective Bidder requiring any clarification may notify online the authority inviting the bid. The authority inviting bid will respond to any request(s) for clarification received earlier than 10 days prior to the deadline for submission of bids. Description of clarification sought and the response of the authority inviting the bid will be uploaded in the website https://tntenders.gov.in for information of the public or other Bidders without identifying the source or request for clarification.

20.8 Amendment of Bidding Documents

20.9 Before the deadline for submission of bids but not later than 48 hours before opening of technical bids, the Employer may modify the bidding documents by issuing online corrigendum. The corrigendum will appear on the web page of the website https://tntenders.gov.in under **"Latest Corrigendum"** and email notification is also automatically sent to those Bidders who have moved this tender to their **"My Tenders"** area.

20.10 Any addendum thus issued shall be part of the bidding documents and deemed to have been communicated to all the Bidders who have moved this tender to their **"My Tenders"** area. In case of any addendum/corrigendum, the system will automatically send e-mails to all Bidders who have downloaded the bidding document.

20.11 To give prospective Bidders reasonable time in which to take an addendum into account in preparing their bids, the Employer shall extend by 48 hours, the deadline for submission of bids, in accordance with Clause 16.2.

21. Deadline for Submission of the Bids

21.1 Bids must be received by the Tender inviting authority at the address specified in clause 20.8 above not later than **15.00 Hours (as per Server Time) on 16 .06.2026 through e-Tendering method.** 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 The electronic bidding system would not allow any late submission of bids after due date and time as per server time.

23. Modification, Substitution and Withdrawal of Bids

23.1 The bidder may modify his bid by uploading his request for modification prior to the deadline for submission of bid. For bid modification and consequential re-submission, the bidder is not required to withdraw his bid submitted earlier. The last modified bid submitted by bidder within the bid submission time shall be considered as the bid. For this purpose, modifications by other means will not be accepted. In online system of bid submission, the modification and consequential re-submission of bids is allowed any number of times.

23.2 No tenderer shall be allowed to withdraw the tenders after submission of tender
No bid shall be modified or substituted after the deadline for submission of bids.

23.3 Modification 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".

23.4 Alternative Proposals by Bidders
Bidders shall submit offers that comply with the requirements of the bidding documents, including the basic technical design/specification as indicated in the specifications. Alternatives will not be considered.

F. BID OPENING AND EVALUATION

24. Bid Opening

24.1 The Employer inviting bids or its authorized representatives will open the bids online and this could be viewed by the Bidders also online. In the event of the specified date for the opening of bids being declared a holiday for the Employer, the bids will be opened at the appointed time on the next working day.

24.2 The file containing the Part I of the bid will be opened first. **Bids for which original EMD/EMD exemption document have not been received through ONLINE at the time opening of bids will be rejected and the technical bids of such bids will not be opened.**

24.3 In all cases, the amount of EMD and validity of the bid shall be scrutinized. Thereafter, the Bidders' name and such other details as the Employer may consider appropriate, will be notified as Part I bid opening summary by the authority inviting bids at the online opening. A separate electronic summary of the opening is generated and kept online.

24.4 The Employer will also prepare minutes of the Bid opening. Including the information disclosed and uploads the same for viewing online.

24.5 Evaluation of Part I of bids with respect to bid security, qualification information and other information furnished in Part I of the bid in pursuant to Clause 12.1, shall be taken up and completed and a list will be drawn up of the qualified Bidders whose Part II of bids will be eligible for opening.

24.6 The result of evaluation of Part I of the Bids shall be made public on e-procurement following which there will be a period of 5 working days during which any Bidder may submit complaint which shall be considered for resolution before opening of Part II of the bid. Any complaint shall be dealt with in accordance with complaint handling protocol as available on the e-procurement portal, https://tntenders.gov.in.

24.7 The Employer shall inform, the bidders, who have qualified during evaluation of Part I of bids, of the date, time of online opening of Part II of the bid, if the specified date of opening of financial bid is changed. In the event of the specified date being declared a holiday for the Employer, the bids will be opened at the appointed time and location on the next working day.

24.8 Part II of bids of only those Bidders, who have qualified in Part I of the bid will be opened online. The Bidders' names, the Bid prices, the total amount of each bid, and such other details as the Employer may consider appropriate will be notified online by the Employer at the time of bid opening. Any Bid price, which is not declared and recorded, will not be taken into account in Bid Evaluation.

24.9 The Employer shall prepare the minutes of the online opening of Part II of Bids and upload the same for viewing online.

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 and contacting the Employer

26.1 No Bidder shall contact the Employer on any matter relating to its bid from the time of the bid opening to the time the contract is awarded. If the Bidder wishes to bring additional information to the notice of the Employer, it shall be done in writing.

26.2 Bidders are requested to read all norms for qualification and evaluation carefully and submit the required credential documents in support of information given by them against these norms so that their evaluation may be carried. In the absence of these documents the bids are liable to be rejected. 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 During the detailed evaluation of Part I of Bids, the Employer will determine whether each Bid (a) meets the eligibility criteria defined in the above Clauses: (b) has been properly signed; (c) is accompanied by the required EMD; and (d) is substantially responsive to the requirements of the bidding documents. During the detailed evaluation of Part II of Bids, the responsiveness of the bids will be further determined with respect to the remaining bid conditions, i.e., priced bill of quantities, technical specifications.

27.2 A substantially responsive bid is one which conforms to all the terms, conditions, and specifications of the bidding documents, without material deviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality, or specification of the Materials; (b) which limits in any substantial way, inconsistent with the bidding documents, the Employer's rights or the Bidder's obligations under the Contract; or (c) whose rectification would affect unfairly the competitive position of other Bidders presenting substantially responsive bids.

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.

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

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

In determining the lowest evaluated price, the following factors will be considered as per Tamil Nadu Transparency in Tender Act 1998 and Rules 2000.
The price bids shall be evaluated as per the provisions section of the Tamil Nadu Transparency in Tenders Act, 1998.

The Employer will evaluate and compare only the bids determined to be substantially responsive in accordance with Clause 26. In evaluating the bids, the Employer will determine for each bid the evaluated bid price by adjusting the bid price through making an appropriate adjustment for any other acceptable variation, deviations or price modifications offered.

The Employer reserves the right to accept or reject any variation, deviation, or alternative offer. Variations, deviations and alternative offers and other factors which are in excess of the requirements of the bidding document or otherwise result in unsolicited benefits for the Employer shall not be taken into account.

If the Bid of the 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 analyses for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, the employer may require that the amount of the security deposit set forth in Clause 34 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. The amount of the increased performance security shall be decided at the sole discretion of the Employer, which shall be final, binding and conclusive on the bidder.

To assist in the examination, evaluation and comparison of bids, the employer may, at his discretion, ask any bidder for providing clarification of his bid, including breakdown of the unit rates within five days from the clarification seeking date. The request for clarification and the response shall be in writing or by mail but no change in the price or substance of the bid shall be sought, offered, permitted. If clarification is not provided within the stipulated time period, the bid will have declared non-responsive.

The Price Bid evaluation shall only consider basic rate inclusive of freight, loading, unloading at site, toll and any such other levies / taxes as may be applicable for the execution of the works, as per specifications, at the designated site. The basic price shall be exclusive of GST. GST will be calculated at 18% of the basic cost by the system and will be indicated separately.

In case of discrepancy between the amount in figures and in words, the lower of the two will be taken up for consideration.

To assist in the examination, evaluation and comparison of bids, the employer may, at his discretion, ask any Bidder for providing clarification of his bid, including breakup of the unit rates within five days from the clarification seeking date. The request for clarification and the response shall be in writing or by mail. **If clarification is not provided within the stipulated time period, the bid will be declared non-responsive.**

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 mail and 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

33.1 The successful contractor/firm, if not a registered contractor in TWAD / PWD / CMWSSB or any other Nodal Agency of GoTN or GoI., he / they shall get himself / themselves registered in any of the TWAD / PWD / CMWSSB or any other Nodal Agency of GoTN or GoI.

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 Chief Technical Officer, New Tirupur Area Development Corporation Limited (NTADCL), Tirupur**

(OR)

ii) Unconditional and irrevocable bank guarantee issued by any one of the branches of "Nationalised Bank or scheduled Bank", within the State of Tamilnadu, provided they are in prescribed format (enclosed in this Document) for an amount equivalent to 5% (Percentage) as noted below of the total value of the contract in favour of **the Chief Technical Officer, New Tirupur Area Development Corporation Limited (NTADCL), Tirupur**

For tenders with any plus % and upto minus 5% of Department value	:	2% of Contract value
For tenders with minus 5% and upto minus 15% of Department value	:	4% of Contract value.
For tenders with more than minus 15% Department value	:	5% of Contract value.

34.2 The bidder along with the performance security,shall deliver a non-judicial stamp paper for Rs.100/- (Rupees One 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.

35.5 Amendment to Agreement

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

36. Mobilization Advance

Mobilization Advance Not Applicable

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 **18 (Eighteen) months** for **construction work and followed by successful commissioning & proof of guarantee performance up to defect liability period is 12 (Twelve) Months.**

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

Sl. No.	Description	% of achievement	Cumulative % of achievement
1	In First Six Months	35%	35%
2	In Second Six Months	35%	70%
3	In Third & Last Six Months	30%	100%
	(DLP) Defect liability period		**12 Months**

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 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 achieves the next mile stone within the stipulated period cumulatively (i.e., including the first mile stone) the levied Liquidated Damages will be revoked. The amount recoverable towards liquidated damages shall not be more than 10% of the total value of 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 utilized 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 up to

- 95 % of the measured and check measured quantity
- 2.5 % on commissioning of the scheme and
- 2.5 % on commissioning of the entire scheme against unconditional irrevocable Bank Guarantee for a period of 1 year

Pumping Main, Booster Main, Feeder Main, Gravity Main and D'System:

For Pipes & allied works

➢	After supply at site	75%
➢	After laying, jointing and testing of pipe	85%
➢	After satisfactory completion of trial run and commissioning of the entire length of main	95%
➢	After commissioning of the entire scheme	100% against unconditional irrevocable Bank Guarantee for a period of 1 year for the 5% of the amount
Note:	For the first & second consignment of pipes:	Payment shall be made only when the pipes & specials are accepted at site by the Engineer.
	For the subsequent consignments,	Payment shall be made only when the pipes and specials are accepted at site by the Engineer and at least 50% of the pipes and specials supplied at site in the consignment immediately preceding the present consignment and 100% of all other earlier consignments are laid, jointed and tested to the satisfaction of the Engineer

2. Mechanical items in Pumping plant & Treatment Plant:

➢	After receipt of materials at site	75% will be released after supply of Electro Mechanical items at site after completion of 80 % of Civil works
➢	After erection	90% will be released after erection of the machineries and equipments at site.
➢	After commissioning	95%
➢	After commissioning of the entire scheme	100% as against unconditional irrevocable Bank Guarantee for a period of 2 years for the 5% of the amount

3. <u>For Higher capacity Pump sets (above 25 HP)</u>

➢ After receipt of materials at site	75% will be released after supply of above at site on production of Bank Guarantee equivalent to the amount to be paid after completion of 80 % of Civil works
➢ After erection, commissioning & Post installation, inspection by third Party agency	90% will be released after erection of the machineries and equipments at site. The Bank Guarantee obtained towards the advance paid for the equipments and plants already erected can be released proportionately
➢ After commissioning & Post installation, inspection by third Party agency	95%
➢ After commissioning of the entire scheme	100% as against unconditional irrevocable Bank Guarantee for a period of 2 years for the 5% of the amount

Note:

- The percentage of payment mentioned above is 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 up to 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.

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

- 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 Engineer-In-Charge or any of his subordinate officer under his control as directed by the **Chief Technical Officer, NTADCL, Tirupur**. The **Chief Technical Officer, NTADCL, Tirupur** 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 Chief Technical Officer, New Tirupur Area Development Corporation Limited (NTADCL), Tirupur**. 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 **NTADCL** 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 in lieu of the recovery of 40% in each bill in prescribed form in non-judicial stamp paper for a value of Rs.100/- 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/overhead tanks/water retaining structure).

If defects are noticed within the stipulated period of **12 months of satisfactory performance (DLP)**, 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/overhead tank, sand 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/overhead 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 Performance security shall be released after completion of Defect Liability Period (24 months from the date of commissioning)

44.3 While releasing the Bank Guarantee after Defect Liability Period, A fresh Bank Guarantee equivalent to 5% of the value of water retaining structure shall be obtained for a further period of 3 years.

Final bill for section II of contract shall be prepared after satisfactorily completion of contractors paid maintenance period. Indemnity bond may also be delivered

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 by the contractor at his cost as a forming part of the works.

44.5 Pre final bill may be prepared on commencement of paid maintenance and 100 % payment made for the construction works against 5 % Bank Guarantee on value of construction works.

Final bill may be prepared and payment may be made after completion of O&M period

45. Recovery of money payable to the NTADCL

45.1 All losses, costs, damages and expenses and other money payable to the **NTADCL** 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 **NTADCL** shall be insufficient to pay such losses, costs, damages, and other money payable to the **NTADCL** by the contractor, it shall be lawful for the Engineer in charge without any further

consent on the part of the contractor to sell or dispose of any securities deposited in the **NTADCL** 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

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.

47. Goods & Service Tax

GST is applicable as per GO. 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 20.10.2017 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 and Notification No 03/2022 - Central Tax (Rate) dated 13.07.2022 subject to issue of amendments from time to time

47.1 **TDS - GST**

From every individual periodic payment made to the firm/Contractor, TDS - GST will be deducted at the rates as may be notified from time to time by the Government

48. Fund Contribution for Manual Workers

Towards contribution of fund for the benefit of manual workers employed in the construction works an amount equivalent to 1% 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/ L&E(I2) Dept/ Dt.17.12.2013 subject to issue of amendment from time to time by the respective department of Government of Tamilnadu Department.

49. Price Adjustment Not Applicable

49.1 The conditions for price adjustment shall be as follows.

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 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 and 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. 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 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 milestones. 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 officially' 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 Adjustment"

49.2 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. (The provisions of the G.O. Ms. No. 227/ MA&WS (MA3) Dept., Dated 23.11.2009 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.

$Vc = 0.85 \times Pc / 100 \times R (C_1-C_0) / C_0$

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 of the calendar year in which the last date on bid submission is fixed 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 49.2.

(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 = $0.85 \times Psr / 100 \times R (S_1-S_0) / S_0$

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 of the calendar year in which the last date on bid submission is fixed as published by RBI / Office of the Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi.

S_1 = The AllIndia 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 49.2.

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

Table 49.2: Percentages of various components in the work.

Sl. No.	Description of Item.		Percentage
i.	Cement	P_c	**%**
ii.	Steel	P_{sr}	**%**

50. Bonus for Advance Completion of work: - (Not Applicable)

VI. LIST OF ANNEXURES

Sl. No.	Description	Para No.
I.	Performance of the bidder showing value of Civil Engineering work for the past five 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 last 5 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 Equipment 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 authorized 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 Format-VIII
8	Income Tax Clearance Certificate	7.1.13
9	GST Registration certificate	7.1.14
10	Certificate of performance issued by not less than the 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 Five Financial Years

Year	Monetary Value of Civil Engineering work (Rs. In lakhs)
2020 - 2021	
2021 - 2022	
2022 - 2023	
2023 - 2024	
2024 - 2025	

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

ANNEXURE II

Annual Construction Turnover

Each Bidder must fill in this form

Annual Turnover Data (Civil Engineering Work) in the Last Five Financial years.		
Sl. No.	**Year**	**Amount Currency**
1	2020 - 2021	
2	2021 - 2022	
3	2022 - 2023	
4	2023 - 2024	
5	2024 - 2025	

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 within a period of 5 years

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 comple tion	Reason for the delay, if any in comple ting the Project

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

ANNEXURE IV

Commitments of works on hand

Sl. No	Name of the Department/ Division	Name of the Project/ Description of the work	Agreement			Value of works remaining to be completed (Rs. in lakhs)	Anticipated date of completion
			No. and Date	Amount (Rs. in lakhs)	Period of completion in months		
I	**TAMILNADU**						
1	TWAD (including Outsourcing)						
2	CMWSSB						
3	Highways						
4	CMA						
5	DTP						
6	DRD						
II	**OTHER STATES**						
III	**PRIVATE**						

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

ANNEXURE V

Works for which Bids 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/Thiru..…… is a reputed company with a good financial standing?

If the contract for the work, namely "**Procurement, Construction and Commissioning of Combined Water Supply Scheme for providing 3.5 MLD to SIPCOT Defense Industrial Park, Varapatti, 2.0 MLD to TIDCO Aerospace Industrial Park, Sulur and 3.0 MLD to TIDCO Semi-Conductor Industrial Park, Kethanur from NTADCL Water Distribution Station (WDS 24) Murugampalayam, Tirupur" (Construction Period: 18 (Eighteen) Months and followed by defect liability period up to 12 (Twelve) Months)** is awarded to the above firm, we shall be able to provide overdraft/ credit facilities to the extent of **Rs.16.30 Crore** to meet their working capital requirements for executing the above contract.

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 / UT Government Department or Undertaking / Organization.

Seal

……..
……

(Signature of the Bidder)

ANNEXURE XI

Details of Components proposed to be sublet and sub-contractors 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.

"NTA.DCL" means New Tirupur Area Development Corporation Ltd., a company incorporated under the Companies Act, 1956 and having its Registered Office at No.66, Appachi Nagar, Kongu Main Road, Tirupur, Tamil Nadu. And having its Corporate Office at Polyhose Towers, First Floor, 86, Mount Road, Guindy, Chennai 600032.

"Employer" means the Chief Technical Officer, New Tirupur Area Development Corporation Limited, (NTADCL), Tirupur 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 authorized 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 authorized 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 authorized 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 complete 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 therefrom 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 do 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 1st 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 twenty eighth day 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 center 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	Number of persons required	Rate of Penalty
1)	**Project Manager, B.E.(Civil)** or equivalent with 15 years' experience	1	Rs. 25,000/- per month/ person
2)	**Deputy Project Manager, B.E.(Civil)** or equivalent with 10 years' experience	1	Rs. 15,000/- per month/ person
3)	**Resident Engineer, B.E.(Civil)/** Mechanical/Electrical or equivalent with 5 years' experience	2	Rs. 10,000/- 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.

The items quoted with violent excess percentage i.e., (+) 25 % and above over the departmental rate should not ordinarily exceed the departmental quantity during execution of work. If any involved during execution on those items, department rates shall only be allowed for the excess quantity of works. Further, the items quoted with violent less percentage i.e., (-) 10 % and below than the departmental value shall not be ordinarily omitted or reduced during execution of works.

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 pump sets 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 notwithstanding 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 shall 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 New Tirupur Area Development Corporation Ltd., 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 equipment's 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.

28.1 Labour

The contractor shall not employ any person who has not completed Eighteen 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.

28.2 Registration of Construction Workers Welfare Board

The Contractors and Sub-Contractors hired by main Contractors shall engage construction workers registered with the Construction Workers Welfare Board as required under the Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act,1996 (Central Act 27 of 1996)

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 contractor 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 any time, 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.

95% shall be paid as per agreement for additional quantity executed subject to the condition that overall expenditure shall not exceed administrative sanction amount

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 give 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 up to 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 may 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 in charge of the work. This will include the maintenance of the entire work by the firm/ contractor for a period of 1 Year.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 completion of the works in this project.

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 authorized 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 land 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) 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 defense 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.

2) 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 googles.

c)Stonebreakers 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 at least 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 18 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 pasteof ready-made paint.

   ii) Suitable face masks shall be supplied for use by workers when paint is applied inthe 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 facilitiesshall be provided to enable working painters to wash during and on cessation of works.

3) 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.

4) 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 a 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.

5) 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.

6) 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.

7) 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.

8) 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.

9) 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".

10) 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.

11) 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 up to 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 seignories 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 **NTADCL** /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.

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.

65 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.

66 Settlement of dispute

a. Dispute Redressal Committee

In order to ensure a dispute Redressal mechanism, a committee headed by the Managing Director headed by the Managing Director NTADCL and consisting of Chief Technical Officer, Chief Financial Officer NTADCL, will comprise the " Dispute Redressal Committee" for each package in order to resolve any disputes between the Employer / Engineer - in charge 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 (Tirupur) where the contract is awarded and agreement is concluded and by no other court.

67 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 will the Employer be responsible for any liability incurred by the bidder on this account.

68 Linear Measurement for Earth work excavation

The Bidder should carefully inspect the site to assess the prevalence of differing soil classification and quote his rate for trench excavation for Laying pipe line taking into account of all soil classification that are likely to be encountered and no extra rate will be paid for excavation of trench an account of any variations on the classification of soil met with during actual execution.

(A) LETTER OF NEGOTIATION

In pursuance of negotiation with the Chief Technical Officer, NTADCL 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

(B) NEW TIRUPUR AREA DEVELOPMENT CORPORATION LIMITED (NTADCL)

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 up to 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 less is and the Lump sum provision sufficient or likely to be exceeded.	:

II. **Additional Information**

A. **Original Agreement**

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

TENDERER

2. If concessional rate of EMD & SD has 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. :

(C) NEW TIRUPUR AREA DEVELOPMENT CORPORATION LIMITED

(NTADCL)

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 NEW TIRUPUR AREA DEVELOPMENT CORPORATION LIMITED (NTADCL) (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 carry out 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 matter 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, NTADCL,----------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 authorized 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 the reform 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 includes 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 onmatters 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

Dispute Redressal Committee

In order to ensure a dispute Redressal mechanism, a committee headed by the Managing Director NTADCL and consisting of Chief Technical Officer, Chief Financial Officer of NTADCL, will comprise the " Dispute Redressal Committee" for each package in order to resolve any disputes between the Employer / Engineer - in charge concerned and the contractor

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

ii) 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.

g) 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 **18 (Eighteen)** 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
NTADCL.

Signed, Name and
Designation of Witness

Chief Technical Officer,
NTADCL, Tirupur

(D) **PERFORMANCE BANK GUARANTEE (UNCONDITIONAL)**

To

The Chief Technical Officer, NTADCL, Tirupur

-—---------- (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 recognized 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, up to 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 thereunder 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 defect's liability period. '

SIGNATURE AND SEAL OF THE GUARANTOR

Name of Bank ——----------

Address ————————————

————————————

Date ——————————

(E) BID SECURITY (BANK GUARANTEE)/ INDEMNITY BOND

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 _____ **20…...**

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.

(F) 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.

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 digitally signed without omission are also upload the designated website https://tntenders.gov.in.

Changes in the Probable of Probable of Quantity

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

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.

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.

Goods and Service Tax & TDS on GST

The GST @ 18% (or) as per G.O. amended from time to time. The Bidder should quote basic price of each item in the Bill of Quantity. The GST amount should be arrived for the total basic cost of all the items from every payment made to the Firm/Contractor, deduction at source forwards GST shall be made for Civil Work Contractor subject to issue of amendments from time to time.

The Executive Engineer has to show restraint in execution of works under the following category by duly observance of procedure.

i. **Items quoted with violent excess percentage i.e., (+) 25% and above over the departmental rate should not ordinarily exceed the departmental quantity during execution. Department rates shall only be allowed for the excess quantity if any involved during execution on these items.**
ii. **The items quoted with violent less percentage i.e. (-) 10% and below than the departmental value shall not be ordinarily omitted or reduced during execution**.

Name of Work: Procurement, Construction and Commissioning of Combined Water Supply Scheme for providing 3.5 MLD to SIPCOT Defense Industrial Park, Varapatti, 2.0 MLD to TIDCO Aerospace Industrial Park, Sulur and 3.0 MLD to TIDCO Semi-Conductor Industrial Park, Kethanur from NTADCL Water Distribution Station (WDS 24) Murugampalayam, Tirupur (Construction Period: 18 (Eighteen) Months and followed by defect liability period up to 12 (Twelve) Months)

Item No.	Description of work	Probable quantity in Figures	TNBP No. Other specification	Units in	Rates in		Amount in figures
					Figures	Words	
1	2	3	4	5	6	7	8
Vide separate sheets attached.							

DOWNLOADED CERTIFICATE

Certified that **no correction/ alteration on the bid document as found in the web site** was made by me/ us and I/ We shall abide by all the terms, conditions and specifications contained in the bid document.

Tenderer

NEW TIRUPUR AREA DEVELOPMENT CORPORATION LIMITED
(NTADCL)

BID DOCUMENT

Name of Scheme: - **Procurement, Construction and Commissioning of Combined Water Supply Scheme for providing 3.5 MLD to SIPCOT Defense Industrial Park, Varapatti, 2.0 MLD to TIDCO Aerospace Industrial Park, Sulur and 3.0 MLD to TIDCO Semi-Conductor Industrial Park, Kethanur from NTADCL Water Distribution Station (WDS 24) Murugampalayam, Tirupur.**

(TECHNICAL SPECIFICATION)

(E - Tendering System)

TECHNICAL SPECIFICATIONS

INDEX

I. 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 Steel

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 requirements of IS 269/1976 with the latest revision thereof for ordinary Portland cement. It shall be of the best normal setting quality unless especially 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 band containing the bars shall bear the ISI Certification mark.

1.4 All the samples of construction materials should be tested in the Material Testing Laboratories located within the region (Coimbatore) to ensure the quality of the material. If the sample could not be tested in the Coimbatore Laboratory due to some unavoidable reasons, the sample may be tested in any one of the other 3 Materials Testing Laboratories located at Madurai, Trichy and Tindivanam. 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 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.

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, 1.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 be exceeding the limits given in table I of I.S. 383. Unless otherwise specified all coarse aggregate in RCC shall be graded aggregate of 20 mm. 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.

3. Water required for Construction

3.1 The water used in the construction shall be of potable quality and shall be tested the contractor' cost. The contractor has made 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 456/1978.

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 approved 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 40 mm thick and strong props. This shall be providing complying with clause 10 of IS 456 /1978 and specification no. 30.8 of TNBP. The timber of 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 motor blocks of suitable size with wire embodiment 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 456/1978

STRENGTH:

A satisfactory butt welded joint of HDPE will have the strength factor of one. Temperature is of primary importance and weld efficiency may decrease if the temperature is more or less than 210 deg C.

7.4 Ductile Iron pipe

Ductile Iron pipe shall be procured from the reputed manufacturers and the pipes shall confirm to IS 8329/2000. The pipes diameter given in schedule is the clear inner diameter. The pipe and specials should be supplied with inside lining with a cement mortar of standard thickness and specifications and outside coating of Metallic Zinc as per I.S. specifications. The pipes should be with ISI marking. The test certificate furnished by the manufacturers should be produced.

7.5 PVC pipes.

The unplasticized PVC rigid pipes shall strictly conform to IS 4985/1988 and amended from time to time and shall carry ISI marking in every pipe.

The contractor should procure the PVC rigid pipes from a reputed manufacturer.

The contractor should furnish the test certificate issued by the manufacturer.

The manufacturer's test certificate and third-party inspection certificate should be produced by the contractor for the pipe used in the works.

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 specification gravity, impact strength at 0^0C internal hydraulic pressure test, diameter, thickness etc. in TWAD Board laboratory.

The PVC pipe joints shall be with solvent cement of good quality, conforming to IS 14182/1994.

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.

All the PVC specials required for use in conjunction with PVC pipes, should be got approved by the Engineer-in-charge.

7.6 GI pipes

GI pipes should be procured by the contractor from reputed manufacturer or from their authorized dealer of reputed manufacturer and should conform to IS 1239 /part I, namely the inner and outer diameter, length and weight. The pipes which are found to be not conforming to relevant specification shall be rejected by the Engineer-in-charge.

7.7 CI D/F Pipes

The CI D/F Pipes procured for use in the wok should conform to the relevant BIS Specification and suitable for use in the work.

Valves

7.7.1 The contractor should procure reputed make of sluice valves, scour valves, reflux valves and air valves from the manufacturer or his authorized dealer and they should conform to the relevant BIS Specification and suitable for use in the work. The valves shall bear ISI marks.

7.8 CI/PVC/GI Specials and Fittings

7.8.1 The specials and fittings should be in conformity to the relevant BIS specification.

7.9 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.

7.9.2 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 thereof.

8. Water meter

a) Water meter should be supplied conforming to ISO 4064 Class B
b) Life cycle test certificate approved by M/S. Fluid Control Research Institute, Palghat (or) through National Physical Laboratories (NPL), New Delhi (or) any other National Accreditation Board of Laboratories (NABL), approved Government Organisation should be furnished.

II. CIVIL WORKS

1. General

1.1 Tamil Nadu 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 various with any provision under IS or description of work, technical specifications and conditions of contract, the provisions of the latter shall be deemed to supersede 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 the departmental lands within 150m. of plant site and as directed by the Engineer in charge.

2.3 Stacking.

Where the location of the work is such and does not permit the deposition of excavated earth while digging trenches for laying pipes, the excavated earth should be conveyed to a convenient place and deposited there temporarily, as directed by the Engineer-in-charge. Such deposited soil shall be reconveyed to the site of the work for the purpose of refilling of trenches, if it is suitable for refilling. The unit rate for trench work of excavated and refilling shall include the cost of such operation

2.4 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 leveling the road. Sectioning is to be done as detailed in TNBP. It is to be understood that no extra payment, will be made for this and the unit rate for trench work of excavation and refilling shall include the cost of removal of surplus earth to disposal site approved by the Engineer-in-charge, its spreading and sectioning at the bidder's expense.

2.5 Shoring, Strutting and Baling out Water

The rate for excavation of trench work shall include charges of shoring strutting, bailing out water wherever necessary and no extra payment will be made for any of these contingent works. While bailing out water, care should be taken to see that the bailed-out water is properly channelized to flow away without stagnation or inundating the adjoining road surfaces and properties.

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 specified proportions satisfying the maximum aggregate size, water cement ratio and required cube strength and workability as per IS 456-1978. 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 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 456-1978.

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 456-1978. It is imperative that all concreting operations be done rapidly and efficiently with minimum re handling 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 be dropped from such a height as it may cause segregation 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 456-1978 and as directed by the Engineer in charge. The efficiency of tempering and consolidation will be judge by complete absence of air pockets, voids and honey combing after removal of form works.

3.4 Curing

3.4.1 Curing shall be done to avoid excess shrinkage or harmful effort to the members generally complying with clause 12.5 of IS 456-1978.

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 TNBP and BIS and as directly by the engineer in such a manner that no damage is caused to the structures. The striping time shall not be less than that indicated in clause 10.3 of IS 456-1978.

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 456-1978. 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 contractors' cost.

3.6.3 The inspection and testing of structures shall be done in accordance with clause 16 of IS 456-1978

4. Masonry

4.1 All masonry works such as Random Rubble /Coursed Rubble/Brick work must be done as per TNBP Specification and Bid schedule specification.

5. Plastering

5.1 Plastering would be 12mm. 20mm and 25 mm thick cement plaster either plan or water proof 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 water proof 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. 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 wood work shall be inform 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.

7.7 The mode of measurement shall be on area unit 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 snowcem painting. Shade and make shall be as directed by the Engineer and for decorative purpose, Engineer may ask 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.

III. SOURCE CREATION

The proposal involves drawing potable water 8.50 MLD by gravity by providing 300mm Inlet Tapping from the Distribution Main of NTADCL Water Distribution Station (WDS 24) Murugampalayam, Tirupur to the adjacent proposed collection sump cum pump house with a storage capacity of 7.50 ML.

From the collection sump potable water is being pumped to the respective destinations through DI 450mm/ OPVC 400mm to 160mm pipe for a total length of 50.68 Kms. The water will be pumped for 20 hours daily using vertical turbine pumps (2 Working and 1 Standby) each pump with a discharge rate of 213 m^3 per hour and a total head of 171 meters.

IV. PIPE LAYING WORKS

1. General.

1.1 The earthwork or the pipe laying work shall generally conform to the details given below:

Sl. No.	Dia of pipe in millimeter	Depth of Bottom of pipe below trench Bottom in centimeter	Width of at ground level centimeter
1.	PVC Pipe up to 140	105	60
2.	For other Pipes up to 150	105	75
3.	200	110	80
4.	250	120	80
5.	300	135	80
6.	350	145	90
7.	400	155	90
8.	450	170	100
9.	500	185	100
10.	600	205	110
11.	700	230	120
12.	750	245	125

1.2 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.

1.3 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	IS 7118/1983 & IS 15371996
MS Pipes	IS 3589/2001
DI Pipes	IS 8329/2000
PVC Pipes	IS 4985/2000
HDPE Pipes PE 100	IS 4984/2016

In portion of pipe line, 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.

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 15cm thick layers duly waiting 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 any time till the completion of the work, the contractor at his cost should make good there filling to the required level as may be directed by the Engineer in charge.

1.4 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.

1.5 If the work is in a residential area, the contractor should carry out the excavation carefully to avoid collapse of any structure.

1.6 Valves shall be provided with valves pits with proper cover to bear the loads coming on it as per bid documents and departmental drawings and specification Public fountains, Fire hydrants shall be provided as per type design and specification.

1.7 Adequate protective measures shall be taken against surge pressure. Zero velocity valves and air cushion valves should be provided at the appropriate places; Trust blocks and anchor blocks should be provided at all bends and appropriate places.

1.8 Water required for testing the pipeline shall be arranged by the contractor at his cost.

2. Laying of Cost Iron/DI Pipes

2.1 The laying and jointing of cast iron pipes shall be carried out as follows.
Before laying the pipes, the contractor shall carefully brush then 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 properly 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.

2.2 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.

2.3 Cutting of C.I./DI 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.

2.4 Covering up Open Ends.

The Contractor shall take particulars care to ensure that the apertures and open ends of pipes are carefully covered whenever the workmen are not actually employed therein.

2.5 Jointing of C.I./DI 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.

a) 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 may 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 lead close against the face of the socket. The joints shall then be run with molten lead in sufficient quantity so that after being caulked solid, the lead may project 3mm beyond the face of the socket against the outside of the spigot but must be flush with the 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 ad 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 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 joints 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

Nominal size of pipe in mm.	Lead / Joint In kg.	Depth of Lead joints in mm.	Spun Yarn per joint in kg.
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 provisional and variation of 20 percent is permissible.

b) **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 fiber 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 pacing should be checked before another pipes is joined on.

c) **Cement Joints**

The cement for the joints shall conform to IS269\1996 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 at least six pipes laid to the final grade and alignment ahead of the joint to be made of the joint to be made. Starting at the bottom of the joint 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 approvedwet 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.

d) **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 joints are assembled. A timer header shall be used between the pipe and crow bar or jack to avoid damages to the pipe while the plain end of the pipe is pushed onto the socket either with a crow bar or jack, or lever puller.

2.6 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 pipe line 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 in cases where the position of the valve is to one side the metalloid road) the walls of the valve chamber shall be 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.

2.7 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.

2.8 Fixing Air Valve.

Air valves shall be fixed at the summits of pipe lines or at places may be directed by the Engineer. The air valve connections etc., shall be carried out as per drawing.

2.9 Interconnection work

The Inter connection work between the existing main to the existing main to the 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 pump sets, 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 work shall proceed without interruption by engaging labour for carrying out the work on a continuous 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 interconnection. 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 lump sum rate quoted in the schedule for inter connection.

2.10 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.

2.11 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.

2.12 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 leveled, 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 20mm thick and the outside with cement mortar 12 mm thick. The chamber shall be topped with pre-cast R.C.C. Slabs 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 one 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 risk 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.

2.13 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 joint show seepage or slight leakage, such joints shall be cut out and replaced as directed 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 value, 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 connection 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 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 2kg hammer.

When a flange joint is found to be leaking, care shall be taken that while tightening up the flanges, the neighbouring joints are not affected.

If the length of pipe line under test in is found to be satisfactory and on 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 defective joint and the length of pipe line shall be retested 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.

2.14 Restoring Road Surface

The surface of the road or ground shall be finished off to the proper level with the same kind of material as the surface consisted of before the excavation commenced, except in the case of superior roads and tarred roads in which case the surfaces should be finished off with water bound macadam surface. Should any settlement occur after refilling is completed, and up to the end of the period of maintenance, it shall be made good at once and the surface restored to the satisfaction of the authority under whose jurisdiction such road or ground may be, all at cost of the contractor.

2.15 Collection or 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 and find a deposit thereof and anything which may have collected within the works, during the period of maintenance shall also be removed before the works are finally accepted by the Employer.

3.2 Ductile Iron pressure pipes and special with tyton joints

3.1 Applicable codes

The laying of DI pipes and fittings / specials shall comply with all currently applicable statutes, regulations, standards and codes. In particular the following standards, unless otherwise

specified herein, shall be referred. In all cases, the latest revision of the standards/codes shall be referred to. Other IS: Codes not specifically mentioned here but pertaining to the use of DI pipes shall be part of this Specification.

Table No. 3.1

I.S. Number	Title
IS: 8329: 2000 Amend No.-1 2000	Centrifugally cost (spun) ductile iron Pressure pipes for water, gas and sewage (third revision)
IS: 9523: 2000	Ductile iron fittings for pressure pipes for water, gas and sewage.
IS: 12288: 1987	Code of practice for use and laying of ductile iron pipes
IS: 5382: 1985	Rubber sealing rings for gas mains, water mains and sewer (first revision)

3.2 Ductile iron pipes

3.2.1 The pipes shall be centrifugally cast (spun) Ductile iron pipes for water and sewage confirming to the IS 8329: 2000. The pipes used shall be either with push on joints (Rubber Gasket Joints) or Flanged joints. The class of pipe to be used shall be of the class K-7 & K-9.

3.2.2 The pipes shall be coated with bitumen and have factory provided cement mortar lining in the inside as per the provisions of the IS 8329:2000. The pipes are supplied in standard length of 4.00, 5.00, 5.50 and 6.00 meters length with suitably rounded or chamfered ends. Each pipe of the push on joint variety shall also be supplied with a rubber EPDM/(SBR) gasket.

3.2.3 The flanged joints shall confirm to the Clause 6.2 of IS: 8329.The pipe supply shall include one rubber gaskets for each flange.

3.2.4 Specifications of sockets and spigot pipes, classes K7 and K9 are mentioned below.

Table No.3.2
(Refer Table 2 IS 8329-2000)
(in mm)

Nominal Diameter	External Diameter	Barrel wall thickness 'e'	
DN	**DE**	**K7**	**K9**
80	98	5	6
100	118	5	6
125	144	5	6
150	170	5	6
200	222	5	6.3
250	274	5.3	6.8
300	326	5.6	7.2
350	378	6	7.7
400	429	6.3	8.1
450	480	6.6	8.6
500	532	7	9
600	635	7.7	9.9
700	738	9	10.8
750	790	9.7	11.3
800	842	10.4	11.7
900	945	11.2	12.6
1000	1048	12	13.5

3.2.5 Specification of (PN 10) Standard flange Drilling for screwed Flanges and Welded Flange are mentioned below:

(PN 10) Table No.3.3
(Refer Table 3 IS 8329-2000)
(in mm)

Nominal Diameter	Outer diameter of flange D	Holes		Bolt size
DN	**D**	**Number**	**Dia d**	Metric
80	200	4	19	M16
100	220	8	19	M16
125	250	8	19	M16
150	285	8	23	M20
200	340	8	23	M20
250	395	12	23	M20
300	445	12	23	M20
350	505	16	23	M20
400	565	16	28	M24
450	615	20	28	M24
500	670	20	28	M24
600	780	20	31	M27
700	895	24	31	M27
750	960	24	31	M27
800	1015	24	34	M30
900	1115	28	34	M30

Nominal Diameter	Outer diameter of flange D	Holes		Bolt size
DN	D	Number	Dia d	Metric
1000	1230	28	37	M33

3.2.6 Specifications of (PN 16) standard Flange Drilling for screwed Flanges and Welded flange are mentioned below:

(PN 16) Table No.3.4
(Refer Table 4 IS 8329-2000)
(in mm)

Nominal Diameter	Outer diameter of flange	Holes		Bolt size
DN	D	Number	Dia (d)	Metric
80	200	8	19	M16
100	220	8	19	M16
125	250	8	19	M16
150	285	8	23	M20
200	340	12	23	M20
250	400	12	28	M24
300	445	12	28	M24
350	520	16	28	M24
400	580	16	31	M27
450	640	20	31	M27
500	715	20	34	M30
600	840	20	37	M33
700	910	24	37	M33
750	970	24	37	M33
800	102	24	40	M36
900	112	28	40	M36
1000	125	28	43	M39

3.2 Coating:

Pipe shall be supplied internally (cement mortar lining) and externally (bituminous coating) coated as under:

3.3.1 Cement Mortar Lining –

3.3.1.1. Cement -the cement used for the lining shall conform to the existing standards on cement, the type of cement to be used is to be mutually decided between the purchaser and manufacturer, Normal recommendations are:

3.3.1.1.1 Portland cement (as per IS 8112 or IS 455) mortar lining perform rather well and have an expected life of approximately 50 years in soft water with moderate amount of aggressive Co2 and when Ph is within 6 to 9. Longer service life can be obtained by increasing the mortar lining thickness.

3.3.1.1.2 Where cement mortar lining may be exposed to sulphate attack, ordinary Portland cement should be replaced by sulphate resisting Portland cement (as per IS 12330 or IS 6909).

3.3.1.1.3 The sulphate concentration limit for sulphate resisting Portland in approximately 3000 mg/litre, the same as blast furnace slag cement which naturally possess a good resistant to sulphate attack.

3.3.1.1.3 High alumina cement (as per IS 6452) mortar lining is suitable for continuous use of pH between 4 and 12 and no sever damage occur after occasional exposure to pH 3 to 4 and 12 to 13.

3.3.1.1.4 The recommended type of cement used for lining are as given in table 3.5

Recommended type of cement used for lining
Table no 3.5
(Refer Table 14 IS 8329-2000)

Sl. No	Water characteristics	Portland	Sulphate Resisting Cements (including Blast-Furnace Stag Cement)	High alumina Cement
1	**2**	**3**	**4**	**5**
1	Minimum value of pH	6	5.5	4
2	Maximum Content (mg/l) of:-			
	Aggressive co_2	7	15	No limit
	Sulphates (so_4)	400	3000	No limit
	Magnesium (Mg^{++})	100	500	No limit
	Ammonium (NH_4)	30	30	No limit

3.3.1.2 Sand

3.3.1.2.1 The sand use shall have a controlled granulometric distribution from fine to coarser elements; it shall be clean and shall be composed of inert, hard, strong and stable granular particles.

3.3.1.2.2 The fine fraction comprising particles passing through a sieve of aperture size 0.125 mm shall not be more than 10 percent by mass.

3.3.1.2.3 The coarsest fraction (comprising particles which do not pass through a sieve of the aperture size closest to half the normal thickness of the mortar lining) shall not exceed 5% by mass.

3.3.1.3. Water- The water used for the preparation of the mortar shall not contain substances deleterious to the mortar nor to the water is it eventually intended to transport in the pipe. The presence of solid mineral particles is, however, admissible provided that these requirements are still fulfilled.

3.3.1.4. Mortar - The mortar of the lining shall be composed of cement, sand and water.
Additives may be used, provided that they do not prejudice the quality of the coating and that of the transported water.

3.3.1.4.1 The mortar shall be thoroughly mixed and shall have a consistency which results in a dense and homogenous lining.

3.3.1.4.2 The mortar shall contain by mass at least one part of cement to 3.5 parts of sand.

3.3.2 Bituminous Coating-

3.3.2.1. Coating shall not be applied to any pipe unless its surfaces are clean, dry and free from rust.

3.3.2.2 The coating material shall set rapidly with good adherence and shall not scale off.

3.3.2.3 The mean thickness of the coating shall be not less than 70 μm and the local Minimum thickness shall be not less than 50 μm.

3.3.2.4 Where the coating material has a bitumen base, it shall be smooth and tenacious and hard enough penknife.

3.3.2.5 When the pipes to be used for conveying potable water the inside coating shall not contain any constituent soluble in such water or any ingredient which could impart any taste or whatsoever to the potable water after sterilization and suitable washing of the mains.

3.3.2.6 Pipes with or without sockets and flanges which are imperfectly coated or where the coating does not set or conform to the required quality, the coating shall be removed and the pipes/flanges recoated.

3.4 Hydrostatic site test pressures and hydraulic working pressure.

3.4.1 Hydrostatic site test pressures and hydraulic working pressure of the newly laid pipe line is specified as under in

Table No.3.6
Refer Amendment No.1, (Annex E -Table 1): IS 8329-2000

DN	Allowable operating pressure (excluding surge) AOP		Allowable Maximum Operating pressure (including surge) MOP		Allowable site test Pressure (STP)	
	K7	K9	K7	K9	K7	K9
	Mpa		Mpa		Mpa	
80	0.8	6.4	1.25	7.7	1.75	9.6
100	0.8	6.4	1.25	7.7	1.75	9.6
125	0.8	6.4	1.25	7.7	1.75	9.6
150	0.8	6.4	1.25	7.7	1.75	9.6
200	0.8	6.2	1.25	7.4	1.75	7.9
250	0.8	5.4	1.25	6.5	1.75	7
300	0.8	4.9	1.25	5.9	1.75	6.4
350	0.8	4.5	1.25	5.4	1.75	5.9
400	0.8	4.2	1.25	5.1	1.75	5.6
450	0.8	4	1.25	4.8	1.75	5.3
500	0.8	3.8	1.25	4.6	1.75	5.1
600	0.8	3.6	1.25	4.3	1.75	4.8
700	0.8	**3.4**	1.25	**4.1**	1.75	**4.6**
750	0.8	**3.3**	1.25	**3.9**	1.75	**4.4**
800	1	**3.2**	1.5	**3.8**	**2**	**4.3**
900	1	**3.1**	1.5	**3.7**	**2**	**4.2**
1000	1	**3**	1.5	**3.6**	**2**	**4.1**

3.4.2 Other Test of Pipes:

3.4.2.1 Mechanical test are carried out during the manufacture. One test shall be conducted for every batch of production.

3.4.2.2 Tensile Test shall be conducted by cutting a sample from the spigot end of the pipe. This sample may be cut perpendicular to or parallel with the pipes axis, but in case of dispute the parallel to axis sample shall be used.

3.4.2.3 Two methods of measuring the tensile strength may be used at the manufacturer's option.

3.4.2.4 Method 1 - Machine the test bar to its nominal diameter + 10 percent, measure the actual diameter before the test with an accuracy of 0.01 mm and use this measured diameter to calculate the cross-sectional area and the tensile strength; or:

3.4.2.5 Method 2 - Machine the test bar to its nominal area S0 within a specified tolerance on diameter and use the nominal area to calculate the tensile strength.

3.4.3 Brinell Hardness Test:

3.4.3.1 When tested in accordance with IS 1500, the Brinell hardness shall not exceed 230 HB on the external un-machined surface.

3.5 Marking

3.5.1 Each pipe shall have as cast or stamped or legibly and indelibly painted on it with the following appropriate marks:

(a) Indication of the source of manufacture:
(b) The nominal diameter:
(c) Class reference;
(d) The last two digits of the year of manufacturer:
(e) The non-standard length of the pipe if specially ordered:
(f) Where applicable, an indication of length over which the pipe is suitable for cutting on site: and
(g) A short white line at the spigot end of each pipe with push-on joint in sizes DN 700 and above, to indicate the major axis of the spigot.

3.6 Fittings

3.6.1 Dimensional and other requirement for fittings for specified Diameter shall conform to the details given in tables 15 to 31 section 3 of the IS specification code IS: 9523: 2000.

3.6.2 Hydrostatic test

For hydrostatic test, the fittings shall be kept under pressure for 10 seconds. They shall withstand the pressure test without showing any sign of leakage, sweating or other defect of any kind. The test shall be conducted before the application of surface coating.

3.6.3 The fittings shall withstand the hydrostatic pressure given in table.4.7 Hydrostatic test pressure for castings

Table No. 3.7
(Refer Table No. 2 IS 9523-2000)

Nominal Diameter DN (mm)	Hydrostatic Test Pressure at works, MPa
Up to and including 300	2.5
Over 300 and up to and including 600	1.6
Over 600 and up to and including 2000	1.0

3.7 Tolerances:

3.7.1 The tolerance on dimensions of barrel and socket for push-on-joint fittings shall be as given in Table 4.8

Table No.3.8

(Refer Table No. 3 IS 9523-2000)

Nominal Diameter	External Diameter DE		Wall Thickness mm		
DN	Nominal	Tolerance	K12	K14	Torerance
1	2	3	4	5	6
80	98	+1/-2.7	7	8.1	-2.38
100	118	+1/-2.8	7.2	8.4	-2.40
125	144	+1/-2.8	7.5	8.7	-2.42
150	170	+1/-2.9	7.8	9.1	-2.45
200	222	+1/-30	8.4	9.5	-2.50
250	274	+1/-3.1	9.0	10.5	-2.55
300	326	+1/-3.3	9.6	11.2	-2.60
350	378	+1/-3.4	10.2	11.9	-2.65
400	429	+1/-3.5	10.8	12.6	-2.70
450	480	+1/-3.6	11.4	13.3	-2.75
500	532	+1/-3.8	12.0	14.0	-2.80
600	635	+1/-4	13.2	15.4	-2.90
700	738	+1/-4.3	14.4	16.8	-3.00
750	790	+1/-4.4	15.0	17.5	-3.05
800	842	+1/-4.5	15.6	18.2	-3.10
900	945	+1/-4.8	16.8	19.6	-3.20
1000	1048	+1/-50	18.0	21.0	-3.30

3.7.2 Tolerances for the various dimensions of flanges shall be as given in tables 4.9 and 4.10

3.7.2.1 Dimensions of standard Flange Drilling for Flange Fittings PN 10

Table No.3.9
(Refer Table No. 4 IS 9523-2000)

(in mm)

Nominal Diameter	Dimensions of flange		Holes	Dia of Holes	Bolt Size, Metric
DN	D (outer dia)	b (Thickness)	No	Dia (d)	
1	2	5	7	8	9
80	200	16	4	19	M16
100	220	16	8	19	M16
125	250	16	8	19	M16
150	285	16	8	23	M20
200	340	17	8	23	M20
250	395	19	12	23	M20
300	445	20.5	12	23	M20
350	505	20.5	16	23	M20
400	565	20.5	16	28	M24
450	615	21	20	28	M24
500	670	22.5	20	28	M24
600	780	25	20	31	M27
700	895	27.5	24	31	M27
750	960	29	24	31	M27

Nominal Diameter	Dimensions of flange		Holes	Dia of Holes	Bolt Size, Metric
DN	D (outer dia)	b (Thickness)	No	Dia (d)	
800	1015	30	24	34	M30
900	1115	32.5	28	34	M30
1000	1230	35	28	37	M33

3.7.2.2 Dimensions of standard Flange Drilling for flange fittings PN 16

Table No. 3.10
(Refer Table No. 5 IS 9523-2000)
(in mm)

Nominal Diamer	Outer Diameter	Holes		Bolt Size, Metric
DN	D	No	Dia (d)	
1	2	3	4	9
80	200	8	19	M16
100	220	8	19	M16
125	250	8	19	M16
150	285	8	23	M20
200	340	12	23	M20
250	400	12	28	M24
300	455	12	28	M24
350	520	16	28	M24
400	580	16	31	M27
450	640	20	31	M27
500	715	20	34	M30
600	840	20	37	M33
700	910	24	37	M33
750	970	24	37	M33
800	1025	24	40	M36
900	1125	28	40	M36
1000	1255	28	43	M39

3.7.2.3 Lengths of Fittings

The permissible deviations on the lengths of fittings shall be as under.

Deviation on Lengths of Fittings
Table No.3.11
(Refer Table No. 14 IS 9523-2000)

Types of fittings	nominal Diameter DN mm	Deviation in L & H mm
Flange socket, Flanged Spigot, Collars, tapers	80 to 1200	±25
Tees	80 to 1200	± 50/-25
Bends 90º (1/4)	80 to 2000	± (15 + 0.03 DN)
Bends 45º (1/8)	80 to 2000	± (10 + 0.025 DN)
Bends 20º (30) and11º (15)	80 to 1200	± (10 + 0.02 DN)

3.8 Marking

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

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

3.8.3 BIS Certification Marking
The fittings may also be marked with the Standard Mark.

3.8.4 The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made there under. The details of conditions under which the license for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

3.9 Specification for Laying and jointing of Pipe Line System for water Supply.
Code of practice for use and laying of DI Pipes should be as per IS 12288:1987.

3.9.1 **Preparatory work:**

The contractor will inspect the route along which the pipe line is proposed to be laid. He should observe/find out the existing underground utilities/construction and propose an alignment along which the pipeline is to be laid.

3.9.2 He should make all efforts to keep the pipe as straight as possible with the help of ranging rods. Wherever there is need for deviation, it should be done with the use for necessary specials or by deflection in pipe joints.

3.9.3 The alignment as proposed should be marked on ground with a line of white chalk and got approved from engineer In charge. The contractor will than prepare an L-Section along this alignment showing the location of proposed pipe line. The L-section should also be got approved from the site Engineer. The position of fittings, valves, shall be shown on the plan.

3.9.4 **Alignment and the L-sections:**

The alignments-section (depth of laying) and location of specials, valves and chambers may be changed at site in co-operation with and after approval of the Engineer in charge.

3.9.5 **Transportation of pipes and specials:**

3.9.5.1 The contractor has to transport the pipes and other materials form supplier to the site of laying as indicated by the engineer in charge. Pipes should be handled with care to avoid damage to the surface, internal lining and the socket and spigot ends, deformation or bending.

3.9.5.2 Pipes shall not be dragged along the ground or the loading end of a vehicle. Pipes shall be transported on flat bed vehicles/trailers. The bed shall be smooth and free from any sharp objects. The pipes shall rests uniformly on the vehicle bed in their entire length during transportation. Pipes shall be loaded and un-loaded manually or by suitable mechanical means without causing any damage.

3.9.6 Cranes or chain pulley block or other suitable handling and lifting equipment shall be used for loading and un-loading of heavy pipes. However, for pipes up to 400 mm nominal bore, skid timbers and ropes may be used.

3.9.6.1 Where using crane hooks at sockets and spigot ends hooks shall be broad and protected by rubber or similar material, in order to avoid damage to pipe ends and lining. Damage to lining must be repaired before pipe laying. Pipes shall not be thrown directly on the ground.

3.9.7 **Bedding of the pipes:**

3.9.7.1 The pipe shall be laid out along the proposed alignment in a such a manner that they do not create any problem to public and are not damaged.

3.9.7.2 The trench bottom shall be even and smooth so as to provide a proper support for the pipe over its entire length, and shall be free from stones, lumps, roots and other hard objects that may endure the pipe or coating. Holes shall be dug in the trench bottom to accommodate sockets so as to ensure continues contact between the trench and the entire pipe barrel between socket holes.

3.9.8 **Laying and jointing of DI pipes:**

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

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

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

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

3.9.8.2.3 Where a pipeline crosses a watercourse, the design and method of construction should take into account the characteristics of the watercourse to ascertain the nature of bed, scour levels, maximum velocities, high flood levels, seasonal variation, etc. which effect the design and laying of pipeline.

3.9.8.2.4 The socket and spigot end of the pipes shall be brushed and cleaned. The chamfered surface and the end of the spigot end has to be coated with a suitable lubricant recommended by the manufacturer of the pipes. Oil, petroleum bound oils, grease or other material which may damage the rubber gasket shall not be used as lubricant. The rubber gasket shall be inserted into the cleaned groove of the socket. It has to be checked for correct positioning.

3.9.8.2.5 The rubber gaskets shall be kept in their original packing and stored in cool conditions/not exposed to the direct sunlight, should only be taken out when needed.

3.9.8.2.6 The two pipe shall be aligned properly in the pipe trench and the spigot end shall be pushed axially into the socket either manually or with a suitable tool specially designed for the reassembly of pipes and as recommended by the manufacturer. The spigot has to be inserted up to the insertion mark on the pipe spigot. After insertion, the correct position of the socket has to be tested with a feeler blade.

3.9.8.2.6 Deflection of the pipes if-any-shall be made only after they have fully been assembled. The deflection shall not exceed 75% of the values indicated by the pipe manufacturer.

3.10 Joints

3.10.1. In the case of push-on with or without centering rings.

3.10.1.2 The lengths of the spigot necessary for jointing shall not be less than the length of the socket of the jointing pipe.

3.10.1.3 In case of push-on-joint the spigot end of fitting, if any, shall be suitably chamfered to facilitate smooth entry of spigot in the socket of the pipes or fittings fitted with rubber gasket.

3.10.1.4 In case of flange and mechanical joint casting, the flange shall be at right angle to the axis of the joint. The bolt holes shall be either cored or drilled.

3.10.1.5 The centre of bolt holes circle shall be concentric with the bore circle and shall be located of the centre line. Unless otherwise specified by the purchaser. Where there are two or more flanges, the bolt holes shall be correctly aligned between them.

3.10.1.7 For high pressure mains, requiring working pressure greater than 2.4 MPa, suitable flexible joint may be preferred where the joint is restrained against axial movement.

3.10.1.8 Push-on-joint fittings are normally not used for sizes above DN 1600.

3.11.1 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.

3.11.2 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 affected 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.

3.11.3 Flanged Joints:

Flanged joints are made on pipes having a machined flange at each end of pipe. The seal is usually affected 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.

3.11.4 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) Centralisation 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 225mm. 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.

3.11.5 Rubber Gaskets

The material of rubber gaskets for use with mechanical joints and push-on-joints shall conform to IS: 5382, unless otherwise agreed between the manufacturer and the purchaser. Dimensions of the rubber gasket shall be as per manufacturer's Own design.

3.12 Anchoring of the pipeline:

Thrust block shall be provided at each bend, tee, taper, end piece to prevent undue movements of the pipeline under pressure. They shall be constructed as per design of engineer-in-charge according to the highest pressure during operation or testing of the pipes, the safe bearing pressure of the surrounding soil and the friction coefficient of the soil.

3.13 Measurement

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

5. HDPE Pipes, MDPE Pipes & Specials and Zero Velocity Valves

5.1 Applicable Codes

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 specifications conflict with the requirements of the standards /Codes, this specification shall govern.

Table No.-5.1

Code No.	Title/Specification
IS 4984 /2016	High Density polyethylene pipes for Water Supply
IS 5382	Rubber sealing rings for gas mains, water mains and sewers
IS 7634	Laying & jointing of polyethylene (PE) Pipes
ISO 4427	Medium Density Polyethylene Pipes for Water Supply
IS 2530	Methods of test for polyethylene moulding materials and polyethylene compounds
IS 4905	Methods for random sampling
IS 9845	Method of analysis for the determination of specific and/or overall migration of constituents of plastics material and articles intended to come into contact with foodstuffs.
IS 10141	Positive list of constituents of polyethylene in contact with food stuffs, pharmaceuticals and drinking water.

Specification of Pipes:

5.2 Colour

5.2.1 The colour of the pipe shall be black

5.2.2 Each pipe shall contain minimum three equi spaced longitudinal stripes of width 3 mm (Min) in blue colour. These stripes shall be more than 0.2 mm in depth. The material of the stripes shall be of the same type of resin, as used in the base compound for the pipe.

5.3 Dimensions of pipes and ovality of pipe

5.3.1 Ovality shall be measured at the manufacturer's end as the difference between maximum outside diameter and minimum out-side diameter measured at the same cross section of the pipe, at 300mm away from the cut end. For pipes to be coiled, the ovality shall be measured prior to coiling For coiled pipes, however, re-rounding of pipe shall be carried out prior to the measurement of ovality.

5.3.2 Outside diameter, tolerance and ovality of pipes shall be as per table 5.2.
Tolerance and ovality is given below

Table 5.2
(Refer Table No. 2 IS 4984-2016)

S.No	Outside Diameter (mm)	Tolerance (only positive tolerances) (mm)	Ovality (mm)
1	20.0	0.3	1.2
2	25.0	0.3	1.2
3	32.0	0.3	1.3
4	40.0	0.4	1.4
5	50.0	0.5	1.4
6	63	0.6	1.5
7	75.0	0.7	1.6
8	90.0	0.9	1.8
9	110.0	1.0	2.2
10	125.0	1.2	2.5
11	140.0	1.3	2.8
12	160.0	1.5	3.2
13	180.0	1.7	3.6
14	200.0	1.8	4.0
15	225.0	2.1	4.5
16	250.0	2.3	5.0
17	280.0	2.6	9.8
18	315.0	2.9	11.1
19	355.0	3.2	12.5
20	400.0	3.6	14
21	450.0	4.1	15.6
22	500.0	4.5	17.5
23	560.0	5.0	19.6
24	630.0	5.7	22.1
25	710.0	6.4	24.9

5.4 Wall thickness as per allowable hydrostatic design stress-

5.4.1 The minimum & maximum wall thickness of pipe for the PE100 grade of pipe as per IS: 4984 for PN6, PN8 & PN10 shall be as per table 5.3.

Table No.-5.3
(Refer Table No. 5 IS 4984-2016)

Nominal Dia	Wall Thickness of Pipes					
	PN6		PN8		PN10	
DN	Min	Max	Min	Max	Min	Max
1	2	3	4	5	6	7
20	-	-	-	-	-	-
25	-	-	-	-	-	-
32	-	-	-	-	2.4	2.9
40	-	-	2.4	2.9	3.0	3.5
50	2.3	2.8	3.0	3.5	3.7	4.3
63	2.9	3.4	3.8	4.4	4.7	5.4
75	3.5	4.1	4.5	5.2	5.6	6.4
90	4.1	4.8	5.4	6.2	6.7	7.6
110	5	5.7	6.6	7.5	8.1	9.2
125	5.7	6.5	7.5	8.5	9.2	10.4
140	6.4	7.3	8.4	9.5	10.3	11.6
160	7.3	8.3	9.6	10.8	11.8	13.2
180	8.2	9.3	10.8	12.1	13.3	14.9
200	9.1	10.3	12	13.4	14.8	16.5
225	10.3	11.6	13.5	15.1	16.6	18.5
250	11.4	12.8	15.0	16.7	18.4	20.5
280	12.8	14.3	16.8	18.7	20.6	22.9
315	14.4	16.1	18.9	21.0	23.2	25.8
355	16.2	18.1	21.2	23.6	26.2	29.1
400	18.2	21.2	23.9	27.7	29.5	34.2
450	20.5	23.8	26.9	31.2	33.1	38.8
500	22.8	26.5	29.9	34.6	36.8	42.6
560	25.5	29.6	33.5	38.8	41.2	47.6
630	28.7	33.3	37.7	43.6	46.4	53.6
710	32.3	37.4	42.4	49.0	52.3	60.4

5.5 Length of straight Pipe & marking on pipe

5.5.1 The length of straight pipe used shall be more than 6 m or as agreed by Engineer in charge. Short lengths of 3 meter (minimum) up to a Maximum of 10% of the total supply may be permitted.

5.5.2 Each straight length of pipe shall be clearly marked in indelible ink/paint on either end and for coil at both ends or hot embossed on white base every meter throughout the length of pipe/coil with the following information:
(a) Manufacturer's Name / Trade-mark,
(b) Designation of pipe
(c) Lot No./Batch No.
(d) BIS certification marking on each pipe.

5.6 Coiling

5.6.1 The pipes supplied in coils shall be coiled on drums of minimum diameter of 25 times the nominal diameter of the pipe ensuring that kinking of pipe is prevented.

5.6.2 Pipe beyond 110 mm dia shall be supplied in straight length not less than 6m

5.7 Appearance

5.7.1 Pipe shall be free from all defect including indentation, delaminating, bubbles, pinholes, cracks, pits, blisters, foreign inclusion that due to Their nature degree or extent detrimentally affect the strength and Serviceability of the pipe.

5.7.2 The pipe shall be as uniform as commercially practicable in colour opacity, density and other physical properties as per relevant IS code or equivalent International Code. The inside surface of each pipe shall be free of scouring, cavities, bulges, dents, ridges and other defects that result in a variation of inside diameter from that obtained on adjacent unaffected portions of the surface. The pipe ends shall be cut clearly and perpendicular to the axis of the pipe.

5.8 Marking:

5.8.1 Each straight length of pipe shall be clearly marked in indelible ink/paint on either end and for coil at both ends or hot embossed on white base every meter throughout the length of pipe/coil with the following information:
(a) Manufacturer's name/Trade-mark.
(b) Designation of pipe
(c) Lot number/Batch number.

5.8.2 BIS Certification Marking

Each pipe may also be marked with Standard Mark.

5.9 Testing of Pipe:

5.9.1 HDPE pipes are subjected to following tests:-

5.9.1.1 Internal pressure creep rupture test

5.9.1.2 Longitudinal Revision Test

5.9.1.3 Overall Migration Test

5.9.1.4 Density

5.9.1.5 Melt Flow Rate (MFR)

5.9.16 Carbon Black Content and Dispersion

5.10 Handling, Transportation storage and Lowering of pipes.

5.10.1 If transportation of HDPE pipes from a distance greater than 300km than pipes shall be received only when bare coils of pipe have been wrapped with hessian cloth.

5.10.2 The truck use for transportation of the PE pipes shall be exclusively used of PE pipes only with no other material loaded-especially no metallic, glass and wooden items. The truck shall not have sharp edges that can damage the pipe.

5.10.3 At the time of opening coils it must be remembered that the coiled under tension and must be open in control manner. Straight length should be stored on horizontal racks giving continuous support. Loss/damages during transit, handling, storage will be to the Contractor’s account.

5.10.4 During handling, transportation, storage and lowering, all sections shall be handled by such means and in such a manner that no distortion or damage is done to the section or to the pipes as a whole.

5.10.5 Pipes must not be stored or transported where they are exposed to heat sources likely to exceed 60º C.

5.10.6 Pipes shall be stored such that they are not in contact with direct sunlight, lubricating or hydraulic oils, petrol, solvents and other aggressive materials.

5.10.7 Scores or scratches to a depth of greater than 10 % or more of wall thickness are not permissible; any pipes having such defects should be strictly rejected.

5.10.8 PE pipes should not be subjected to rough handling during loading and unloading operations. Rollers shall be used to move, drag the pipes across any surface.

5.10.9 Only polyester webbing slings should be used to lift heavy PE (>315mm) pipes by crane. Under no circumstances, chains, wire ropes and hooks be used on PE surface.

5.10.10 Pipes shall not be dropped to avoid impact or bump. If any time during handling or during installation, any damage, such as gouge, crack or fracture occurs, the pipe shall be repaired if so permitted by the competent authority before installation.

5.11 Lowering, Laying of pipes

5.11.1 IS: 7634 shall be applicable. Before using the pipe following precautions/check shall be taken.

5.11.2 Each pipe shall be thoroughly checked for any damages before laying and only the pipes which are approved by the Engineer shall be laid.

5.11.3 While installing the pipes in trenches, the bed of the trench should be level and free from sharp edged stones. In most cases, the bedding is not required, as long as the sharp and protruding stones are removed, by sieving the dug earth, before using the same as a backfill material. While laying in rocky areas suitable bed of sand or gravel should be provided. The fill to about 10 to 15 cm above the pipe should be fine sand or screened excavated material. Where hard rock is met with, bed concrete 15 cm thick of grade M-15 or 20 cm thick sand bed as approved by the engineer may be provided.

5.11.4 As PE pipes are flexible, long lengths of fusion-jointed pipes having joints made above ground can be rolled or snaked into narrow trenches. Such trenches can be excavated by narrow buckets.

5.11.5 During the pipe laying of continuous fusion jointed systems, due care and allowance should be made for the movements likely to occur due to the thermal expansion/contraction of the material. This effect is most pronounced at end connections to fixed positions (such as valves etc.) and the branch connections. Care should be taken in fixing by finishing the connections at a time the length of the pipe is minimal (lower temperature times of the day).

5.11.6 For summer time installations with two fixed connection points, a slightly longer length of PE pipe may be required to compensate for contraction of the pipe in the cooler trench bottom.

5.11.7 The final tie-in connections should be deferred until the thermal stability of the pipeline is achieved.

5.11.8 The flexibility of polyethylene pipes allows the pipe to be cold bend. The fusion jointed PE pipe is also flexible as the plain pipe. Thus the total system enables directional changes within the trench without recourse to the provision of special bends or anchor blocks. However, the pipe should not be cold bend to a radius less than 20 times the OD of the pipe.

5.11.9 The installation of flanged fittings such as connections to sluice/air/gate valves and hydrant tees etc., requires the use of stub ends (collars/flange adaptor complete with backing rings and gasket. Care should be taken when tightening these flanges to provide even and balance torque.

5.11.10 Provision should be made at all heavy fittings installation points for supports (such as anchoring of the flange in the soil) for the flange joint to avoid the transfer of valve wheel turning torque on to the PE flange joint.

5.11.11 PE pipe is lighter than water. Hence care should be taken for normal installations where there could be a possibility of flooding of the trench thus the trench shall be kept free of water till the jointing has been properly done.

5.11.12 However, weights by way of concrete blocks (anchors) are to be provided so that the PE pipe does not float when suddenly the trench is flooded and the soil surrounding the pipe is washed away. Thus site conditions study is necessary to ensure the avoidance of flotation.

5.11.13 Pipe embedment backfill shall be stone-free excavated material placed and compacted to the 95 % maximum dry density.

5.12 jointing of pipes

The pipe shall have a jointing system that shall provide for fluid tightness for the intended service conditions. Appropriate jointing for HDPE pipe as per IS4984 shall be selected considering site and working conditions, pressure and flow or liquid.

5.13. Belding:-

5.13.1 In case of sandy strata no separate bedding is required. However the bottom face/trench bed where pipe shall be placed shall be compacted to provide a minimum compaction corresponding to 95 % of maximum dry density. The pipe bedding should be placed so as to give complete contact between the bottom of the trench and the pipe.

5.14 Back Filling

5.14.1 Backfilling should be placed in layers not exceeding 15cm thickness per layer, and should be compacted to a minimum of 95% maximum dry density. The refilling should be done on both sides of pipe together & height difference in earth fill on each side should not be more to cause lateral movement of pipe.

5.14.2 Most coarse grained soil are acceptable. This may comprise of gravel or sand. However silty sand, clayey sand, silty and clayey gravel shall not be used unless proposed to be used in conjunction with gravel or clean sand.

5.14.3 It is very important that the pipe zone backfill material dies not wash away or migrate ink to the native soil. Likewise, potential migration of the native soil in to the pipe zone backfill must also be prevented.

5.14.4 Heavy earth moving equipment used for backfilling should not be brought until the minimum cover over the pipe is 90 cm in the case of wide tracked bulldozers or 120 cm in the case of wheeled roaders or roller compactors.

5.15. Compaction:-

5.15.1 Vibratory methods should be used for compaction. Compaction within distances of 15 cm to l45 cm from the pipe should be usually done with hand tempers. The backfill material should be compacted not less than 95 % of maximum dry density.

5.16 Fittings and specials

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

5.17 HDPE bends and tee.

HDPE bends and tee shall be plain square ended conforming to IS: 8360 (Part I, II & III). Bends may be fabricated by jointing several small section of pipe to reach the required angel. Tees may be moulded or fabricated from pipes elements.

5.18 HEPE Reducer must be moulded and shall be plain square ended as per IS:8008 (Part-1 & VII)

5.19 HDPE stub ends-

HDPE stub ends shall be square ended conforming to IS: 8008 (Part-I & VII) specification stub ends will be welded on the pipe. Flange will be of slip on flange type as given in clause 15.16 below.

5.20 Slip on Flanges

Slip on flange shall be metallic flanges covered by epoxy coating or plastic powder coating. Slip-on-flanges shall be conforming to standard mating relevant flange of valves, pipes etc Nominal pressure rating of flanges shall be PN10

5.21 Jointing Procedure

Jointing between HDPE pipes and specials shall be done as per the latest IS: 7643 part II. Method of jointing between the pipes to pipes and pipes to specials shall be with butt fusion welding using automatic or semi-automatic, hydraulically operated, superior quality butt fusion machines which will ensure good quality butt fusion welding up to of HDPE pipes.

8.21.1 The commonly used joints are as follows:-
8.21.1.1 Insert type joints.
8.21.1.2 Compression fittings.
8.21.1.3 Fusion welding.
8.21.1.4 Threaded Joints
8.21.1.5 Flanged joints, and
8.21.1.6 Telescopic joints.

5.21.2 "There are insert type of fittings of both Plastic and Metals available for use with PE pipes. In corrosive locations plastic fittings are preferred because of their high resistance to corrosion. In less corrosive conditions gun metal fittings are frequently used and in normal or slightly corrosive environments, brass fittings are commonly employed. In certain cases, threaded malleable cast iron fittings are used.

5.21.3 Insert Type Joints

5.21.3.1 These are commonly used for MDPE pipes where in a serrated PE or metallic fitting is inserted into the pipe and tightened by a clip.

5.21.3.2 The outer serrations of HDPE/metal insert type fittings lock into the PE pipes to prevent their coming out under sudden pressure surge. If the pipe bore is slightly undersized, a little heating by immersion in boiling water in case of MDPE and oil bath (1300C) in case of HDPE would soften the pipe to enable insertion of fittings. If the bore of the pipe is loose, the bore clip of worm drive type will secure the fitting and ensure a leak proof joint. The insertion of these fittings into the bore of the pipe is done with hand pressure only. As a measure of safety, worm drive type clip should be used in all cases. This type of jointing is used normally in small diameter pipes up to 110mm.

5.21.4 Compression Fittings

5.21.4.1 They are used for MDPE and HDPE joints. They are detachable joints and are made of metals or plastics.

5.21.4.2 In the majority of cases the metal fittings are based on the type of compression fittings commonly used with copper tubes. In this type of joint the dimensions of the pipe are generally not altered. The joint is effected by an internal liner and a compression ring or sleeve which shrinks and therefore compresses the pipe wall on to the liner, thus gripping to the wall of the pipes. The liner and compression sleeve may also be a integral unit

5.21.4.3 In other case the flared pipe wall is compressed on a conical insert either by two male and female threaded metallic nuts or by backing loose flanges. The water seal is made by compression of ends of PE flared pipe between sloping surface of metallic nuts/flanges and conical inserts.

5.21.4.4 Compression Joints with Collar/Pipe Ends and Flat Gaskets Aluminium alloy or brass fittings with male and female coupling parts are available for jointing with metallic fittings. The male and female ends of the coupling are inserted face to face on two ends of the pipes to be jointed. Collars are made on the pipe ends by heating the ends with hot plate or electric coil. The two collars are brought together and the female end of the coupling is tightened on the male end. A water tight seal is made between the flanges. This is a detachable type of jointing and is practicable up to 50mm dia pipes.

5.21.5 Fusion Welding

5.21.5.1 Fusion welding is commonly used in HDPE and is permanent type of joint.

5.21.5.2 Procedure of Butt Welding of HDPE pipes.

5.21.5.3 The pipe should be cut square and the face of the pipe should be slightly scraped prior to welding to remove oxidized layer. At the time of welding, leveling of the pipes is essential particularly in case of larger diameter pipes. Welding temperature should be 2000C and surfaces of heating mirror should be 2100 ± 50C [heating mirror is a metallic plate heated up to the required temperature either by electrical coil embedded inside or by blow torch. The word mirror has come because this heating plate radiates heat]

The pipes to be welded should be held on either side of the heating mirror with only contact pressure of about 20 kPa(0.2 kgf/cm²). When the rim of molten material is found, the pipes are removed from the heating mirror and immediately the joint is made by application of moderate pressure of approximately 1 to 2 kg/cm² for 2 to 3 seconds. The initial heating time for achieving molten rim, varies from 1 to 5 min depending upon the pipe wall thickness and size.

5.21.5.3.1 Cautions

(a) It is essential to see that the rim formed is not excessive.

(b) While jointing, the pressure should be maintained until the joint is luke-warm and after the pressure is relived, the joint allowed to cool completely.

(c) The mirror should be kept exactly around 2100C which needs about 30 minutes time (for electrical mirror). It is also essential to see that the temperature is maintained constant by the proper setting of regulator. For detecting the correct temperature crayon chalk is used. For example at 2100C the colour of crayon dot on the mirror changes within 2 seconds. But the dot made should be thin and if not, time taken will be more, indicating a wrong temperature.

5.21.5.4 Strength - A satisfactory butt welded joint of HDPE will have the strength factor of one. Temperature is of primary importance and weld efficiency may decrease if the temperature does not fall within the range of 200 ± 100C.

5.21.6 Flanged Joints

5.21.6.1 These are used for jointing MDPE and HDPE pipes particularly of larger size to valves and vessels and large size metal pipes where strength in tension is required.

5.21.6.2 It consists of flanges either loose or welded to the pipe ends. It is recommended that suitable metallic backing plates be used to support the polyethylene flanges to enable them to be bolted together. Injection moulded polyethylene flanges with metal inserts of 6 to 9 mm thickness may also be used. In most cases, sealing is improved by incorporating a natural or synthetic rubber gasket between polyethylene flanges.

5.21.7 Telescopic Joint

5.21.7.1 Any joint (socket and spigot type) that permits sliding of the free end (spigot end) inside the socket with a rubber or suitable gasket, without any leakage is called telescopic joint.

5.21.7.2 The socket could be an integral part of the pipe at one end or two ends or a special coupler into which the free ends (spigot ends) of the pipes are pushed to achieve a water tight joint.

5.21.7.3 These joints are normally weak in longitudinal pull and hence need anchoring wherever such a tendency of longitudinal pull is likely in the pipe line. In the case of telescopic joints, one external anchorage is generally necessary at each end of the pipe line, at valve and at all

changes of direction. The supports of the side connection should ensure that excessive lateral bending does not occur. In small diameter the coupler itself could be modified to have a split, threaded, grip type gasket of hard materials in addition to "O" ring type of rubber gasket (for water tightness) to prevent any slipping out of the free end of the pipe in longitudinal pull.

5.22 Test to Establish Perfectibility/portability of work

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

(i) Smell of the extract
(ii) Clarity of the colour of the extract
(iii) Acidity and Alkality
(iv) Global migration UV absorbing material Heavy metals
(v) Unreacted monomers (styrens) and biological tests

5.23 Hydraulic Test

After laying the pipe hydraulic test shall be done to conform the quality of work and material. There shall not be any signs of localized swelling, leakage or weeping. It should conform to IS: 4984 & IS 7634.

5.24 Measurement

The net length of fixed pipe shall be measured in running meters correct to a cm. The portion of the pipe inside the joints shell not be included in the length of pipe work. Specials shall be excluded and measured and paid separately under the relevant item.

IV(b). LAYING AND JOINTING OF PIPES

1.1 General

The specification for laying and jointing shall generally conform with IS: 783-1985

1.2 Earthwork excavation

General

Before commencing the work, and also during the progress of the work, the contractor shall give notice to the concerned authorities viz., the Panchayat, the Municipalities, the Railways, the Electricity Board, the Telegraph Department, the Traffic Department attached to the Police and other Departments or Companies, as may be required to the effect that the work is being taken up in a particular locality and that necessary diversion of traffic may be arranged for. 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 also provide at his own expense watch and light during the day and the night and put required notice towards such as “Caution” “Road Closed for Traffic”etc. He should also provide and maintain at his own expense the necessary supports for underground cables, etc. to afford the best protection to them in consultation with the authorities in charge of the properties and to their best satisfaction.

1.2.1 Trench excavation

The width and depth of excavation of trench shall be as per relevant BIS. The rate for excavation shall include charges for shoring, strutting, bailing and pumping water whenever necessary and no extra payment shall be made for any of these contingent works

Excavation and refilling for the socket hollows shall be paid for as excavation and refilling for trenches in soil of appropriate classification. The supply of river sand required for refilling should be paid for separately if provided in BOQ as separate them.

The Contractor shall deposit the surplus earth if any from trench work at proper place as may be directed by the Engineer and no extra rates shall be paid

Wherever earthen road or gravel road is cut for the laying of pipes, the contractor shall restore the surface after the pipes and specials are laid and jointed with available materials to the satisfaction of the Engineer without extra cost either for cutting or relaying. The clause shall not apply to the cutting of concrete or macadam or brick surfacing or black top roads. The pipes shall be laid to correct levels and gradients, as may be directed by the Engineer, after fixing the sight rails as in Clause No.106 of TNBP without extra cost.

If the floor of the trench is other than rock, hard clay or boulders, the floor shall be rounded to fit the curve of the pipe to form an even bedding for the pipe for a width equal to hold the outer diameter of the pipe.

If the floor of the trench is in rock, hard or clay which will otherwise not provide uniform support for the pipe, the floor shall be excavated below the proposed bottom level of the pipe to a depth of 20cm and the trench shall be refilled with approved soil or river sand as may be directed by the Engineer and properly compacted to a level of 10cm above bottom of the pipe. If river sand is used for refilling, the sand shall be paid for separately if provided in BOQ as a separate item.

1.3 Hard rock

“Rock requiring blasting” shall exclude all rock such as soft rock, disintegrated rock, small boulders, all of which can be removed either with pick axe or craw bards and shall apply to rocks of different kinds which cannot be removed by any of these means. In case of difference

of opinion, the Engineer's decision as to which rock shall be considered as "rock requiring blasting" shall be final.

Refilling of the trench in reaches where the excavation is in rocky soil shall be with approved soil which is surplus from trench work operations elsewhere along the alignment or which shall be obtained from new borrow pits.

It is to be distinctly understood that if surplus soil from trench work elsewhere along the alignment is used no extra payment shall be paid for conveyance of the soil to the refilling site. No payment will be made for any excess earth brought to site and it shall be disposed off by the contractor at his own cost. Hard rock which is blasted and removed will be measured and paid for on stack measurements with a percentage deduction of 40% for voids. The stacking shall be as directed by the Engineer.

1.4 Lowering of pipes and jointing of pipes and specials

1.4.1 Laying and jointing shall be in accordance with Clause 9.1, IS: 783-1985 for laying of concrete pipes. All pipes and fittings shall be carefully handled and lowered into the trench by means of mobile cranes. Any other method of handling shall be got approved by the Executive Engineer concerned. The pipes and specials should be handled by flat rubber boots. Iron chain or iron crow bards should not be used under any circumstances for handling the pipes and specials at any stage. The sockets shall face opposite to the direction of flow of water in the pipe. Pipes shall be normally laid so that the spigot end enters the socket of the last pipe that is, socket faces and direction of laying. The socket and spigot ends of pipe shall be cleaned of all extraneous matter especially clay or grease. Rubber ring shall be clean and dry.

1.4.2 Pipes shall be laid true to the lines and grades given on the plans. The rubber rings shall be kept evenly positioned on the spigot groove, and when satisfied that pipe and ring are correctly positioned, the pipe shall be forced right home to the full depth of the joint. Inside the joint, the two pipe ends shall be in close proximity.

1.4.3 Baling or pumping out of water from trench including shoring, strutting and removing such while laying, jointing and testing shall be done by the contractor at his expense.

1.5 Special Fittings

1.5.1 Special fittings have to be located at the exact chainage as shown on plans. It might entail in the necessity of laying short pipes in specified length. The number of gaps should be got approved by the Executive Engineer concerned.

1.5.2 Jointing between the special and pipe shall be done with rubber rings.

1.5.3 The construction of all anchor blocks at bends, 'Y's and Tees shall be done by the contractor. It shall be his responsibility to check for the adequacy of the anchor block.

5.6 Testing pipes on position

5.6.1 The finished pipeline shall be tested in convenient sections between stop valves. The test gap and short reaches which could not be tested simultaneously as a continuous reach due to circumstances prevailing during execution may be subjected to the pipeline static pressure or maximum working pressure plus surge pressure which maybe created during testing the short reaches and test gap whichever is higher as the case may be. The Executive Engineer's decision regarding the test pressure at field for the above test gap and short reaches will be final. When testing the pipeline hydraulically, the line shall be filled completely with water and kept filled

for a week. The pressure shall then be increased gradually to full test pressure and maintained at this pressure for one hour. In testing pipelines, a seepage allowance of 2.5 litres per kilo metre per hour per centimetre diameter of the pipe shall be permissible.

5.6.2 Joint testing

When testing the finished pipe line hydraulically after filling the pipeline section under test with water it shall be left under operating pressure for a certain length of period which will depend upon initial permeability, absorption movement of the pipeline under pressure and the quantity of air trapped. More water shall be pumped from a calibrated container until the required test pressure is reached, the test pressure shall be maintained throughout the test by means of continued pumping using a pressure relief valve. The excess water coming from the relief valve shall be returned to the calibrated container. The rate of loss of water from the container shall be determined at regular intervals. The pipeline is satisfactory provided the successive measurement show a diminishing quantity.

An allowance of 3.00 litres per millimetre diameter of pipe per kilometre of pipeline per day per each 30 metre head of pressure applied shall be allowed.

The field test pressure to be imposed should be not less than the greatest of the following.

i) 1 ½ times the maximum sustained operating pressure.
ii) 1 ½ times the maximum pipeline static head; and
iii) Sum of the maximum sustained operating pressure or the maximum pipeline static pressure and the maximum calculated surge pressure.

Subject to a maximum equal to the works test pressure for any pipes and fittings incorporated in the pipeline. However, the line test pressure, in no case, shall exceed the hydrostatic proof test pressure. Pressure gauges shall be inserted at both ends of the line and test so that leakage can be precisely calculated.

5.7 Back filling trenches

5.7.1. The initial back fill shall be of selected materials suitable for tamping under the pipes and down at the sides. Earth shall be placed by hand in 7.5cm layers and rammed well until the backfill material reaches 15cm above the crown line of the pipe. Mechanical rammers may also be used.

5.7.2. The remainder of the trench shall be filled carefully with ordinary excavated material without rock and rammed property.

5.7.3. Refilling can be done leaving the joints portion exposed, after laying

5.8 River crossings

5.8.1 All the supporting structure for pipeline to be taken above M.F.L. (Maximum Flood level) in river. The contractor shall furnish detailed drawings showing the type of bedding needed to support the pipe.

5.9 Railway crossings

Required permission for laying, jointing and testing the pipeline across the railway lines will be obtained by the Employer. The contractor will carry out the work according to the specifications and stipulations made by the Railway authorities.

5.10 Road crossings

Wherever pipeline has to cross roads or cart tracks, it shall be done through a culvert or bridge, wherever necessary.

5.11 Distance indicators

The Employer shall supply and fix indicators at all points of change of direction, at all valves and at every one kilometre intervals along the pipeline. Indicators shall consist of 10 cm x 10cm pre-cast concrete posts 1.25 metre length set 0.75 metre into the ground and painted white above ground level. The description shall be written in blue at one face of the pre-cast post.

5.12 Drawings

The drawings are only indicative. The site conditions will only be the governing factor for manufacture, laying and payment.

V. PUMP SETS AND ACCESSORIES

General

1) All the materials used shall conform 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.

2) The rates should include all the minor items of civil works, if any required for installation complete.

3) All necessary civil works for condition of all equipments and accessories offered by the contractor under this contract should be done by the contractor.

4) Test certificates for machinery and equipments should produced along with supply.

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 authorised dealer. In the event of noon compliance the offer shall be summarily rejected.

6) The contractor shall make necessary arrangements to get 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.

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.

8) Obtaining approval of electrical layout diagram for the installation of all the equipments (transformer, generators, pump sets and other accessories) and obtaining safety certificate on completion of work from Chief Electrical Inspector to Government of Tamil Nadu arranged and got approved by the contractor at his cot.

9) The contractor should get the layout approval in time before execution and for the size and capacity of the equipments before the supply of the same. After execution of the Safety Certificate if any modification or alteration suggested by the Chief Electrical Inspector on the installation work done by the contractor should be carried out by the contractor at his cost.

10) All the materials should be supplied as per BOQ and should be of standard makes mentioned below: -

SL. No.	Description	Make
1)	Centrifugal pump	Kirloskar, Jyothi, best and Crompton Mather and Platt, Inorthington, Flow More or equivalent
2)	Turbine Pump	Kirloskar, Jyothi Best and Crompton Mather and Platt, Inorthington, Flow more Fair Banks Morse or equivalent.
3)	Submersible pump and motor	KSB, Calama, Waterman, Atlanta or equivalent
4)	Make of motor	Jyothi NGEF, GEC, Crompton and Greeves, Siemens or equivalent
5)	Make of transformer	Kirloskar, GEC Indo TECH, Hindustan or equivalent
6)	Diesel Generator	Kirloskar, GEC of equivalent
7)	Starter	L&T, Cutler Hammer, Siemens, MEI or equivalent
8)	Switch fuse and circuit breakers	L&T, Cutler Hammer, Siemens, MEI or equivalent
9)	Cables	Finolex, Unista, Uniflex of equivalent.
10)	Valves	Kirloskar, Venus, Upadyaya CALSONS or equivalent

11) The right of choosing the make among the makes offered by the contractors rest with the employer only.

12) The submersible pumps centrifugal pumps, turbine pumps submersible motors, motors for turbine and centrifugal pump set 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 pump sets.

All tests necessary to ensure that the plan and machinery or equipments complies with the specification and guarantees shall be carried out at site and at the contractor's cost and such test shall be carried out within one month of completion of erection. Should the result of these test not done within the margin specified, the test shall reported within one month from the date of plant is ready for retest and the contractor shall repay to the Engineer all reasonable expenses to which he may be put by such test.

13) If the completed 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(a) TURBINE PUMP

The pump shall be of manufacture's latest standard design to give maximum efficiency when operated under the most exacting conditions at medium speed 1000/1500 RPM, conforming to IS 1710-1989 as amended upto date. The equipment shall conform to the following specifications:

I Impeller

The impeller shall be of bronze. They shall be turned and bered to gauge accurately finished and hydraulically balanced on the own shaft for maximum lifting capacity without overloading the prime mover irrespective of water level fluctuations. The impeller shall be locked to the shaft with sleeves and lock nuts.

II Impeller Shaft

The shall be carbon steel of ample size and stiffness to transmit power without strain or vibration.

III Line Shaft

The shaft shall be of special grade steel having exceptionally high torsion strength. The shaft shall be in standard length of 1.50M/3.M suitably coupled. The shaft shall be held in proper vertical position by suitably provided bearings of high quality phosphor bronzer.

IV Bearings

The line shaft shall be supported by oil lubricated/water lubricated bearings and the bearing retainers shall be designed for noiseless operation shaft coupling shall be specially machined for true alignment of the driven shaft

V Column Pipes

Heavy steel column pipes with machine cut in 1.5M/3M length of suitable diameter shall be provided. The bowl designs shall be such as to provide the straightest possible water passage to minimize friction and turbulence

VI Name Plate

Each pump shall be provided with a brass name plate with duty conditions and with all other particulars clearly engraved in it.

VII Performance Curves

Performance curves for the pump indicating the head in metres. Efficiency and BHP absorbed at the pump shaft against the output in litres per minute shall be furnished. The pump offered shall have working range of plus 10% of the operating head. The performance curve should be duly signed.

The performance curve must contain the following

a. Discharge (full range) Vs. Total head in meters.
b. Discharge (Full range) Vs. Pump efficiency in percentage
c. Discharge (Full range) Vs. overall efficiency percentage (Pump to Motor)
d. Discharge (Full range) Vs. BHP absorbed in KW
e. Discharge (Full range) Vs. power input in KW

2(b) MOTOR

I Type of Motor

The motors (suitable for turbine pump) shall be vertical hallow shaft AC Squirrel cage induction motor with drip proof screen protected continuous using suitable for operation in the range of 360/440 volts 3 phase 50 cycles and the speed 1000/1500 rpm

II Output of motors

The motor shall be capable of developing the mechanical output for the required conditions and shall have continuous normal rating to suite the maximum load when operated at the pump speed. The efficiency and power factor shall be to suit the wide range at load conditions and shall be designed and manufactured in accordance with relevant BIS.

III Bearings

The motors shall be provided with suitable bearings of ample size readily available from stocks in India. The bearings shall be accurately fitted and provided with moisture and dust proof bushes. The contractor shall state the name of the manufactures and the bearing No.

IV Overload

The motors shall be capable of withstanding the overload specified in the relevant condition.

V Temperature Rise

The temperature rise in windings shall not exceed over an ambient temperature after a full load continuous run of 12 hours. The temperature rise shall not reach a value where there is risk of injury to any insulated materials of adjacent part irrespective of that has been mentioned above

VI Earth Terminals

Provision shall be made for suitable double earth copper connections on base plate or motor frame and the earth terminal shall be fixed with lugs suitable for the size of earth wire in accordance with the rules of the Indian electricity Act

The motor HP shall be such that it safely take the load when the total head is reduced by the rise of water level in river during flood conditions in the river

The HP of motor offered shall have a margin of 10% above the BHP absorbed by the pump set at duty point and also above the maximum HP absorbed by the pump offered.

VII Starting

The motor shall give full load torque when taking 1 to 1.5 time of full load current

VIII Capacitor

Capacitor shall be designed to conform to 0.95 lagging power factor for motor with control switches. The test certificate from TESTING AGENCY has to be furnished. The motor shall have a name plate giving the following information.

a) Induction motor (Squirrel cage)
b) Name of the manufacturer
c) Manufacturers number and frame reference
d) Type of enclosure
e) B.H.P
f) Rated output in K.W.
g) Rated Voltage and winding connections
h) Number of Phases
i) Frequency in HZ
j) Current approximate in amperes at rated output
k) Speed in revolutions per minute at rated output

3(a) CENTRIFUGAL PUMPS

The pumps shall be designed, manufactured, erected, tested and commissioned as per standards laid down by IS 1520 1980 and as amended from time to time. The standard accessories required for may be supplied along with irrespective of whether such items are specifically mentioned or not in the specification. The design should ensure the noise pollution level below the permissible limit. The rotating parts are to be statically and dynamically balanced. The name plate in stainless steel should indicate the sl. No. discharge, head, speed specific gravity of water to be pumped pump input, motor rating, make etc.

The casing should be free from blow holes, cracks and other imperfections conforming to relevant standard.

Bearing housing shall be of such design to exclude entry of water bearing may used of oil lubricated or grease lubricated type.

The shaft design should ensure the deflection not exceeding. 1 mm per meter length. The flexible tyre type rubber coupling is recommended for coupling pump and motor of horizontal mounting.

Painting may be done as per relevant Bureau or Indian Standard Specification.

I. Casing

The casing shall be coarse grained, cast iron split along with the horizontal central line separately machined free from bow holes or other defects. The suction and delivery branches shall be casted integral with the lowest half of the casing so as to permit the removal of the impeller for inspection and repairs without disturbing suction and delivery pipe connections and the pump alignment with the motor.

II. Impellers

The impeller shall be of prosper bronze steel. It shall be turned and trimmed to gauge and hydraulically balanced on its pump shaft to ensure the same for running without vibration to suit the required duty to meet the conditions under which the pumps are to be operated.

III. Impeller Shaft

The shaft shall be of stainless steel of ample size and stiffness to transmit maximum power without strain or vibration. It should be turned and ground to the exact diameter and key fitted to prevent the impeller rotating with any play. The shaft shall be protected from contact with water at the stuffing box with readily renewable phosper bronze sleeves.

IV. Stuffing Box

The stuffing boxes shall be ofamp0le depth and size for the packing and shall be provided with lantern rings and connections for sealing water and pressure to prevent leakage of air.

V. Bearings

The Impeller shall be supported by ball or roller bearings mounted in housings. The bearing caps shall be removable and the bearings shall be ample size to ensure cool running with a minimum of attention and shall be provided with an efficient lubricating system. The bearing shall be of standard type of design which is readily available from stocks held in India.

VI. Accessories

Each pump shall be provided with the following accessories.

i) Lifting Hook
ii) Priming funnel

iii) Approved type of lubrication system
iv) Drip water pipes
v) Pressure gauge as specified
vi) Compound gauge as specified

VII. Name Plate

Each pump shall be provided with name plate bearing the following particulars clearly marked on it.

Make
Litres per minute
No. of Stages `
Revolution per minute
Diameter of suction branch
Index No.
Total head in metres
Diameter of delivery branch

VIII. Base Plate

The base plate shall be of extended type for accommodating the pumps and the motors and it shall be rigid substantial casting with machined faces for the feet of the pumps and motor and it shall be faced on the underside.

IX. Coupling

The shaft coupling for connecting up the Impeller shaft with the motor shaft shall be of flexible type. It shall be made of cast iron turned over to obtain perfect balance, bored to shaft size and securely keyed to the shaft.

IX. CharacteristicsCurves

Performance curves for the sump indicating the head in meter, efficiency, B.H.P. observed at pump set against the output in litres per minute shall be furnished.

3 (b)MOTOR

I. **Typeof Motor**

The motors (suitable for turbine pump) shall be vertical hallow shaft AC Squirrel cage induction motor with drip proof screen protected continuous using suitable for operation in the range of 360/440 volts 3 phase 50 cycles and the speed 1000/1500 rpm

II. Output Motors

The motor shall be capable of developing the mechanical output for the required conditions and shall have continuous normal rating to suite the maximum load when operated at the pump speed. The efficiency and power factor shall be to suit the wide range at load conditions and shall be designed and manufactured in accordance with relevant BIS.

III. Bearings

The motors shall be provided with suitable bearings of ample size readily available from stocks in India. The bearings shall be accurately fitted and provided with moisture and dust proof bushes. The contractor shall state the name of the manufactures and the bearing No.

IV. Overload

The motors shall be capable of withstanding the overload specified in the relevant condition.

V. Temperature Rise

The temperature rise in windings shall not exceed over an ambient temperature after a full load continuous run of 12 hours. The temperature rise shall not reach a value where there is risk of injury to any insulated materials of adjacent part irrespective of that has been mentioned above

VI. Earth Terminals

Provision shall be made for suitable double earth copper connections on base plate or motor frame and the earth terminal shall be fixed with lugs suitable for the size of earth wire in accordance with the rules of the Indian electricity Act.

VII. Technical Data

Bidder shall complete as fully as passible the attached annexures which should be returned duly filled in signed.

The motor HP shall be such that it safely take the load when the total head is reduced by the rise of water level in river during flood conditions in the river

The HP of motor offered shall have a margin of 10% above the BHP absorbed by the pump set at duty point and also above the maximum HP absorbed by the pump offered.

VIII. Starting

The motor shall give full load torque when taking 1 to 1.5 time of full load current

IXI. Capacitor

Capacitor shall be designed to conform to 0.95 lagging power factor for motor with control switches. The test certificate from TESTING AGENCY has to be furnished. The motor shall have a name plate giving the following information.

a) Induction motor (Squirrel cage)
b) Name of the manufacturer
c) Manufacturers number and frame reference
d) Type of enclosure
e) B.H.P
f) Rated output in K.W.
g) Rated Voltage and winding connections
h) Number of Phases
i) Frequency in HZ
j) Current approximate in amperes at rated output
k) Speed in revolutions per minute at rated output

4(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 / IS 220/94

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 Pump set
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 be stainless steel of ample size and stiffness to tranmit 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 manufactured 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

Suitable coupling arrangements shall be provided in case of directly coupled pump sets.

VIII. Non-Return Valve

Non return valve shall be provided above the pump discharge case.

IX. Characteristic Curves

The performance curves for the full range of operation indicating the head in meters, efficiency and BHP absorbed at the pump shaft against the output in liters per minute shall be furnished.

4(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 pump sets. 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 suitably 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 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 rotor shaft shall be provided with shaft protective sleeves having a surface finish of 0.75 micron.

IV Earthing Arrangements

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 pumphouse.

V Temperature Rise

The installation 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 safely take the load when the total head is reduced by the rise of water level.

The HP of the motor offered shall have a margin above the HP absorbed by the pump set at duty point and also above the maximum BHP absorbed by the pump sets at duty point and also above the maximum BHP absorbed by the pump set offered.

VIII Overload Capacity

The motor shall be capable of withstanding the overload specified in the relevant condition of BIS.

IX. Starting

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 No. and Frame reference
d) Type of enclosure
e) BHP
f) Rated voltage and winding connections
g) Rated output in KW
h) Number of phases
i) Frequency in HZ
j) Current approximate in amperes at rate outs put
k) Speed in revolutions per minutes at rates output
l) Current approximate in amperes at rates output
m) Speed in revolutions per minute at rates output

X Spare Parts

Supply of spares and tools shall be made as per the list prescribed in BOQ with index card.

XI Tools

Standard tools for the maintenance of the equipment's 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 hammers		1 No
Screw drivers		1 set
Electrical tester	1 No	
Electric meager	1 No	

XII 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.

XIII 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 data of commissioning.

VI. ANNEXURES

I) Pump characteristics

II)

a) Turbine pumps

b) Motors for Turbine

III)

c) Centrifugal pump

d) Motors for Centrifugal pump

IV)

e) Submersible pump

f) Motors for Submersible pump

(THE ABOVE ANNEXURES ARE APPLICABLE SHOULD BE FILLED IN AND DULY SIGNED AND ENCLOSED WITH THE BID DOCUMENT– COVER I)

ANNEXURE - I
Pump Characteristics

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:

The motor must not get over loaded, at Positive low head condition due to Maximum W.L. conditions in Borewell / well.

ANNEXURE II (a)

TURBINE PUMPS

1. Name of manufacturer

2. Model

3. IS reference

4. Type

A. PUMP DETAILS

1. Nature of Lubrication :

2. Suitability for collector well/ collection well with a depth of m :

3. Stages :

4. Bowl outer dia in mm :

5. Discharge in LPM :

6. Total head in metres :

7. Speed in RPM :

8. Power input at duty point HP/K.W :

9. Maximum power input required for entire of operation :

10. Pump set efficiency at duty point in % :

11. Shut off head in metre :

12. Minimum submergence :

B. Column Assembly

1. Dia in mm :

2. Length in metre :

3. Type of joint (flanged or screwed) :

TENDERER

C. SIZE

4.a i) Oil tube if necessary dia …..m
ii) Material

b. i) Line shaft dia …..m
ii) Material

2. Discharge head

Surface / Underground

3. Delivery size in mm

4. Impeller

i) Material
ii) Type

5. Balancing of impeller Dynamic / Static

Floor space required ….. Sq.m

6. Weight of pump heaviest part bowl assembly
Weight of complete pump

7. Type of scaling rings

8. Type of impeller shaft sleeves

9. Type of bearing, make and reference number

10. Are the bearing external

11. Materials of bearings

12. Whether the performance curve is attached

13. Does the characteristics curve conforms to
Indian standard specifications

14 What is the nature of drive

15. Type of coupling

16. Weight of the motor

17. Does the pump and its accessories conform to IS

ANNEXURE – II (b)

TENDERER

MOTOR FOR TURBINE PUMP

1. Rated output HP :

2. Make :

3. Description type :

4. System Voltage :

5. Current in Maps at rated output :

6. Current rating at full load :

7. Class of insulation :

8. Permissible Temperature rise over

   45 degree Ambiant temperature

9. Efficiency at 100% load

   75% load

   50% load

10. Power factor 1/2 Load

    3/4 Load

    Full Load

11. Type of Enclosure

12. B.I.S Reference :

TENDERER

13. Type of Rotor :

14. Type of Starting :

15. Rotor current

a) Max Starting

b) Normal full Load

16. Overload capacity

25%

50%

100%

17. Operating torque

18. Starting current

19. No. of pole

20. Bearing Make & Number

21. Type of coupling

22. Whether motor conform to

B.I.S specifications

23. Weight of motor

ANNEXURE – III (a)

Centrifugal Pumps

TENDERER

1.	Type & Make	:	
2.	B.I.S. reference	:	
3.	Stages	:	
4.	Suction diameter in mm	:	
5.	Delivery diameter in mm	:	
6.	Materials	:	
i)	Casing	:	
ii)	Bearing	:	
iii)	Impeller	:	
iv)	Base Plate	:	
7.	Bearing No.	:	
8.	Speed in RPM	:	
9.	Method of lubrication	:	
10.	Balancing of Rotating parts	:	
11.	Gland Rope size	:	
12.	NPSHR in metre	:	
13.	SHUT off head in metre	:	
14.	Type of coupling	:	
15.	Materials of coupling	:	
16.	Weight of (I) the pump (ii) Heaviest part of the pump	:	
17.	Space required in Sq.m.	:	
18.	The clearance required/ between two strainers, bottom, floor and strainer.	:	
19.	Type of impeller	:	
	i) Type of sealing rings	:	
	ii) Bearing make & number	:	

TENDERER

20.	Are the bearing internal or external	:	
21.	Are the characteristics of pumps attached	:	
22.	Does the characteristics conform to B.I.S.	:	
..23.	Nature of driver	:	
24.	Length of pumpset	:	
25.	Accessories conform to B.I.S.	:	
26.	Whether Performance chart enclosed	:	

SL No.	Description	Head in Metres			Dis charge in Lpm.	Speed in RPM	Efficien cy %	BHP
		Suc Tion	Deli very	Total				
1.	At any point							
2.	At LWL condition							
3	At MWL condition							
4.	At shut off head							

.28.	Are the following accessories provided	:	
a.	Priming funnel and Union	:	
b.	Air Release cocks and drain cocks	:	
c.	Drip water pipes	:	
d.	Compound gauge to suction and delivery branch	:	
e.	Are the gauge graduated in metre head of water, if so, give range	:	
f.	What arrangement is adopted for preventing air being a drawn into the pumps	:	

ANNEXURE – III (b)

Motors for Centrifugal Pumps

1	Name of the Manufacturer	:	
2	Type of Motor	:	
3	Output brake horse power	:	
4	Number of phases	:	

TENDERER

5	Cycles	:		
6.	Voltage	:		
7.	Speed at full load	:		
8.	Rating	:		
9.	Class & insulation	:		
10.	Stator current (Normal full load Phase)	:		
11.	Current	:		
	a) Normal full load	:	Amps	per phase
	b) Maximum starting	:	Amps	per phase
12	Efficiency	:	Load	Tolerance
			Full	%
			3/4	%
			1/2	%
Note	: Manufacturer's Certificate should be enclosed			
13	Overload capacity	:		
	a) 25%			
	b) 50%		Will be furnished later	
	c) 100%			
14	Power factor	:	Load	Tolerance
			Full	%
			3/4	%
			1/2	%

TENDERER

15.	Temperature rise		
	a. With 12 Hrs. of full speed run with 45°C ambient temperature at the place	:	Stator Rotor
16.	Starting torque	:	
	a. In percent of full load torque	:	
	b. Starting currenting percent of Normal full load current system	:	
17.	Details of motor	:	
	a. Number of poles	:	
	b. Type of enclosure	:	
	c. Type of Motor	:	
18.	Bearing manufacturer		
19.	Type and size (Driving end)		
20.	Type and size of bearing at non-driving end		
21.	Size of coupling and its type		
22	Does the motor conform to BIS		
23	Specification reference		
24	Weight of motor		
25	Degree of protection of motor		

ANNEXURE IV (a)

SUBMERSIBLE PUMPS

TENDERER

1	Name of the Manufacturer	:	
2	Type of Pump and Model	:	
3	Number of Stages	:	
4	Material of Strainer	:	
5	Delivery Branch dia (in mm)	:	
6.	Total Discharge in LPM	:	
7.	Materials of Casing	:	
8.	Type of Impeller	:	
9.	Materials of Impeller	:	
10.	Materials of Impeller Shaft	:	
11.	Type of bearings	:	
12.	Are the bearings external or internal		
13.	Material of bearings	:	
14.	Makers Name and Code No. 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	:	

TENDERER

22	Are the characteristics curves of the pumps attached	:	
23.	Total Head	:	
24.	Does the Pump conform to BIS Specification	:	
25.	Specification Reference	:	
26.	Whate is the Nature of the drive	:	
27.	Type of Coupling	:	
28.	Weight of the heaviest part of the Pump	:	
29.	Weight of the Pump Complete	:	

TENDERER

ANNEXURES-IV (b)

MOTOR (FOR SUBMERSIBLE PUMP SETS)

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 b) Maximum Starting	:	…… Amps …… Amps
10.	Efficiency	:	Load Percent Tolerance as per BIS
			Full ¾ ½
11.	Over Load Capacity		
	a) 25%	:	
	b) 50%	:	
	c) 100%	:	
12.	Power Factor		Load Percent as per Full 3/4 ½

TENDERER

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 & its type	:	
20.	Does the Motor conform to BIS Specification	:	
21.	If so, state the No.	:	
22.	Weight of Motor	:	
23.	Total weight of the Pump & Motor	:	
24.	Diameter of the Pump set	:	
25.	Overall efficiency of the Pump set	:	

TENDERER

VII. Maintenance of the Projects

1) It is the sole responsibility of the contractor to maintain the entire project successfully for the (DLP) maintenance period of 12 months

2) The following measures are to be taken essentially by the contractor

- Necessary maintenance crew with supervisory staff shall be deployed. The staff pattern proposed by the contractor for the maintenance of the completed project should be got approved by the Employer one month before the issue of completion certificate. The entire strength of maintenance crew with the supervisory personnel should be available from the first day of the maintenance period.

- The contractor should keep all spares required for replacements at the headworks, pumping main, distribution system, pump sets etc., readily available to ensure uninterrupted water supply to the beneficiaries.

- All the equipments that goes out of order during the course of the maintenance period shall be rectified / replaced immediately to ensure uninterrupted water supply. If any equipment / machinery is found to be defective either due to manufacture or due to unsatisfactory maintenance, the same should be replaced by the contractor at his cost.

- 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.

- During the period of maintenance, all costs towards labour, spares, consumables, repairs and renewals shall be on to the account of the contractor.

- The electrical energy charges payable to TNEB during the maintenance period shall be borne by the Employer.

- Complete quality service shall be ensured by the contractor during the maintenance period.

- Necessary log books indicating the quantity of water pumped, and maintenance carried out and repairs attended with details of spares changed shall be maintained by the contractor on a day to day basis and produced to the Engineer-in-charge whenever called for.

- Immediately after verification of satisfactory functioning of the scheme be the Implementing division within a period of 3 months, the scheme may be handed over to the TWAD Board Maintenance Division even while the implementation contract concluded with the Contractor is alive. The operation and maintenance clause in the implementation contract can be continued to be done by the contractor until the total expiry of contract period (i.e.) **12 months** specified in the implementation contract and the enforcement of the contract with regard to the maintenance clause of the contract will be by the Maintenance Division.

- Completed schemes after twelve months of Contractor's maintenance shall be handed over to the local body by following due procedures laid down in this regard by the Government along with appropriate presentation to the local body about the scheme details and its maintenance.

- After handing over the scheme shall be maintained by the Contractor under joint supervision by the TWAD Board and the local body for the next six months.

If commissioning is delayed due to other reasons not related to the deficiency of the Contractor, the pending payment shall be released against Bank Guarantee.

TENDERER

X. 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
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

Description	BIS No.
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 – 1989
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 – 1980
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 sewage	1538 – 1976 (Part 1 to 24)
Cast iron detachable joints for use with asbestos cement pressure pipes	8794 – 1988

Description	BIS No.
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 – 1955 Part I

Description	BIS No.
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 - 2016
OPVC Pipes	16647 - 2017