

**GOVERNMENT OF TAMIL NADU**

**THANJAVUR CORPORATION**

**BID DOCUMENT**

**PROVIDING WATER SUPPLY IMPROVEMENT SCHEME TO  
THANJAVUR CITY MUNICIPAL CORPORATION IN  
THANJAVUR DISTRICT**

**PART A**

**VOLUME – I**

Section 1	:	Instructions of bidders
Section 2	:	Forms of bid and qualification information
Section 3	:	Conditions of contract
Section 4	:	Contract Data
Section 8	:	Forms of Securities

**GOVERNMENT OF TAMIL NADU**  
**THANJAVUR CORPORATION**  
**NATIONAL COMPETITIVE BIDDING**

Name of Work : Providing Water Supply Improvement Scheme to Thanjavur City Municipal Corporation

**PART A**

Period of Sale of Bid Document : From 30 .10.2015 to 30.11.2015.  
Time: up to 13.00 Hours

Date and Time of Pre-bid Meeting : 23.11.2015, Time : 11.00 Hours

Last Date and Time for Hours receipt of Bids : 30.11.2015, Time:upto15.00

Time and Date of opening of Bids : 30 .11.2015, Time 15.30 Hours

Place of opening of Bids : THANJAVUR Corporation Office,  
THANJAVUR

Officer inviting Bids : **The Commissioner,**  
Thanjavur City Municipal Corporation,  
Thanjavur District

**INVITATION FOR BID  
(IFB)**

**GOVERNMENT OF TAMIL NADU**  
**THANJAVUR CITY MUNICIPAL CORPORATION**

**INVITATION FOR BID**  
**(IFB)**

**NATIONAL COMPETITIVE BIDDING**

Date : 30 .11.2015

Bid No. : 12916 /2015/E1

1. The Government of Tamil Nadu have accorded administrative sanction vide GO no.281 MA&WS (MA2)dt.05.05.2015 Department under Integrated Urban Development Mission 2014-15 .Project and intends to apply the funds to cover eligible payments under the contracts for construction works as detailed below. Bidding is open to all bidders from eligible source countries as defined in the TT act Guidelines for Procurement. Bidders from India should, however, be registered with the Government of Tamil Nadu or other State Governments/ Government of India, or State/ Central Government Undertakings. Bidders are advised to note the minimum qualification criteria specified in Clause 4 of the instructions to Bidders to qualify for the award of the contract.
  
2. **The Commissioner, Thanjavur City Municipal Corporation,** Tamil Nadu invites bids for the construction of works detailed in the table mentioned hereunder, The bidders may submit bids for any or all of the following works.

3. Bid documents may be freely downloaded from the websites <http://tntenders.gov.in>, [www.tenders.tn.gov.in](http://www.tenders.tn.gov.in) from **29 .10.2015 to 30.11.2015** on or before 13.00 hours and used free of cost.
4. Bids must be accompanied by Security of the amount specified for the work in the table below, drawn in favour of **The Commissioner, Thanjavur City Municipal Corporation**, Bid Security will have to be in any one of the forms as specified in the bidding document and shall have to be valid for 120 days beyond the validity of the bid.
5. The bids should be submitted in two cover system, Document such as EMD (Cash Receipt Voucher for having remitted the sum in the Corporation Treasury or NSCs pledged in favour of **The Commissioner, Thanjavur City Municipal Corporation** or **Demand Draft** drawn on any Nationalized banks Payable at **Thanjavur, Unconditional Bank guarantee** favouring **The Commissioner, Thanjavur Corporation**, Experience and Performance Certificate, Audited accounts statement and Income tax returns, RC, TIN and PAN should be scanned and uploaded in the "**Technical Bid**" module of the website. The schedule duly filled in as "**Price Bid**" should be uploaded in the "**Price Bid**" module of the website. The original of all documents including EMD scanned and uploaded in the "**Technical Bid**" module of the website shall be deposited in the box earmarked for this purpose kept in the Engineering Section, Main Office of this **Thanjavur** City Municipal Corporation **for which persons need not come to the office, instead they may send them through post on or before 15:00 hours on 30 .11.2015**. This office will not be held responsible for postal delay, if any. Those bids for which originals of scanned and uploaded document have not been submitted in time, will not be accepted. All documents should have been attested and duly notarized.

6. Bids may be submitted through E-Submission in the [www.tntenders.gov.in](http://www.tntenders.gov.in) (or) [www.tenders.tn.gov.in](http://www.tenders.tn.gov.in) (or) manual submission on or before **15.00 hours** on **30.11.2015** and will be opened on the same day at **15.30 hours** in the presence of the bidders who wish to attend, If that day happens to be Government Holiday, Bandh or any interruption erupted in the above said website in the City Municipal Corporation Office, uploaded bid documents will be received and opened on the next working day at the same time and venue.
  
7. A pre-bid meeting will be held on **23.11.2015** at **11.00** hours at the office of **The Commissioner, Thanjavur City Municipal Corporation, Thanjavur** to clarify queries and to answer questions on any matter that may be raised at that stage as stated in the Instructions to Bidders of the bidding document.
  
8. **The Commissioner, Thanjavur City Municipal Corporation reserves** the right to reject any one (or) all the bids received without any valid reasons.

## **TABLE**

<b>Sl. No.</b>	<b>Name of work</b>	<b>Approximate value of work (in Rs.Lakhs)</b>	<b>Bid security (in Rs. Lakhs)</b>	<b>Period of completion</b>	<b>Class of Contract or</b>
1	Providing Water Supply Improvement Scheme to Thanjavur City Corporation in Thanjavur District	Rs.4569.00 Lakhs	Rs.45.69 Lakhs	18 Months including monsoon period	I

**The Commissioner  
THANJAVUR CORPORATION**

Tender form can be downloaded free of cost from [www.tenders.tn.gov.in](http://www.tenders.tn.gov.in) (or) [www.tntenders.gov.in](http://www.tntenders.gov.in)

**SECTION 1 :**  
**INSTRUCTIONS TO BIDDERS (ITB)**



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# Section 1

## Instructions to Bidders

### A. General

#### 1. Scope of Bid

1.1 The Commissioner of THANJAVUR City Municipal Corporation, THANJAVUR (referred to as Employer in these documents) invites bids for the construction of works (as defined in these documents and referred to as "the works") detailed in the table given in IFB. The bidders may submit bids for any or all of the works detailed in the table given in IFB.

1.2 The successful bidder will be expected to complete the works by the intended completion date specified in the Contract data.

#### 2. Source of Funds

2.1 The Government of Tamil Nadu have accorded administrative sanction vide GO no.281 MA&WS (MA2) Department under Integrated Urban Development Mission 2014-15 .Project and intends to apply a part of the funds to cover eligible payments under the contract for the Works. Payments by the Bank will be made only at the request of the borrower and upon approval of the Bank in accordance with the *Loan Agreement*, and will be subject in all respects to the terms and conditions of that Agreement. Except as the Bank may specifically otherwise agree, no party other than the borrower shall derive any rights from the *Loan Agreement* or have any rights to the Loan proceeds.

#### 3. Eligible Bidders

3.1 This *Invitation for Bids* is open to all bidders in India.

3.2 All bidders shall provide in Section 2, Forms of Bid and Qualification Information, a statement that the Bidder is not 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 or being proposed as Project Manager for the Contract.

A firm that has been engaged by the Borrower to provide consulting services for the preparation or supervision of the works, and any of its affiliates, shall not be eligible to bid.

**3.3** Government-owned enterprises may only participate if they are legally and financially autonomous, operate under commercial law .

**3.4** Bidders shall not be under a declaration of ineligibility for corrupt and fraudulent practices in accordance with sub-clause 35.1.

#### **4. Qualification of the Bidder**

**4.1** All bidders shall provide in Section 2, Forms of Bid and Qualification Information, a preliminary description of the proposed work method and schedule, including drawings and charts, as necessary.

**4.2** All bidders shall include the following information and documents with their bids in Section 2:

- (a) copies of original documents defining the constitution or legal status, place of registration, and principal place of business; written power of attorney of the signatory of the Bid to commit the Bidder;
- (b) total monetary value of construction work performed for each of the last five years;
- (c) experience in works of a similar nature and size for each of the last five years, and details of works under way or contractually committed; and clients who may be contacted for further information on those contracts;
- (d) major items of construction equipment proposed to carry out the Contract;
- (e) qualifications and experience of key site management and technical personnel proposed for the Contract;
- (f) reports on the financial standing of the Bidder, such as profit and loss statements and auditor's reports for the past five years;
- (g) evidence of adequacy of working capital for this contract (access to line (s) of credit and availability of other financial resources);
- (h) authority to seek references from the Bidder's bankers;
- (i) information regarding any litigation or arbitration resulting from contracts executed by the Bidder in the last five years or currently under execution. The information shall include the names of the parties concerned, the disputed amount, cause of litigation, and matter in dispute;

- (j) proposals for subcontracting components of the Works which in aggregate add to more than 20 percent of the Bid Price (for each, the qualifications and experience of the identified sub-contractor in the relevant field should be annexed and no vertical splitting of work for sub contracting is acceptable;
- (k) the proposed methodology and program of construction, including environmental management plan backed with equipment material and manpower planning and deployment, duly supported with broad calculations and quality control procedures proposed to be adopted, justifying their capability of execution and completion of the work as per technical specifications within the stipulated period of completion as per milestones .
- (l) All certificate and enclosures should be attested by Notary Public.

**4.4** Bids from joint ventures are not acceptable.

**4.5 A. To qualify for award of the contract, each bidder in its name should have in the last three years i.e.2012-2013 to 2014-2015**

- a.) (i) Average Annual Turn over for the last three financial years

( 2012-13 & 2013-14,2014-15) of **Rs.45.69 Crore**

- (ii) Minimum Annual Turnover in last three financial year Rs. in crore  
( 2012-13 & 2013-14,2014-15) – 22.70 Crore.

Minimum cash flow required in Rs. **11.42 Crore**

- b.) satisfactorily completed and commissioned any Government Department work as a prime contractor duly certified by the employer at least **one similar nature of water supply work** of any Municipality, City Municipal Corporation, TWAD, Metro Central Govt. Department of value not less than **Rs.1828.00 Lakhs in a single contract**

- c.) (i) Should have supplied, laid, tested and commissioned satisfactorily pumping main / feeder main of **400mm dia** or above DI S/S pipe in single agreement during last 5 financial years not less than **10.00Km**
- (ii) Should have supplied, laid, tested and commissioned satisfactorily distribution system of **100mm dia** or above DI S/S pipe in single agreement during last 5 financial years not less than **46.50Km**
- d) Should have constructed and commissioned satisfactorily **1no 7.50LL** and above RCC over head tank during the last five years duly certified by the employer
- e) Bid capacity assessed Available Bid capacity =  $(A*N*1.5 - B)$  Should be more than **45.69.00 Crore**

@at 2014-2015\* price level. Financial turnover and cost of completed works of previous years shall be given weightage of 10% per year based on rupee value to bring them to 2014-2015 price level\*.

**Each bidder should further demonstrate:**

- (a) availability (either owned or leased or by procurement against mobilization advances) of the key and critical equipment for this work:
- |   |        |
|---|--------|
| 1. Tipper lorry   | 2 Nos. |
| 2. Concrete Mixer   | 2 Nos. |
| 3. Vibrators  | 4 Nos. |
| 4. Air compressor of sufficient capacity operated by diesel | 4 Nos. |
| 5. Derrick Posts with Chain Pulley Block                    | 2 set. |
| 6. Excavator cum loader (JCB)                               | 2 Nos. |
| 7. Water tanker lorry (8000 lits.)                          | 3 Nos. |
| 8. Dewatering pumpsets                                      | 1 No.  |

Based on the studies, carried out by the Engineer the minimum suggested major equipment to attain the completion of works in accordance with the prescribed construction schedule are shown in the above list.

The bidders should, however, undertake their own studies and furnish with their bid, a detailed construction planning and methodology supported with layout and necessary drawings and calculations (detailed) as stated in clause 4.3 (k) above to allow the employer to review their proposals. The numbers, types and capacities of each plant/equipment shall be shown in the proposals along with

the cycle time for each operation for the given production capacity to match the requirements.

- (b) Availability for this work of a Project Engineer with B.E (Civil) with not less than fifteen years' experience in construction of similar civil Engineering works and other key personnel with adequate experience as required; and

**4.6.** Sub-contractors' experience and resources shall not be taken into account in determining the bidder's compliance with the qualifying criteria except to the extent stated in clause 4.5A above.

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

$$\text{Assessed Available Bid Capacity} = (A * N * 1.5 - B)$$

where

A = Maximum value of civil Engineering works executed in any one year during the last five years (updated to 2012-2013 price level) 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. ie., 1 ½ years

B = Value, at 2012-13 price level, of existing commitments and on-going works to be completed during the next 1 ½ years.

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

- made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements; and/or
- record of poor performance such as abandoning the works, not properly completing the contract, inordinate delays in completion, litigation history, or financial failures etc.,

## **5. One Bid per Bidder**

**5.1** Each bidder shall submit only one bid for one tender.

## **6. Cost of Bidding**

- 6.1** The bidder shall bear all costs associated with the preparation and submission of his Bid, and the Employer will in no case be responsible and liable for those costs.

## **7. Site visit**

- 7.1** The Bidder, at the Bidder's own responsibility and risk is encouraged to visit and examine the Site of Works and its surroundings and obtain all information that may be necessary for preparing the Bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the Bidder's own expense. The site visit certificate (certified by municipal engineer) shall be attached in the technical bid.

# **B. BIDDING DOCUMENTS**

## **8. Content of Bidding Documents**

- 8.1** The set of bidding documents comprises the documents listed in the table below and addenda issued in accordance with Clause 10:

### **Invitation for Bids**

Section 1 Instructions to Bidders

2. Forms of Bid and Qualification Information

3. Conditions of Contract

4. Contract Data

5. Specifications

6. Drawings

7. Bills of Quantities

8. Forms of Securities

- 8.2** Of the three sets of the bidding documents supplied, two sets should be completed and returned with the bid.

## **9. Clarification of Bidding Documents**

- 9.1** A prospective bidder requiring any clarification of the bidding documents may notify the Employer in writing or by cable (hereinafter "cable" includes telex and facsimile) at the Employer's address indicated in the invitation to bid. The Employer will respond to any request for clarification which he received earlier than 15 days prior to the deadline for submission of bids. Copies of the

Employer's response will be forwarded to all purchasers of the bidding documents, including a description of the enquiry but without identifying its source.

## **9.2 Pre-bid meeting**

**9.2.1** The bidder or his official representative is invited to attend a pre-bid meeting which will take place at **THANJAVUR City Municipal Corporation** Office at THANJAVUR corporation on **23.11.2015 at 11.00 Hours**.

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

**9.2.3** The bidder is requested to submit any questions in writing or by cable to reach the Employer not later than one week before the meeting.

**9.2.4** Minutes of the meeting, including the text of the questions raised (without identifying the source of enquiry) and the responses given will be transmitted without delay to all purchasers of the bidding documents. Any modification of the bidding documents listed in Sub-Clause 8.1 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 and not through the minutes of the pre-bid meeting.

**9.2.5** Non-attendance at the pre-bid meeting will not be a cause for disqualification of a bidder.

## **10. Amendment of Bidding Documents**

**10.1** Before the deadline for submission of bids, the Employer may modify the bidding documents by issuing addenda.

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

**10.3** To give prospective bidders reasonable time in which to take an addendum into account in preparing their bids, the Employer shall extend as necessary the deadline for submission of bids, in accordance with Sub-Clause 20.2 below.



## C. PREPARATION OF BIDS

### 11. Language of the Bid

11.1 All documents relating to the bid shall be in the English language.

### 12. Documents comprising the Bid

12.1 The bid submitted by the bidder shall comprise the following through E-Submission

(or) Manual submission:

- (a) The Bid (in the format indicated in Section 2).
- (b) Bid Security;
- (c) Priced Bill of Quantities;
- (d) Qualification Information Form and Documents;

and any other materials required to be completed and submitted by bidders in accordance with these instructions. The documents listed under Sections 2, 4 and 7 of Sub-Clause 8.1 shall be filled in without exception.

### 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 the Works described in the **Bill of Quantities** along with total bid price (both in figures and words). *Items for which no rate or price is entered by the bidder will not be paid for by the Employer when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities.* Corrections, if any, shall be made by crossing out, initialing, dating and rewriting.

13.3 All taxes, and other levies payable by the contractor under the contract, or for any other cause shall be included in the rates, prices and total Bid Price submitted by the Bidder. The pipe having outer diameter exceeding 10cm and Jointing apparatus and appliances the contractor should quote the rate without excise duty. As per the Govt. of India Ministry of Finance (Department of Revenue) notification No.2/2012 Dt.17.3.2012 Central Excise. The Excise duty exemption certificate will be obtained from the District Administration (i.e.,) District Collector . The bidder should quote DI pipe rate without excise duty.

**13.3(a)** All taxes, and other levies payable by the contractor Under contractor, or for any other cause shall be included in the rates, prices and total Bid Prices Submitted by the Bidder.

Note :- Bidder may like to ascertain availability of excise/custom duty exemption benefits available in India to the contracts financed under World Bank loan/ credits. They are solely responsible for obtaining such benefits which they have considered the bid and in case of failure to receive such benefits for reasons whatsoever, the employer will not compensate the bidder ( contractor). where the bidder has quote taking into account such benefits, he must give all information required for issue of certificate in terms of such notifications as per form attached to the Qualification Information in the bid. To the extent the employer determines the quantity indicated therein are reasonable keeping in view the bill of quantities, Construction programme and methodology , The certificate will be issued and no Subsequent charges will be permitted . No certificate will be issued for items where no quantity /capacity of equipment is indicated in the statement. The bids which do not conform to the above provisions will be treated as non responsive and rejected. Any delay in procurement of the construction equipment /machinery /goods as a result of the above shall not be a cause for granting any extension of 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 47 of the Conditions of Contract.

#### **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 after the deadline date for bid submission specified in Clause 20. 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 that the bidders may extend the period of validity for a specified additional period. The request and the bidders' responses 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 extend the validity of his bid security for a period of the extension,

and in compliance with Clause 16 in all respects.

## **16. Bid Security**

**16.1** The Bidder shall furnish, as part of his Bid, a Bid security in the amount as shown in column 4 of the table of IFB for this particular work

This bid security shall be in favour of **The Commissioner, THANJAVUR City Municipal Corporation**, and may be in any one of the following forms:

- A bank guarantee issued by a nationalized / scheduled bank located in India in the form given in Section 8
- Certified cheque, Bank draft or Letter of Credit in favour of **The Commissioner, THANJAVUR CORPORATION** payable at THANJAVUR
- Demand Draft drawn in favour of **The Commissioner, THANJAVUR City Municipal Corporation** concerned.
- Fixed deposit receipts from Scheduled bank pledged in favour of the Commissioner, THANJAVUR CORPORATION concerned
- National Savings Certificates pledged in favour of The Commissioner, THANJAVUR CORPORATION concerned

**16.2** Bank guarantees issued as surety for the bid shall be valid for 45 days beyond the validity of the bid.

**16.3** Any bid not accompanied by an acceptable Bid Security and not secured as indicated in Sub-Clauses 16.1 and 16.2 above shall be rejected by the Employer as non-responsive.

**16.4** The Bid Security of unsuccessful bidders will be returned within 28 days of the end of the bid validity period specified in Sub-Clause 15.1.

**16.5** The Bid Security of the successful bidder will be discharged when the bidder has signed the Agreement and furnished the required Performance Security.

**16.6** The Bid Security may be forfeited

- (a) if the Bidder withdraws the Bid after Bid opening during the period of Bid validity;
- (b) if the Bidder does not accept the correction of the Bid Price, pursuant to Clause 27;

or

- (c) in the case of a successful Bidder, if the Bidder fails within the specified time limit to
  - (i) sign the Agreement; or
  - (ii) furnish the required Performance Security.

**17. Alternative Proposals by Bidders**

**17.1** Bidders shall submit offers that comply with the requirements of the bidding documents, including the basic technical design as indicated in the drawing and specifications. Alternatives will not be considered.

**18. Format and Signing of Bid**

**18.1** The Bidder shall prepare the documents comprising the bid as described in Clause 12 of these *Instructions to Bidders*. The bids may be submitted through E-Submission or manual submission.

**18.2** The Bid shall be typed or written in indelible ink and shall be signed by a person or persons duly authorized to sign on behalf of the Bidder, pursuant to Sub-Clauses 4.3. All pages of the bid where entries or amendments have been made shall be initialed by the person or persons signing the bid.

**18.3** The Bid shall contain no alterations or additions, except those to comply with instructions issued by the Employer, or as necessary to correct errors made by the bidder, in which case such corrections shall be initialed by the person or persons signing the bid.

“Improvement of Water Supply Scheme to Thanjavur City Municipal corporation in Thanjavur District” (Bidder’s Name and Address)

## D. SUBMISSION OF BIDS

### 19. Sealing and Marking of Bids

19.1 The bidder may submit bid through E-Submission or Manual submission. The cover containing bid security and qualification, information shall be applied through as **E-Submission or Manual submission**. Another cover containing the duly filled in bill of quantities and signed contractor's bid shall be superscribed as **Price Bid**. These shall be submitted with scanned and to be **uploaded in the websites in the respective modules**.

The cover superscribed as **Technical Bid** alone will be opened first. The **Price Bid** cover will be opened only if the documents required in the **Technical Bid** cover are found in order as per tender conditions. If **Technical Bid** is not submitted with these particulars, the **Price Bid** cover will not be opened and the tender will be rejected and returned to the bidder "**unopened**".

19.2 The envelope shall

(a) be addressed to the Employer at the following address:

**The Commissioner**, Thanjavur City Municipal Corporation,  
Thanjavur District, Tamil Nadu and

(b) bear the following identification:

Bid Replacing of distribution main, Pumping main from clear water Head works to all OHTs, **to Thanjavur City Municipal Corporation In Thanjavur District**

- Bid Reference No. 12916/2014/E1
- DO NOT OPEN BEFORE. **15.30 Hours on 30.11.2015**

(c) The Technical Bid Envelope shall contain the following in the sequence indicated below.  
The **Technical Bid shall be uploaded in the website (or) manual submission** in respective modules with the following.

- i. Covering letter
  - ii. Performance Certificate obtained from the clients as per Qualification Information.
  - iii. The Bid Security
  - iv. Declaration by the Bidder that his bid is without any technical and commercial deviations in the format of the letter enclosed with the bid.
  - v. Certified Power of Attorney authorizing a representative or representatives of the Firm to sign the Bid and all subsequent communication.
  - vi. Documentary evidence of unambiguous fulfillment of eligibility criteria for bidding.
  - vii. Latest Income Tax Clearance Certificate and Sales Tax Clearance Certificate.
  - viii. Bid document signed by the authorized signatory.
  - ix. Full technical description of the items and services proposed by the Bidder including makes.
  - x. Details of construction equipment proposed for the execution of the works and makes.
  - xi. Details of manpower proposed for the Project Management and Site Management including qualification and experience of the personnel.
- (d) The envelope labeled, as “**Price Bid**” shall contain the following in the sequence indicated below. This may be **uploaded in the website** (or) **Manual submission** in respective modules with the following.
- i. Covering letter
  - ii. The Bid Price for the work with each page signed, dated and stamped with the seal of the Firm
  - iii. Apart from the Schedule of Prices and Annexure duly filled in, Bidders shall not enclose any other documents or statements that influence the price. In such an event the Employer shall summarily disqualify the Bidder and reject the Bid.

The Bidder shall seal the original and copy of the Bid in separate envelopes, duly marking the envelopes as “ORIGINAL” and “COPY”. These envelopes (called as inner envelopes) shall then be put inside one outer envelope.

**19.3** In addition to the identification required in Sub-Clause 19.2, the inner envelopes shall indicate the name and address of the bidder to enable the bid to be returned unopened in case it is declared late, pursuant to Clause 21.

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

## **20. Deadline for Submission of the Bids**

**20.1** Bids must be received by the Employer at the address specified above not later than **15.00 hours .11.2015** on In the event of the specified date for the submission of bids declared a holiday for the Employer, the Bids will be received upto the appointed time on the next working day.

**20.2** The Employer may extend the deadline for submission of bids by issuing an amendment in accordance with Clause 10, 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.

## **21. Late Bids**

**21.1** Any Bid received by the Employer after the deadline prescribed in Clause 20 will be returned unopened to the bidder.

## **22. Modification and Withdrawal of Bids**

**22.1** Bidders may modify or withdraw their bids by giving notice in writing before the deadline prescribed in Clause 20.

**22.2** Each Bidder's modification or withdrawal notice shall be prepared, sealed, marked, and delivered in accordance with Clause 18 & 19, with the envelopes additionally marked "**MODIFICATION**" or "**WITHDRAWAL**", as appropriate.

**22.3** No bid may be modified after the deadline for submission of Bids.

**22.4** Withdrawal or modification of a Bid between the deadline for submission of bids and the expiration of the original period of bid validity specified in Clause 15.1 above or

as extended pursuant to Clause 15.2 may result in the forfeiture of the Bid security pursuant to Clause 16.

- 22.5** Bidders may offer discounts to, or modify the prices of their Bids by submitting Bid modifications in accordance with this clause, or included in the original Bid submission.

## **E. BID OPENING AND EVALUATION**

### **23. Technical Bid Opening and Evaluation**

- 23.1** The Employer will open the technical bids of all the Bids received (except those received late), including modifications made pursuant to Clause 22, in the presence of the Bidders or their representatives who choose to attend at **15.30** hours on the date and the place specified in Clause 20. In the event of the specified date of Bid opening being declared a holiday for the Employer, the Bids will be opened at the appointed time and location on the next working day.

- 23.2** Envelopes marked "**WITHDRAWAL**" shall be opened and read out first. Bids for which an acceptable notice of withdrawal has been submitted pursuant to Clause 22 shall not be opened. Subsequently all envelopes marked "Modification" shall be opened and the submissions therein read out in appropriate detail.

- 23.3** The Bidders' names, Bid modifications and withdrawals, the presence or absence of Bid security, and such other details as the Employer may consider appropriate, will be announced by the Employer at the opening. No bid shall be rejected at bid opening except for the late bids pursuant to Clause 21. Bids [and modifications] sent pursuant to Clause 22 that are not opened and read out at bid opening will not be considered for further evaluation regardless of the circumstances. Late and withdrawn bids will be returned un-opened to bidders.

- 23.4** The Employer shall prepare minutes of the Bid opening, including the information disclosed to those present in accordance with Sub-Clause 23.3.

- 23.5** Prior to the detailed evaluation of Bids, the employer will determine whether each Bid (a) meets the eligibility criteria defined in clause 3, (b) has been properly signed; (c) is accompanied by the required securities and (b) is substantially responsive to the requirements of the Bidding documents.



**23.6** A substantially responsive Bid is one which conforms to all the terms and conditions and specifications of the Bidding documents, without material deviations or reservation. A material deviation or reservation is one(a) which affects in any substantial way the scope, quality, or performance of the works; (b) which limits in any substantial way, inconsistent with 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.

**23.7** If a Bid is not substantially responsive, it will be rejected by the Employer and may not subsequently be made responsive by the corrections or withdrawal of the non-conforming deviation or reservation .

#### **24. Price Bid Opening**

**24.1** The Employer shall notify those bidders whose technical bids did not meet the minimum qualification criteria or were considered non responsive, indicating that their price bids will be returned unopened after the award of the contract. The Employer shall simultaneously notify the technically qualified bidders indicating the date and time set for opening of price bid on representation.

**24.2** The price bids shall be opened by the Employer in the presence of bidders representatives who choose to attend. The name of the bidders, quoted bid prices, discounts offered or modification if any shall be read aloud and the Employer shall prepare minutes of the price bid opening.

#### **25. Clarification of Bids**

**25.1** To assist in the examination, evaluation, and comparison of Bids, the Employer may, at his discretion, ask any Bidder for clarification of his Bid. 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 27.

**25.2** Subject to sub-clause 25.1, 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 should do so in writing.

**25.3** Any effort by the Bidder to influence the Employer in the Employer's bid evaluation, bid comparison or contract award decisions may result in the rejection of the Bidders' bid.

## **26. Process to be Confidential**

**26.1** 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 persons 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 rejections of his Bid.

## **27. Correction of Errors**

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

(a) where there is a discrepancy between the rates in figures and in words, the lesser of the two will govern and

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

**27.2** The amount stated in the Bid will be adjusted by the Employer in accordance with the above procedure for the correction of errors and, with the concurrence of the Bidder, shall be considered as binding upon the Bidder. If the Bidder does not accept the corrected amount the Bid will be rejected, and the Bid security may be forfeited in accordance with Sub-Clause 16.6 (b).

## **28 Evaluation and Comparison of Bids**

**28.1** The Employer will evaluate and compare only the Bids determined to be substantially responsive in accordance with Clause 23

- 28.2** In evaluating the Bids, the Employer will determine for each Bid the evaluated Bid Price by adjusting the Bid Price as follows:
- (a) making any correction for errors pursuant to Clause 27; or
  - (b) making an appropriate adjustments for any other acceptable variations, deviations; and
  - (c) making appropriate adjustments to reflect discounts or other price modifications offered in accordance with Sub Clause 22.5.
- 28.3** 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 documents or otherwise result in unsolicited benefits for the Employer shall not be taken into account in Bid evaluation.
- 28.4** The estimated effect of the price adjustment conditions under Clause 47 of the *Conditions of Contract*, during the period of implementation of the Contract, will not be taken into account in Bid evaluation.
- 28.5** 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 performance security 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.

## **F. AWARD OF CONTRACT**

### **29 Award criteria**

**29.1** Subject to Clause 32, the Employer will award the Contract to the Bidder whose Bid has been determined to be substantially responsive to the Bidding 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 provisions of Clause 3, and (b) qualified in accordance with the provisions of Clause 4.

### **30. Employer's Right to Accept any Bid and to Reject any or all Bids**

**30.1** Notwithstanding Clause 29, the Employer reserves the right to accept or reject any Bid, and to cancel the Bidding process and reject all Bids, at any time prior to the 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.

### **31. Notification of Award and Signing of Agreement**

**31.1** The Bidder whose Bid has been accepted will be notified of the award by the Employer prior to expiration of the Bid validity period by cable, telex or facsimile confirmed by registered letter. This letter (hereinafter and in the *Conditions of Contract* called the "Letter of Acceptance") will state the sum that the Employer will pay 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 Contract called the "Contract Price").

**31.2** The notification of award will constitute the formation of the Contract, subject only to the furnishing of a performance security in accordance with the provisions of Clause 34.

**31.3** The Agreement will incorporate all agreements between the Employer and the successful Bidder. It will be signed by the Employer and kept ready for signature of the successful Bidder in the office of the employer, within 28 days following the notification of award along with the Letter of Acceptance. Within 21 days of receipt, the successful Bidder will sign the Agreement .

**31.4** Upon the furnishing by the successful Bidder of the Performance Security, the Employer will promptly notify the other Bidders that their Bids have been unsuccessful.

## **32. Performance Security**

**32.1** Within 21 days of receipt of the Letter of Acceptance, the successful Bidder shall deliver to the Employer a Performance Security in any of the forms given below for an amount equivalent to 2% of the Contract price plus additional security for unbalanced Bids in accordance with Clause 28.5 of ITB and Clause 52 of Conditions of Contract:

- a bank guarantee in the form given in Section 8; or
- Certified cheque/Bank draft, in favour of **The Commissioner**, Thanjavur City Municipal Corporation payable at THANJAVUR

**32.2** If the performance security is provided by the successful Bidder in the form of a Bank Guarantee, it shall be issued either (a) at the Bidder's option, by a Nationalized/Scheduled Indian bank or (b) by a foreign bank located in India and acceptable to the Employer or (c) by a foreign bank through a correspondent bank in India ( Scheduled or Nationalized )

**32.3** Failure of the successful bidder to comply with the requirements of sub-clause 32.1 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, and the Employer may resort to awarding the contract to the next ranked bidder.

## **33 Advance Payment and Security**

**33.1** The Employer will provide an Advance Payment on the Contract Price as stipulated in the Conditions of Contract, subject to maximum amount, as stated in the Contract Data.

### **34. Adjudicator**

**34.1** The Employer proposes that Thiru. \_\_\_\_\_ B.E., Chief Engineer (Rtd), be appointed as Adjudicator under the Contract, at a daily fee of **Rs.5000/-** plus reimbursable expenses. If the Bidder disagrees with this proposal, the Bidder should so state in the Bid. If in the Letter of Acceptance, the Employer has not agreed on the appointment of the Adjudicator, the Adjudicator shall be appointed by Employer at the request of either party.

### **35. Corrupt or Fraudulent Practices**

**35.1** The employer requires that the bidders as well as Suppliers/Contractors and Consultants, observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy, the employer.

(a) defines, for the purposes of this provision, the terms set forth below as follows :

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

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

(iii) 'collusive practice' means a scheme or arrangement between two or more Bidders, with or without knowledge of the borrower, designed to establish bid price at artificial noncompetitive levels: and

(iv) 'coercive practice' means harming or threatening to harm, directly or indirectly, persons or third party to influences the participation in the procurement process of the execution of contract:

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

(c) will cancel the contract if it determines at any time that representatives of the contractor engaged in corrupt, fraudulent, collusive or coercive practices during the procurement or the execution of that contract, without

having taken timely and appropriate action satisfactorily to the Employer to remedy the situation;

- (d) will sanction a firm or individual, including declaring them ineligible, either indefinitely or for a stated period of time, to be awarded a contract if it any time determines that they have, directly or through an agent engaged, in corrupt, fraudulent, collusive, or coercive practices in competing for, or in executing a contract ; and
  
- (e) will have right to require that a provision be included in Bidding Documents and in contracts, requiring Bidders, Suppliers, Contractors and Consultants to permit the Employer to inspect the accounts and records and other documents relating to the Bid submission and contract performance and to have them audited by auditors appointed by the Employer.

**35.2** Furthermore, Bidders shall be aware of the provision stated in sub-clause 23.2 and sub-clause 59.2 of the Conditions of Contract.

**SECTION 2 :**  
**FORMS OF BID, QUALIFICATION**  
**INFORMATION & LETTER OF**  
**ACCEPTANCE**

**Table of Forms**

- **CONTRACTOR'S BID**
  
- **QUALIFICATION INFORMATION**
  
- **LETTER OF ACCEPTANCE**
  
- **NOTICE TO PROCEED WITH THE WORK**
  
- **AGREEMENT FORM**



# CONTRACTOR'S BID

Name of Work : **Providing Water Supply Improvement Scheme to THANJAVUR City Municipal Corporation in Thanjavur District.**

To

**The Commissioner,**  
THANJAVUR CITY  
MUNICIPAL CORPORATION  
THANJAVUR ,  
THANJAVUR District, Tamil Nadu

GENTLEMEN,

Having examined the bidding documents including addendum, we offer to execute the Works described above in accordance with the Conditions of Contract, Specifications, Drawings and Bill of Quantities accompanying this Bid for the Contract Price of **Rs.** ----- (in figures) ( \_\_\_\_\_ ) (in words)<sup>1</sup>

The advance Payment required is: **Rupees** -----

We accept the appointment of \_\_\_\_\_ as the Adjudicator.

(OR)

We do not accept the appointment of \_\_\_\_\_ as the Adjudicator and propose instead that \_\_\_\_\_ be appointed as Adjudicator whose daily fees and biographical data are attached.

This Bid and your written acceptance of it shall constitute a binding contract between us. We understand that you are not bound to accept the lowest or any Bid you receive.

We here certify that we have taken steps to ensure that no person acting for us or on our behalf will engage in bribery.

We also undertake that, in competing for (and, if the award is made to us, in executing) the above contract, we will strictly observe the laws against fraud and corruption in force in India namely "Prevention of Corruption Act 1988".

We hereby confirm that this Bid complies with the eligibility, Bid Validity and Bid Security required by the Bidding documents.

Yours faithfully,

Authorized Signature:

Name & Title of Signatory: -----

Name of Bidder : -----

Address : -----

-----

-----

-----

Note 1 :

To be filled in by the Bidder, together with his particulars and date of submission at the bottom of the Form of Bid.

# QUALIFICATION INFORMATION

The information to be filled in by the Bidder in the following pages will be used for purposes of post qualification as provided for in Clause 4 of the Instructions to Bidders. This information will not be incorporated in the Contract.

## 1. For Individual Bidders

### 1.1 Constitution or legal status of Bidder

**[Attach copy]**

Place of registration: .....

Principal place of business: .....

Power of attorney of signatory of Bid **[Attach]**

### 1.2 Total value of Civil Engineering construction and water supply works executed and payments received in the last five years (2011-2012 to 2015-2016)

2010 – 2011	Rs-----
2011 – 2012	R-----
2012 – 2013	R-----
2013 - 2014	R-----
2014 - 2015	R-----

### 1.3.1 Work performed as prime contractor (in the same name) on works of a similar nature over the last five years. (2011-2012 to 2015-2016)

Project Name	Name of the Employer*	Description of work	Contract No.	Value of contract (Rs.Crores)	Date of issue of work order	Stipulated period of completion	Actual date of completion*	Remarks explaining reasons for delay and work completed

### 1.3.2 Quantities of work executed as prime contractor (in the same name and style) in the last five years: (2010-2011 to 2014-2015).

Year	Name of the Work	Name of the employer*	Quantity of work performed @		Remarks *(indicate contract Ref)
			Supplying, laying, jointing, testing and commissioning of DI / HDPE Distribution main/pumping main		
2010-11					
2011-12					
2012-13					
2013-14					
2014-15					

\*Attach certificate(s) from the Engineer(s)-in-Charge

@The item of work for which data is requested should tally with that specified in ITB clause 4.5A(c).

Attach certificate from Chartered Accountant.

**1.4** Qualifications and experience of key personnel proposed for administration and execution of the Contract. Attach biographical data. Refer also to Sub Clause 4.3 (e) and 4.5 (B) (b) of instructions to Bidders and Sub Clause 9.1 of the Conditions of Contract.

Position	Name	Qualifications	Years of experience (general)	Years of experience in the proposed position	
Project Manager *	*	*	*	*	*
	*	*	*	*	*
	*	*	*	*	*
	*	*	*	*	*
etc.					

**1.5** Proposed subcontracts and firms involved. [Refer ITB Clause 4.3 (j)]

Sections of the works	Value of Sub-contract	Sub-contractor (name and address)	Experience in similar work
*	*	*	*
	*	*	*
*	*	*	*
	*	*	*
*	*	*	*

- 1.6 Financial reports for the last five years: balance sheets, profit and loss statements, auditors' reports (in case of companies/corporation), etc. List them below and attach copies.
- 1.7 Evidence of access to financial resources to meet the qualification requirements: cash in hand, lines of credit, etc. List them below and attach copies of support documents *[sample format attached]*.
- 1.8. Name, address, and telephone, telex, and fax numbers of the Bidders' bankers who may provide references if contacted by the Employer.
- 1.9 Information on litigation history in which the Bidder is involved.

-----

Other party(ie)	Employer	Cause of dispute	Amount involved	Remarks showing present status
-----------------	----------	------------------	--------------------	---

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1.10 Proposed work method and schedule. The Bidder should attach descriptions, drawings and charts as necessary to comply with the requirements of the Bidding documents. [Refer ITB Clause 4.1 and 4.3 (k)].

**2. Additional Requirements**

2.1 Bidders should provide any additional information required to fulfill the requirements of Clause 4 of the Instructions to the Bidders, if applicable.

# LETTER OF ACCEPTANCE

(letter head paper of the Employer)

Letter No.....

Dated.....

To:

.....  
.....  
.....  
.....

[name and address of the Contractor]

**Dear Sirs,**

This is to notify you that your Bid dated ..... for execution of the Providing Water Supply Improvement Scheme to Thanjavur City Municipal corporation in Thanjavur District .....[name of the contract and identification number, as given in the Instructions to Bidders] for the Contract Price of Rupees ..... (Rs.....) [amount in words and figures], as corrected and modified in accordance with the Instructions to Bidders<sup>1</sup> is hereby accepted by our Agency.

We accept/do not accept that .....be appointed as the Adjudicator<sup>2</sup>.

We note that as per bid, you do not intend to subcontract any component of work.

[OR]

We note that as per bid, you propose to employ M/s. .... as sub-contractor for executing .....

*[Delete whichever is not applicable]*

You are hereby requested to furnish Performance Security, plus additional security for unbalanced bids in terms of ITB clause 29.5, in the form detailed in Para 34.1 of ITB for an amount of Rs.——— within 21 days of the receipt of this letter of acceptance valid upto 28 days from the date of expiry of Defects Liability Period i.e. upto ..... and sign the contract, failing which action as stated in Para 34.3 of ITB will be taken.

We have received the construction methodology submitted by you along with the bid in response to ITB clause for 4.3 (k) and our comments are given in the attachments. You are requested to submit a revised program including environmental management plan as per clause of 27 of general condition of contract with in 14 days of the receipt of this letter.

Yours faithfully,

Authorized Signature

Name and Title of Signatory

Name of Agency

- 1 Delete "corrected and" or "and modified" if only one of these actions applies. Delete "as corrected and modified in accordance with the Instructions to Bidders" if corrections or modifications have not been effected.
- 2 To be used only if the Contractor disagrees in his Bid with the Adjudicator proposed by the Employer in the "Instructions to Bidders."

# ISSUE OF NOTICE TO PROCEED WITH THE WORK

(letterhead of the Employer)

Letter No.....

Dated.....

To

.....  
.....  
.....

(name and address of the Contractor)

**Ref:**

**Dear Sirs,**

Pursuant to your furnishing the requisite security as stipulated in ITB clause 34.1 and signing of the contract agreement for the Providing Water Supply Improvement Scheme to THANJAVUR City Municipal Corporation in THANJAVUR District @ a Bid Price of Rs....., you are hereby instructed to proceed with the execution of the said works in accordance with the contract documents.

Yours faithfully,

(Name and Title of Signatory, of authorized to  
Sign on Behalf of Employer)



# AGREEMENT FORM

## Agreement

This agreement, made the..... day .of.....2015 between **The Commissioner of THANJAVUR City Municipal Corporation, , THANJAVUR District** of the one part and

.....  
.....

[name and address of contractor] (hereinafter called "the Contractor" ) of the other part.

Whereas the Employer is desirous that the Contractor execute the Replacing of distribution main, Pumping main from clear water Head works to all OHTs, Rejuvenation of of old slow sand filter bed, Replacing motor pumpsets to Thanjavur City Municipal Corporation in Thanjavur District

.....[name and identification number of Contract] (hereinafter called "the Works") and the Employer has accepted the Bid by the Contractor for the execution and completion of such Works and the remedying of any defects therein, at a contract price of Rs.....(Rupees.....)

NOW THIS AGREEMENT WITNESSETH as follows:

1. In this Agreement, words and expression shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to, and they shall be deemed to form and be read and construed as part of this Agreement.
2. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein in conformity in all aspects with the provisions of the Contract.
3. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying the defects wherein the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.
4. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz.:

- i) Letter of Acceptance;
- ii) Notice to proceed with the works;
- iii) Contractor's Bid;
- iv) Contract Data;
- v) Conditions of contract (including Special Conditions of Contract);
- vi) Specifications;
- vii) Drawings;
- viii) Bill of Quantities; and
- ix) Any other document listed in the Contract Data as forming part of the contract.

In witness whereof the parties thereto have caused this Agreement to be executed the day and year first before written.

The Common Seal of .....

was here unto affixed in the presence of:

Signed, Sealed and Delivered by the said

.....  
 .....  
 .....

In the presence of:

Binding Signature of Employer .....

Binding Signature of Contractor .....

## Excise Duty Exemption Form

(Name of the Project)

(Declaration regarding customs / excise duty exemption for materials / Construction equipment bought for the work)

(Bidder's Name and Address)

To:.....  
(Name of the Employer)

Dear Sir,

Ref : (Name of work).....

Certificate for Import / Procurement of Goods / Construction Equipment

- 1) We confirm that we are solely responsible for obtaining customs / excise duty waivers which we have considered in our bid and in case of failure to receive such waivers for reasons whatsoever, the Employer will not compensate us.
- 2) We are furnishing below the information required by the Employer for issue of the necessary certificate in terms of the Government of India Central Excise Notification No.108/95 and Customs Notification No.85/99.
- 3) The goods / construction equipment for which certificates are required are as under:

Items	Make / Brand Name	Capacity (Where applicable)	Quantity	Value	State whether it will be procured locally or imported (if so from which country)	Remarks regarding justification for the quantity and their usage in works
Goods						
(a)						
(b)						

- 4) We agree that no modification to the above list is permitted after bids are opened.
- 5) We agree that the certificate will be issued only to the extent considered reasonable by the Employer for the work, based on the Bill of Quantities and the construction programme and methodology as furnished by us long with the bid.
- 6) We confirm that the above goods will be exclusively used for the construction of the above work and construction equipment will not be sold or otherwise disposed of in any manner for a period of five years from the date of acquisition.

Date : \_\_\_\_\_

Signature \_\_\_\_\_

Place : \_\_\_\_\_

(Printed Name) \_\_\_\_\_  
(Designation) \_\_\_\_\_  
(Common Seal) \_\_\_\_\_

This certificate will be issued within 60 days of signing of contract and no subsequent change will be permitted.

**SECTION 3 :**  
**CONDITIONS OF CONTRACT**

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# CONDITIONS OF CONTRACT

## A. General

### 1. Definitions

- 1.1 Terms which are defined in the Contract Data are not also defined in the Conditions of Contract but keep their defined meanings. Capital initials are used to identify defined terms.

The **Adjudicator** is the person appointed jointly by the Employer and the Contractor to resolve disputes in the first instance, as provided for in Clauses 24 and 25. The name of the Adjudicator is defined in the Contract Data.

**Bill of Quantities** means the priced and completed **Bill of Quantities** forming part of the Bid.

**Compensation Events** are those defined in Clause 44 hereunder.

The **Completion Date** is the date of completion of the Works as certified by the Engineer in accordance with Sub Clause 55.1.

The **Contract** is the contract between the Employer and the Contractor to execute, complete and maintain the Works. It consists of the documents listed in Clause 2.3 below.

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

The **Contractor** is a person or corporate body whose Bid to carry out the Works has been accepted by the Employer.

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

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

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

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

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

The **Employer** is the party who will employ the Contractor to carry out the Works.

The **Engineer** is the person named in the Contract Data (or any other competent person appointed and notified to the contractor to act in replacement of the Engineer) who is responsible for supervising the execution of the works and administering the Contract.

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

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

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

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

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

The **Site** is the area defined as such in the Contract Data.

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

**Specification** means the Specification of the Works included in the Contract and any modification or addition made or approved by the Engineer.

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

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

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

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

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

## 2. Interpretation

- 2.1 In interpreting these Conditions of Contract, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Engineer will provide instructions clarifying queries about the Conditions of Contract.
- 2.2 If sectional completion is specified in the Contract Data, references in the Conditions of Contract to the Works, the Completion Date, and the Intended Completion Date apply to any Section of the Works (other than references to the Completion Date and Intended Completion date for the whole of the Works).
- 2.3 The documents forming the Contract shall be interpreted in the following order of priority:



- (1) Agreement
- (2) Letter of Acceptance, notice to proceed with the works
- (3) Contractor's Bid
- (4) Contract Data
- (5) Conditions of Contract including Special Conditions of Contract
- (6) Specifications
- (7) Drawings
- (8) Bill of Quantities and
- (9) any other document listed in the Contract Data as forming part of the Contract.

### **3. Language and Law**

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

### **4. Engineer's Decisions**

- 4.1** Except where otherwise specifically stated, the Engineer will decide contractual matters between the Employer and the Contractor in the role representing the Employer.

### **5. Delegation**

- 5.1** The Engineer may delegate any of his duties and responsibilities to other people except to the Adjudicator after notifying the Contractor and may cancel any delegation after notifying the Contractor.

### **6. Communications**

- 6.1** Communications between parties which are referred to in the conditions are effective only when in writing. A notice shall be effective only when it is delivered (in terms of Indian Contract Act).

### **7. Subcontracting**

- 7.1 The Contractor may subcontract with the approval of the Engineer but may not assign the Contract without the approval of the Employer in writing. Subcontracting does not alter the Contractor's obligations.

## **8. Other Contractors**

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

## **9. Personnel**

- 9.1 The Contractor shall employ the key personnel named in the Schedule of Key Personnel as referred to in the Contract Data to carry out the functions stated in the Schedule or other personnel approved by the Engineer. The Engineer will approve any proposed replacement of key personnel only if their qualifications, abilities, and relevant experience are substantially equal to or better than those of the personnel listed in the Schedule.

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

## **10. Employer's and Contractor's Risks**

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

## **11. Employer's Risks**

- 11.1 The Employer is responsible for the excepted risks which are (a) in so far as they directly affect the execution of the Works in the Employer's country, the

risks of war, hostilities, invasion, act of foreign enemies, rebellion, revolution, insurrection or military or usurped power, civil war, riot commotion or disorder (unless restricted to the Contractor's employees), and contamination from any nuclear fuel or nuclear waste or radioactive toxic explosive, or (b) a cause due solely to the design of the Works, other than the Contractor's design.

## **12. Contractor's Risks**

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

## **13. Insurance**

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

- (a) loss of or damage to the Works, Plant and Materials;
- (b) loss of or damage to Equipment;
- (c) loss of or damage of property (except the Works, Plant, Materials and Equipment) in connection with the Contract; and
- (d) personal injury or death.

**13.2** 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.

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

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

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

**14. Site Investigation Reports**

14.1 The Contractor, in preparing the Bid, shall rely on any site Investigation Reports referred to in the Contract Data, supplemented by any information available to the Bidder.

**15. Queries about the Contract Data**

15.1 The Engineer will clarify queries on the Contract Data.

**16. Contractor to Construct the Works**

16.1 The Contractor shall construct and install the Works in accordance with the Specification and Drawings and as per instruction of Engineer.

**17. The Works to Be Completed by the Intended Completion Date**

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

**18. Approval by the Engineer**

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

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

18.3 The Engineer's approval shall not alter the Contractor's responsibility for design of the Temporary Works.

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

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

## **19. Safety**

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

## **20. Discoveries**

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

## **21. Possession of the Site**

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

## **22. Access to the Site**

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

## **23. Instructions**

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

**23.2** The Contractor shall permit the bank to inspect the Contractor's accounts and records relating to the performance of the Contractor and to have them audited by auditors appointed by the Bank, if so required by the Bank.

## **24. Disputes**

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

## **25. Procedure for Disputes**

- 25.1** The Adjudicator shall give a decision in writing within 28 days of receipt of a notification of a dispute.
- 25.2** The Adjudicator shall be paid daily at the rate specified in the Contract Data together with reimbursable expenses of the types specified in the Contract Data and the cost shall be divided equally between the Employer and the Contractor, whatever decision is reached by the Adjudicator. Either party may refer a decision of the Adjudicator to an Arbitrator within 28 days of the Adjudicator's written decision. If neither party refers the dispute to arbitration within the above 28 days, the Adjudicator's decision will be final and binding.
- 25.3** The arbitration shall be conducted in accordance with the arbitration procedure stated in the Special Conditions of Contract.

## **26. Replacement of Adjudicator**

- 26.1** Should the Adjudicator resign or die, or should the Employer and the Contractor agree that the Adjudicator is not fulfilling his functions in accordance with the provisions of the Contract, a new Adjudicator will be jointly appointed by the Employer and the Contractor. In case of disagreement between the Employer and the Contractor, within 30 days, the Adjudicator shall be designated by the Appointing Authority designated in the Contract Data at the request of either party, within 14 days of receipt of such request.

## **B. TIME CONTROL**

### **27. Program**

- 27.1** Within the time stated in the Contract Data the Contractor shall submit to the Engineer for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works along with monthly cash flow forecast.
- 27.2** An update of the Program shall be a program showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work including any changes to the sequence of the activities.
- 27.3** The Contractor shall submit to the Engineer, for approval, an updated Program at intervals no longer than the period stated in the Contract Data. If the Contractor does not submit an updated Program within this period, the Engineer may withhold the amount stated in the Contract Data from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program has been submitted.
- 27.4** The Engineer's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Engineer again at any time. A revised Program is to show the effect of Variations and Compensation Events.

### **28. Extension of the Intended Completion Date**

- 28.1** The Engineer shall extend the Intended Completion Date if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date without the Contractor taking steps to accelerate the remaining work and which would cause the Contractor to incur additional cost.
- 28.2** The Engineer shall decide whether and by how much to extend the Intended Completion Date within 21 days of the Contractor asking the Engineer for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information. If the Contractor has failed to give early warning of a

delay or has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.

**29. Acceleration - Deleted**

**30. Delays Ordered by the Engineer**

- 30.1 The Engineer may instruct the Contractor to delay the start or progress of any activity within the Works.

**31. Management Meetings**

- 31.1 Either the Engineer or the Contractor may require the other to attend a management meeting. The business of a management meeting shall be to review the plans for remaining work and to deal with matters raised in accordance with the early warning procedure.
- 31.2 The Engineer shall record the business of management meetings and is to provide copies of his record to those attending the meeting and to the Employer. The responsibility of the parties for actions to be taken is to be decided by the Engineer either at the management meeting or after the management meeting and stated in writing to all who attended the meeting.

**32. Early Warning**

- 32.1 The Contractor is to warn the Engineer at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work, increase the Contract Price or delay the execution of works. The Engineer may require the Contractor to provide an estimate of the expected effect of the future event or circumstance on the Contract Price and Completion Date. The estimate is to be provided by the Contractor as soon as reasonably possible.
- 32.2 The Contractor shall cooperate with the Engineer in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Engineer.



## **C. QUALITY CONTROL**

### **33. Identifying Defects**

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

**33.2** The contractor shall permit the Employer's Technical auditor to check the contractors work and notify the Engineer and the contractor of any defects that are found. Such a check shall not affect the Contractor's or the Engineer's responsibility as defined in the Contract Agreement.

### **34. Tests**

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

### **35. Correction of Defects**

**35.1** The Engineer shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion and is defined in the Contract Data. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

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

### **36. Uncorrected Defects**

**36.1** If the Contractor has not corrected a Defect within the time specified in the Engineer's notice, the Engineer will assess the cost of having the Defect corrected, and the Contractor will pay this amount.

## **D. COST CONTROL**

### **37. Bill of Quantities**

**37.1** The Bill of Quantities shall contain items for the construction, installation, testing, and commissioning work to be done by the contractor.

**37.2** The Bill of Quantities is used to calculate the Contract Price. The Contractor is paid for the quantity of the work done at the rate in the Bill of Quantities for each item.

### **38. Changes in the Quantities**

**38.1** If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 25 percent, provided the change exceeds 1% of Initial Contract Price, the Engineer shall adjust the rate to allow for the change.

**38.2** The Engineer shall not adjust rates from changes in quantities if thereby the Initial Contract Price is exceeded by more than 15 percent, except with the Prior approval of the Employer.

**38.3** If requested by the Engineer, the Contractor shall provide the Engineer with a detailed cost breakdown of any rate in the Bill of Quantities.

### **39. Variations**

**39.1** All Variations shall be included in updated Programs produced by the Contractor.

### **40. Payments for Variations**

**40.1** The Contractor shall provide the Engineer with a quotation (with breakdown of unit rates) for carrying out the Variation when requested to do so by the Engineer. The Engineer shall assess the quotation, which shall be given within seven days of the request or within any longer period stated by the Engineer and before the Variation is ordered.

**40.2** If the work in the Variation corresponds with an item description in the Bill of Quantities and if, in the opinion of the Engineer, the quantity of work above the

limit stated in Sub Clause 38.1 or the timing of its execution do not cause the cost per unit of quantity to change, the rate in the bill of Quantities shall be used to calculate the value of the Variation. If the cost per unit of quantity changes, or if the nature or timing of the work in the Variation does not correspond with items in the Bill of Quantities, the quotation by the Contractor shall be in form of new rates for the relevant items of work.

**40.3** If the Contractor's quotation is unreasonable (or if the contractor fails to provide the Engineering with a quotation within a reasonable time specified by the Engineer in accordance with clause 40.1) , the Engineer may order the Variation and make a change to the Contract Price which shall be based on Engineer's own forecast of the effects of the Variation on the Contractor's costs.

**40.4** If the Engineer decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given and the Variation shall be treated as a Compensation Event.

**40.5** The Contractor shall not be entitled to additional payment for costs that could have been avoided by giving early warning.

**41. Cash flow forecasts**

**41.1** When the Program is updated, the contractor is to provide the Engineer with an updated cash flow forecast.

**42. Payment Certificates**

**42.1** The Contractor shall submit to the Engineer monthly statements of the estimated value of the work completed less the cumulative amount certified previously along with details measurements of the quantity of works executed in a tabulated forms as approved by the Engineer .

**42.2** The Engineer shall check the Contractor's monthly statement and within 14 days certify the amount to be paid to the Contractor after taking into account any credit or debit for the month in question in respect of materials for the works in the relevant amounts and under conditions set forth in sub-clause 51(3) of the Contract Data (Secured Advance).

**42.3** The value of work executed shall be determined by the Engineer after due check measurement of the quantities claimed as executed by the contractor.

**42.4** The value of work executed shall comprise the value of the quantities of the items in the Bill of Quantities completed..

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

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

### **43. Payments**

**43.1** Payments shall be adjusted for deductions for advance payments, retention, other recoveries in terms of the contract and taxes, at source, as applicable under the law. The Employer shall pay the Contractor the amounts certified by the Engineer within 28 days of the date of each certificate. If the Employer makes a late payment, the Contractor shall be paid interest on the late payment in the next payment. Interest shall be calculated from the date by which the payment should have been made upto the date when the late payment is made at 10% per annum.

**43.2** If an amount certified is increased in a later certificate or as a result of an award by the Adjudicator or an Arbitrator, the Contractor shall be paid interest upon the delayed payment as set out in this clause. Interest shall be calculated from the date upon which the increased amount would have been certified in the absence of dispute.

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

**43.4** All the Supply items like Valves, cables pipes, and other accessories etc., should be tested by the Third Party Agency to ensure the quality and test certificate should be obtained before payment.

**43.5** During execution of RCC works, concrete cubes should be prepared and quality should be checked in the Government Engineering Collage / Authorized Laboratories and test certificate should be obtained before payment.

#### **44. Compensation Events**

**44.1** The following are Compensation Events unless they are caused by the Contractor:

- (a) The Employer does not give access to a part of the Site by the Site Possession Date stated in the Contract Data.
- (b) The Employer modifies the schedule of other contractors in a way which affects the work of the contractor under the contract.
- (c) The Engineer orders a delay or does not issue drawings, specifications or instructions required for execution of works on time.
- (d) The Engineer instructs the Contractor to uncover or to carry out additional tests upon work which is then found to have no Defects.
- (e) The Engineer unreasonably does not approve for a subcontract to be let.
- (f) Ground conditions are substantially more adverse than could reasonably have been assumed before issuance of Letter of Acceptance from the information issued to Bidders (including the Site Investigation Reports), from information available publicly and from a visual inspection of the Site.
- (g) The Engineer gives an instruction for dealing with an unforeseen condition, caused by the Employer, or additional work required for safety or other reasons.

- (h) Other contractors, public authorities, utilities or the Employer does not work within the dates and other constraints stated in the Contract, and they cause delay or extra cost to the Contractor.
- (i) The advance payment is delayed.
- (j) The effect on the Contractor of any of the Employer's Risks.
- (k) The Engineer unreasonably delays issuing a Certificate of Completion.
- (l) Other Compensation Events listed in the Contract Data or mentioned in the Contract.

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

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

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

## **45. Tax**

**45.1** The rates quoted by the Contractor shall be deemed to be inclusive of the sales and other taxes that the Contractor will have to pay for the performance of this Contract. The Employer will perform such duties in regard to the deduction of such taxes at source as per applicable law.

## **46. Currencies**

**46.1** All payments shall be made in Indian Rupees.

## **47. Price Adjustment**

**47.1** Contract price shall be adjusted for increase or decrease in rates and price of all commodities in accordance with the following principles and procedures and as per formula given in the contract data:

- (a) The price adjustment shall apply for the work done from the start date given in the contract data upto end of the initial intended completion date or extensions granted by the Engineer and shall not apply to the work carried out beyond the stipulated time for reasons attributable to the contractor.
- (b) The price adjustment shall be determined during each quarter from the formula given in the contract data.
- (c) Following expressions and meanings are assigned to the work done during each quarter:

R = Total value of work done during the quarter. It would include the amount of secured advance for materials paid for (if any) during the quarter, less the amount of the secured advance recovered, during the quarter. It will exclude value for works executed under variations for which price adjustment will be worked separately based on the terms mutually agreed.

**47.2** To the extent that full compensation for any rise or fall in costs to the contractor is not covered by the provisions of this or other clauses in the contract, the unit rates and prices included in the contract shall be deemed to include amounts to cover the contingency of such other rise or fall in costs.

## **48. Retention**

**48.1** The Employer shall retain from each payment due to the Contractor the proportion stated in the Contract Data until Completion of the whole of the Works.

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

**48.3** On completion of the whole works, the contractor may substitute retention money (balanced half) with an “on demand” Bank guarantee.

**49. Liquidated Damages**

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

**49.2** If the Intended Completion Date is extended after liquidated damages have been paid, the Engineer shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment certificate. The Contractor shall be paid interest on the over payment calculated from the date of payment to the date of repayment at the rates specified in Sub Clause 43.1.

**50. Bonus - Deleted**

**51. Advance Payment**

**51.1** The Employer shall make Mobilization advance payment to the Contractor of the amounts stated in the Contract Data by the date stated in the Contract Data, against provision by the Contractor of an Unconditional Bank Guarantee in a form and by a bank acceptable to the Employer in amounts and currencies equal to the advance payment. The guarantee shall remain effective until the advance payment has been repaid, but the amount of the guarantee shall be progressively reduced by the amounts repaid by the Contractor. Interest will be charged on the advance payment at the rate of 10% per annum.

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



**51.3** The advance payment shall be repaid by deducting proportionate amounts from payments otherwise due to the Contractor, following the schedule of completed percentages of the Works on a payment basis. No account shall be taken of the advance (mobilization and equipment only) payment or its repayment in assessing valuations of work done, Variations, price adjustments, Compensation Events, or Liquidated Damages.

**51.4 Secured Advance:**

The Engineer shall not make advance payment in respect of materials intended for but not yet incorporated in the Works in accordance with conditions stipulated in the Contract Data.

**52. Securities**

**52.1** The Performance Security shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in an amount and form and by a bank or surety acceptable to the Employer, and denominated in Indian Rupees. The Performance Security shall be valid until a date 28 days from the date of expiry of Defects Liability Period and the additional security for unbalanced bids shall be valid until a date 28 days from the date of issue of the certificate of completion.

**53. Day works - Deleted**

**54. Cost of Repairs**

**54.1** 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.

## **E. FINISHING THE CONTRACT**

### **55. Completion**

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

### **56. Taking Over**

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

### **57. Final Account**

**57.1** The Contractor shall supply to the Engineer a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Engineer shall issue a Defect Liability Certificate and certify any final payment that is due to the Contractor within 56 days of receiving the Contractor's account if it is correct and complete. If it is not, the Engineer shall issue within 56 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Engineer shall decide on the amount payable to the Contractor and issue a payment certificate, within 56 days of receiving the Contractor's revised account.

### **58. Operating and Maintenance Manuals**

**58.1** If "as built" Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates stated in the Contract Data.

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

### **59. Termination**

**59.1** The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract.

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

- (a) the Contractor stops work for 28 days when no stoppage of work is shown on the current Program and the stoppage has not been authorized by the Engineer;
- (b) the Engineer instructs the Contractor to delay the progress of the Works and the instruction is not withdrawn within 28 days;
- (c) the Employer or the Contractor is made bankrupt or goes into liquidation other than for a reconstruction or amalgamation;
- (d) a payment certified by the Engineer is not paid by the Employer to the Contractor within 56 days of the date of the Engineer's certificate;
- (e) the Engineer gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Engineer;
- (f) the Contractor does not maintain a security which is required;
- (g) the Contractor has delayed the completion of works by the number of days for which the maximum amount of liquidated damages can be paid as defined in the Contract data; and
- (h) if the contractor, in the judgment of the purchaser has engaged in fraud and corruption, as defined in GCC clause 63, in competing for or in executing the contract.

**59.3** When either party to the Contract gives notice of a breach of contract to the Engineer for a cause other than those listed under Sub Clause 59.2 above, the Engineer shall decide whether the breach is fundamental or not.

**59.4** Notwithstanding the above, the Employer may terminate the Contract for convenience.

**59.5** 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.

## **60. Payment upon Termination**

**60.1** If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Engineer shall issue a certificate for the value of the work done less advance payments received up to the date of the issue of the certificate, less other recoveries due in terms of the contract, less taxes due to be deducted

at source as per applicable law and less the percentage to apply to the work not completed as indicated in the Contract Data. Additional Liquidated Damages shall not apply . If the total amount due to the Employer exceeds any payment due to the Contractor the difference shall be a debt payable to the Employer.

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

**61. Property**

- 61.1** All materials on the Site, Plant, Equipment, Temporary Works and Works are deemed to be the property of the Employer, if the Contract is terminated because of a Contractor's default.

**62. Release from Performance**

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

**63. Fraud and corruption**

- 63.1** The Employer requires that the Bidders as well as the Suppliers, Contractors and Consultants observe the highest standard of ethics during the procurement and execution of such contract, In pursuit of this policy, the Employer.

- (a) defines for the purposes of this provision, the terms set forth below as follows.
- 1) 'corrupt practice' means the offering, giving, receiving or soliciting, directly or indirectly of anything of value to influence the action of public official in the procurement process or in contract execution.'

- 2) 'fraudulent practice' means the misrepresentation or omission of facts in order to influence a procurement process or the execution of a contract.
  - 3) 'collusive practice' means a scheme or arrangement between two or more bidders with or without the knowledge of the borrower, designed to establish bid prices at artificial noncompetitive levels ; and
  - 4) 'coercive practice' means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the procurement process or affect the execution of a contract;
- b) will cancel the contract if it determines at any time that representatives of the contractor engaged in corrupt, fraudulent, collusive or coercive practices during the procurement or the employer to remedy the situation;
- (c) will sanction a firm or individual, including declaring them ineligible either indefinitely or for a stated period of time, to be awarded a contract if at any time to be awarded a contract if at any time determines that they have directly or through an agent, in corrupt, fraudulent, collusive or coercive practices in competing for, or in executing, a contract,; and
- (d) will have the right to require that contractor to permit the employer to inspect their accounts and records and other documents relating to the bid submission and contract performance and to have them audited by auditors appointed by the employer.

## **F. SPECIAL CONDITIONS OF CONTRACT**

### **1. LABOUR**

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

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

### **2. COMPLIANCE WITH LABOUR REGULATIONS**

During continuance of the contract, the Contractor and his sub contractors shall abide at all times by all existing labour enactments and rules made there under, regulations, notifications and bye laws of the State or Central Government or local authority and any other labour law (including rules), regulations, bye laws that may be passed or notification that may be issued under any labour law in future either by the State or the Central Government or the local authority. Salient features of some of the major labour laws that are applicable to construction industry are given below. The Contractor shall keep the Employer indemnified in case any action is taken against the Employer by the competent authority on account of contravention of any of the provisions of any Act or rules made there under, regulations or notifications including amendments. If the Employer is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications/bye laws/Acts/Rules/regulations including amendments, if any, on the part of the Contractor, the Engineer/Employer shall have the right to deduct any money due to the Contractor including his amount of performance security. The Employer/Engineer shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Employer.

The employees of the Contractor and the Sub-Contractor in no case shall be treated as the employees of the Employer at any point of time.

## **Salient features of some major labour laws applicable to establishments engaged in building and other construction work.**

- a) **Workmen Compensation Act 1923:** The Act provides for compensation in case of injury by accident arising out of and during the course of employment.
- b) **Payment of Gratuity Act 1972:** Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years service or more or on death the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.
- c) **Employees P.F. and Miscellaneous Provision Act 1952 (since amended) :** The Act Provides for monthly contributions by the employer plus workers @ 10% or 8.33%. The benefits payable under the Act are :
  - (i) Pension or family pension on retirement or death, as the case may be.
  - (ii) Deposit linked insurance on the death in harness of the worker.
  - (iii) payment of PF accumulation on retirement/death etc.
- d) **Maternity Benefit Act 1951:** The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.
- e) **Contract Labour (Regulation & Abolition) Act 1970:** The Act provides for certain welfare measures to be provided by the Contractor to contract labour and in case the Contractor fails to provide, the same are required to be provided, by the Principal Employer by Law. The Principal Employer is required to take Certificate of Registration and the Contractor is required to take license from the designated Officer. The Act is applicable to the establishments or Contractor of Principal Employer if they employ 20 or more contract labour.
- f) **Minimum Wages Act 1948:** The Employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employments.
- g) **Payment of Wages Act 1936:** It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.

- h) **Equal Remuneration Act 1979:** The Act provides for payment of equal wages for work of equal nature to Male and Female workers and for not making discrimination against Female employees in the matters of transfers, training and promotions etc.
- i) **Payment of Bonus Act 1965:** The Act is applicable to all establishments employing 20 or more employees. The Act provides for payments of annual bonus subject to a minimum of 8.33% of wages and maximum of 20% of wages to employees drawing Rs.3500/-per month or less. The bonus to be paid to employees getting Rs.2500/- per month or above upto Rs.3500/- per month shall be worked out by taking wages as Rs.2500/-per month only. The Act does not apply to certain establishments. The newly set-up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of this Act.
- j) **Industrial Disputes Act 1947:** The Act lays down the machinery and procedure for resolution of Industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.
- k) **Industrial Employment (Standing Orders) Act 1946:** It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the Employer on matters provided in the Act and get the same certified by the designated Authority.
- l) **Trade Unions Act 1926:** The Act lays down the procedure for registration of trade unions of workmen and employers. The Trade Unions registered under the Act have been given certain immunities from civil and criminal liabilities.
- m) **Child Labour (Prohibition & Regulation) Act 1986:** The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of Child Labour is prohibited in Building and Construction Industry.



- n) **Inter-State Migrant workmen's (Regulation of Employment & Conditions of Service) Act 1979:** The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The Inter-State migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home upto the establishment and back, etc.
  
- o) **The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act 1996 and the Cess Act of 1996:** All the establishments who carry on any building or other construction work and employs 10 or more workers are covered under this Act. All such establishments are required to pay cess at the rate not exceeding 2% of the cost of construction as may be modified by the Government. The Employer of the establishment is required to provide safety measures at the Building or construction work and other welfare measures, such as Canteens, First-Aid facilities, Ambulance, Housing accommodations for workers near the work place etc. The Employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.
  
- p) **Factories Act 1948:** The Act lays down the procedure for approval at plans before setting up a factory, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing 10 persons or more with aid of power or 20 or more persons without the aid of power engaged in manufacturing process.

### **3. SUB-CONTRACTING (GCC Clause 7)**

Please add the following as Clause 7.2:

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

- a) the sub-contracting of any part of the Works for which the Sub-contractor is named in the contract;
- b) the provision of labour; and

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

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

- The contractor shall not sub-contract the whole of the Works.
- The contractor shall not sub-contract any part of the Work without prior consent of the Engineer. Any such consent shall not relieve the contractor from any liability or obligations under the contract and he shall be responsible for the acts, defaults and neglects of any sub-contractor, his agents or workmen as fully as if they were the acts, defaults or neglects of the contractor, his agents or workmen.
- The Engineer should satisfy whether (a) the circumstances warrant such sub-contracting; and (b) the sub-contractors so proposed for the Work possess the experience, qualifications and equipment necessary for the job proposed to be entrusted to them in proportion to the quantum of work to be sub-contracted.
- If payments are proposed to be made directly to that sub-contractor, this should be subject to specific authorization by the prime contractor so that this arrangement does not alter the contractor's liability or obligations under the contract.

.....  
**Note:**

1. *All bidders are expected to indicate clearly in the bid, if they proposed sub-contracting elements of the works amounting to more than 20 percent of the Bid Price. For each such proposal the qualification and the experience of the identified sub-contractor in the relevant field should be furnished along with the bid to enable the employer to satisfy himself about their qualifications before agreeing for such sub-contracting and include it in the contract. In view of the above, normally no additional sub-contracting should arise during execution of the contract.*
2. *However, (a) sub contracting for certain specialized elements of the work is not unusual and acceptable for carrying out the works more effectively, but vertical splitting of the works for subcontracting is not acceptable. (b) In any case, proposal for sub-contracting in addition to*

*what was specified in bid and stated in contract agreement will not be acceptable if the value of such additional sub-contracting exceeds 25% of value of work which was to be executed by Contractor without sub-contracting.*

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

#### **4. ARBITRATION (GCC Clause 25.3)**

The procedure for arbitration will be as follows :

- 25.3 (a)** In case of Dispute or difference arising between the Employer and a domestic contractor relating to any matter arising out of or connected with this agreement, such disputes or difference shall be settled in accordance with the Arbitration and Conciliation Act, 1996.

The arbitral tribunal shall consist of 3 arbitrators one each to be appointed by the Employer and the Contractor. The third Arbitrator shall be chosen by the two Arbitrators so appointed by the Parties and shall act as Presiding arbitrator. In case of failure of the two arbitrators appointed by the parties to reach upon a consensus within a period of 30 days from the appointment of the arbitrator appointed subsequently, the Presiding Arbitrator shall be appointed by the President of the Institution of Engineers (India), Tamil Nadu chapter.

- (b)** In the case of dispute with a Foreign contractor the dispute shall be settled in accordance with provisions of UNCITRAL Arbitration Rules. The Arbitral Tribunal shall consist of three Arbitrators one each to be appointed by the Employer and the Contractor. The third Arbitrator shall be chosen by the two Arbitrators so appointed by the Parties, and shall act a presiding arbitrator. In case of failure of the two arbitrators appointed by the parties to reach upon a consensus within a period of 30 days from the appointment of the arbitrator appointed subsequently, the Presiding arbitrator shall be appointed by the President of the Institution of Engineers (India), Tamil Nadu chapter

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

- (d) Arbitration proceedings shall be held at THANJAVUR , THANJAVUR District, Tamil Nadu, India, and the language of the arbitration proceedings and that of all documents and communications between the parties shall be English.
- (e) The decision of the majority of arbitrators shall be final and binding upon both parties. The cost and expenses of Arbitration proceedings will be paid as determined by the arbitral tribunal. However, the expenses incurred by each party in connection with the preparation, presentation, etc. of its proceedings as also the fees and expenses paid to the arbitrator appointed by such party or on its behalf shall be borne by each party itself.
- (f) Where the value of the contract is Rs.50 millions and below, the disputes or differences arising shall be referred to the Sole Arbitrator. The Sole Arbitrator should be appointed by agreement between the parties; failing such agreement, by the appointing authority, namely the President of the Institution of Engineers (India), Tamil Nadu Chapter.
- (g) Performance under the contract shall continue during the arbitration proceedings and payments due to the contractor by the owners shall not be withheld, unless they are the subject matter of the arbitration proceedings.

## **5. PROTECTION OF ENVIRONMENT:**

Add the following as GCC Clause 16.2:

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

During continuance of the contract, the contractor and his sub-contractors shall abide at all times by all existing enactments on environmental protection and rules made there under, regulations, notifications and bye-laws of the State or Central Government, or local authorities and any other law, bye-law, regulations that may be passed or notification that may be issued in this respect in future by the State or Central Government or the local authority.

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

1. The Water (Prevention and Control of Pollution) Act, 1974, This provides for the prevention and control of water pollution and the maintaining and restoring of wholesomeness of water. 'Pollution' means such contamination of water or such alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may, or is likely to, create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants or of aquatic organisms.
2. The Air (Prevention and Control of Pollution) Act, 1981, This provides for prevention, control and abatement of air pollution. 'Air Pollution' means the presence in the atmosphere of any 'air pollutant', which means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment.
3. The Environment (Protection) Act, 1986, This provides for the protection and improvement of environment and for matters connected therewith, and the prevention of hazards to human beings, other living creatures, plants and property. 'Environment' includes water, air and land and the inter-relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property.
4. The Public Liability Insurance Act, 1991, This provides for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling hazardous substances and for matters connected herewith or incidental thereto. Hazardous substance means any substance or preparation which is defined as hazardous substance under the Environment (Protection) Act 1986, and exceeding such quantity as may be specified by notification by the Central Government.

*[Employers should note that the Loan Agreement between IBRD and the borrowing country may establish specific measures to be taken during construction of the Works for the protection of the environment. Sub-clause 16.2 should be modified/expanded to take into account such specific measures or other measures considered appropriate by the Employer].*

## **6. Liquidated Damages**

Sub clause 49.1

Please substitute the last sentence with the following

“Time is the essence of the contractor and payment or deduction of liquidated damages shall not relieve the contractor from his obligation to complete the work as per agreed the construction programme and milestones or form any other of the contractor’s obligation and liabilities under the contract.”

## **7. Third Party Inspection**

Tentatively third party inspection is required for following materials for Providing Water Supply Improvement Scheme to THANJAVUR CORPORATION in THANJAVUR District.

- All kinds of pipes
- All kinds of Specials
- All kinds of valves

However actual list of materials to be inspected by the third party shall be issued to the contractor after signing the agreement. The third party inspection charges will be borne by the Employer.

**SECTION 4 :**  
**CONTRACT DATA**

# CONTRACT DATA

Items marked "N/A" do not apply in this Contract.

The following documents are also part of the Contract: **Clause Reference**

- The Schedule of Operating and Maintenance Manuals [58]
- The Schedule of Other Contractors [08]
- The Schedule of Key Personnel [09]
- The Methodology and Program of Construction [27]
- The Schedule of Key and Critical equipment to be deployed on the work as per agreed program of construction [27]
- Site Investigation reports [14]

The Employer is

Name: **The Commissioner,**  
**THANJAVUR CORPORATION,**  
THANJAVUR District  
THANJAVUR 638 183 (1.1)

Address: Name of authorized Representative: **Assistant Engineer, THANJAVUR City Municipal Corporation**

The Engineer is (1.1)

Name: **Executive Engineer**  
**THANJAVUR CITY MUNICIPAL CORPORATION**  
Name of Authorized Representative: **Assistant Engineer, THANJAVUR CITY MUNICIPAL CORPORATION**

The Adjudicator appointed jointly by the Employer and Contractor is:

Name :

Address

The name and identification number of the Contract is :



Providing Water Supply Improvement Scheme to THANJAVUR City Municipal Corporation in THANJAVUR

District. (1.1)

The Works consist of the following items :

Sl. No.	Description of Work	Quantity
1.	Replacing / Providing new Distribution main line	46500m
2.	Construction of 1.50 lakhs litre capacity OHT	1 No
3.	Construction of 5.00 lakhs litre capacity OHT	4 Nos
4.	Construction of 7.50 lakhs litre capacity OHT	2 Nos.
5.	Replacing new feeder main from clear water Head works to all OHTs	26950 m

The Start date shall be the date of issue of notice to proceed with the work (1.1)

The Intended Completion Date for the whole of the Works is – **18 Months from the Start date** with the following milestones:

Sl. No.	Description of work	Mile Stone I (6 months)	Mile Stone II (12 months)	Mile Stone III (18 months)
1	Replacing / Providing new Distribution main line	9.30 Km	27.90 Km	46.50 Km
2	Construction of 5.00 lakhs litre capacity OHT	25%	75%	100%
3	Construction of 5.00 lakhs litre capacity OHT	25%	75%	100%
4	Construction of 5.00 lakhs litre capacity OHT	25%	75%	100%
5	Replacing new feeder main from clear water Head works to all	5.39 Km	16.17 Km	26.95 Km
6	Providing SCADA system	-	-	100%
7	Installation of Electro Chlorinator Water Disinfectant Equipment	-	-	100%
8	Testing, Commissioning & Trial run	-	-	100%

Note :

The following documents also form part of the Contract: [2.3]

Detailed work plan & methodology including environmental management plan.

The Contractor shall submit a revised program including Environmental Management plan for the works (in such form and detail as the Engineer shall reasonably prescribe) within Fourteen days of delivery of the Letter of Acceptance (refer to last para of letter of acceptance) (27)

*[This program should be in adequate detail and generally conform to the program submitted along with bid in response to ITB Clause 4.3 (k). Deviations if any from that should be clearly explained and should be satisfactory to the Engineer]*

The Site of Possession Dates shall be : The date of issue of notice to proceed with the work

The Site is located at THANJAVUR and is defined in drawings enclosed (1)

The Defects Liability Period is two years from the date of certification of completion of works (where sectional completion certificate is issued this will apply from those dates for those sections) (35)

Insurance requirements are as under (13)

Sl. No.	Description	Minimum Cover for Insurance	Maximum deductible for Insurance
(i)	Works and Plant and Materials	Rs.4569.00 Lakhs	10% of claim amount
(ii)	Loss or damage to Equipment	Rs.50.00 Lakhs	10% of claim amount
(iii)	Other Property	Rs.50.00 Lakhs	10% of claim amount
(iv)	Personal injury or death insurance: a) for other people; b) for Contractor's Employees	Rs.35.00 Lakhs  In accordance with the statutory requirements applicable to India	No deduction

The following events shall also be Compensation Events: **None** [44]

The period between Program updates shall be 15 days [27]

The amount to be withheld for late submission of an updated Program shall be **Rs.5,00,000/-** [27]

The language of the Contract documents is English [03]

The law which applies to the Contract is the laws of Union of India [03]

The currency of the Contract is Indian Rupees. [46]

Fees and types of reimbursable expenses to be paid to the Adjudicator:[25]

Rs. 5,000/- per day + Boarding , Lodging and conveyance as per actual. [25]

Appointing Authority for the Adjudicator: President of Institution of Engineers (India) Tamil Nadu Chapter, Chennai. [26]

The formula(e) for adjustment of prices are:

[47]

R = Value of work as defined in Clause 47.1 of Conditions of Contract.

### **Adjustment for labour component**

- (i) Price adjustment for increase or decrease in the cost due to labour shall be paid in accordance with the following formula:

$$V_L = 0.85 \times P_l/100 \times R \times (L_i - L_o)/L_o$$

$V_L$  = increase or decrease in the cost of work during the quarter under consideration due to changes in rates for local labour.

$L_o$  = the average consumer price index for industrial workers for THANJAVUR centre for the quarter preceding the date of opening of Bids as published by Labour Bureau, Ministry of Labour, Government of India.

$L_i$  = The average consumer price index for industrial workers for THANJAVUR centre for the quarter under consideration as published by Labour Bureau, Ministry of Labour, Government of India.

$P_l$  = Percentage of labour component of the work.

### **Adjustment for cement component**

- (ii) Price adjustment for increase or decrease in the cost of cement procured by the contractor shall be paid in accordance with the following formula.

$$V_c = 0.85 \times P_c/100 \times R \times (C_i - C_o)/C_o$$

$V_c$  = Increase or decrease in the cost of work during the quarter under consideration due to changes in the rates for cement

$C_o$  = The all India average wholesale price index for cement for the quarter preceding the date of opening of Bids as published by the Ministry of Industrial Development, Government of India, New Delhi

$C_i$  = The all India average wholesale price index for cement for the quarter under consideration as published by Ministry of Industrial Development, Government of India, New Delhi

$P_c$  = Percentage of cement component of the work

### **Adjustment for steel component**

- (iii) Price adjustment for increase or decrease in the cost of steel procured by the Contractor shall be paid in accordance with the following formula:

$$V_s = 0.85 \times P_s / 100 \times R \times (S_i - S_o) / S_o$$

$V_s$  = Increase or decrease in the cost of work during the quarter under consideration due to changes in the rates for steel

$S_o$  = The all India average wholesale price index for steel (Bars and Rods) for the quarter preceding the date of opening of Bids as published by the Ministry of Industrial Development, Government of India, New Delhi

$S_i$  = The all India average wholesale price index for steel (Bars and Rods) for the quarter under consideration as published by Ministry of Industrial Development, New Delhi

$P_s$  = Percentage of steel component of the work

Note: For the application of this clause, index of Bars and Rods has been chosen to represent steel group.

### **Adjustment for POL (fuel and lubricant) component**

- (v) Price adjustment for increase or decrease in cost POL (fuel and lubricant) shall be paid in accordance with the following formula :

$$V_r = 0.85 \times P_f / 100 \times R \times (F_i - F_o) / F_o$$

$V_f$  = Increase or decrease in the cost of work during the quarter under consideration due to changes in rates for fuel and lubricants.

$F_o$  = The average official retail price of High Speed Diesel (HSD) at the existing consumer pumps of IOC at Chennai on the day thirty days prior to the date of opening of Bids.

$F_i$  = The average official retail price of HSD at the existing consumer pumps of IOC at ..... for the 15<sup>th</sup> day of the middle calendar month of the quarter under consideration.

$P_f$  = Percentage of fuel and lubricants component of the work.

Note : For the application of this clause, the price of High Speed Diesel oil has been chosen to represent fuel and lubricants group.

### **Adjustment for Plant and Machinery Spares component**

- (vi) Price adjustment for increase or decrease in the cost of plant and machinery spares procured by the Contractor shall be paid in accordance with the following formula:

$$V_p = 0.85 \times P_p / 100 \times R \times (P_i - P_o) / P_o$$

$V_p$  = Increase or decrease in the cost of work during the quarter under consideration due to changes in the rates for plant and machinery spares

$P_o$  = The all India average wholesale price index for heavy machinery and parts for the quarter preceding the date of opening of Bids as published by the Ministry of Industrial Development, Government of India, New Delhi

$P_i$  = The all India average wholesale price index for heavy machinery and parts for the quarter under consideration as published by Ministry of Industrial Development, New Delhi

$P_p$  = Percentage of plant and machinery spares component of the work

Note: For the application of this clause, index of Heavy Machinery and Parts has been chosen to represent the Plant and Machinery Spares group.

### **Adjustment for Pig Iron component (DI) pipes and specials**

- (vii) Price adjustment for increase or decrease in the cost of Pig Iron shall be paid in accordance with the following formula:

$$V_D = 0.85 \times (P_D / 100) \times R \times (D_i - D_o) / D_o$$

$V_D$  = Increase or decrease in the cost of work during the quarter under consideration due to changes in the rates for Pig Iron

$D_o$  = The all India average wholesale price index for Pig Iron for the quarter as published by the Ministry of Industrial Development, Government of India, New Delhi

$D_i$  = The all India average wholesale price index for Pig Iron for the quarter under consideration as published by Ministry of Industrial Development, New Delhi

$P_D$  = Percentage of Pig Iron component of the work

## Adjustment of Local materials

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

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

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

$M_o$  = The all India average wholesale price index (all commodities) for the quarter preceding the date of opening of Bids, as published by the Ministry of Industrial Development, Government of India, New Delhi.

$M_i$  = The all India average wholesale price index (all commodities) for the quarter under consideration as published by Ministry of Industrial Development, Government of India, New Delhi.

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

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

1. Labour - $P_l$	10 %
2. Cement - $P_c$	5 %
3. Steel - $P_s$	20 %
4. Bitumen - $P_b$	0 %
5. POL - $P_f$	1 %
6. Plant & Machinery Spares - $P_p$	1 %
7. Pipes - $P_D$	1 %
8. Other materials - $P_m$	62 %
<b>Total</b>	<b>100 %</b>

The proportion of payments retained (retention money) shall be 6% from each bill subject to a maximum of 5% of final contract price [48]

The liquidated damages for the whole of the works are **Rs.57,500/-** per day and that for the milestone are as under : [49]

For milestone 1                    **Rs. 7,500 per day**  
 For milestone 2                    **Rs. 15,000 per day**  
 For milestone 3                    **Rs. 35,000 per day**

The maximum amount of liquidated damages for the whole of the works is ten percent of final contract price. [49]

The amounts of the advance payment are: [51]

Nature of Advance	Amount (Rs.)	Conditions to be fulfilled
1. Mobilization	5% of the Contract price	On submission of un-conditional Bank Guarantee. (to be drawn before end of 20% of Contract period)
2. Equipment	- Nil -	

(The advance payment will be paid to the Contractor not later than 15 days after fulfillment of the above conditions).

Repayment of advance payment for mobilization and equipment [51]

The advance loan shall be repaid with percentage deductions from the interim payments certified by the Engineer under the Contract. Deductions shall commence in the next Interim Payment Certificate following that in which the total of all such payments to the Contractor has reached not less than 15 percent of the Contract Price or 2 months from the date of payment of first installment of advance, whichever period concludes earlier, and shall be made at the rate of 15 percent of the amounts of all Interim Payment Certificates until such time as the loan has been repaid, always provided that the loan shall be completely repaid prior to the expiry of the original time for completion pursuant to Clauses 17 and 28.

**Repayment of secured advance:**

The advance shall be repaid from each succeeding monthly payments to the extent materials [for which advance was previously paid pursuant to Clause 51.4 of G.C.C. and 51(3) of Contract Data on pre page] have been incorporated into the Works.

The Securities shall be for the following minimum amounts equivalent as a percentage of the Contract Price: [52]

Performance Security for 2 per cent of contract price plus Rs. .... as additional security in terms of ITB Clause 29.5.

The standard form of Performance Security acceptable to the Employer shall be an **unconditional** Bank Guarantee of the type as presented in Section 8 of the Bidding Documents.

The date by which operating and maintenance manuals are required is within 28 days of issue of certificate of completion of whole or section of the work, as the case may be. [58]

The date by which "as-built" drawings (in appropriate scale) in 5 sets including soft copies are required is within 28 days of issue of certificate of completion of whole or section of the work, as the case may be. [58]

The amount to be withheld for failing to supply "as built" drawings and/or operating and maintenance manuals \*by the date required is Rs.10,00,000/ [58]

The following events shall also be fundamental breach of contract:[59.2]

1. The Contractor has contravened Sub-clause 7.1 and Clause 9.0 of GCC.
2. The contractor does not adhere to the agreed construction program (Clause 27 of GCC) and also fails to take satisfactory remedial action as per agreements reached in the management meetings (Clause 31) for a period of 60 days.
3. The contractor fails to carry out of the instruction of the Engineer within a reasonable time determined by the Engineer in accordance with GCC clause 16.1 and 23.1

The percentage to apply to the value of the work not completed representing the Employer's additional cost for completing the Works shall be 20 percent. [60]



**SECTION 8:  
FORMS OF SECURITIES**

## Forms of Securities

Acceptable forms of securities are annexed. Bidders should not complete the Performance and Advance Payment Security forms at this time. Only the successful Bidder will be required to provide Performance and Advance Payment Securities in accordance with one of the forms, or in a similar form acceptable to the Employer.

**Annex A:** Bid Security (Bank Guarantee)

**Annex B:** Performance Bank Guarantee

**Annex B1:** Performance Bank Guarantee for Unbalanced Items

**Annex C:** Deleted

**Annex D:** Bank Guarantee for Advance Payment

## Annex A

### BID SECURITY (BANK GUARANTEE)

**WHEREAS**, ..... *[name of Bidder]* (hereinafter called "the Bidder") has submitted his Bid dated ..... for Providing Water Supply Improvement Scheme to THANJAVUR City Municipal Corporation in THANJAVUR

District.....*[name of Contract]* (hereinafter called "the Bid").

**KNOW ALL PEOPLE** by these presents that We ..... *[name of bank]* of ..... *[name of country]* having our registered office at ..... (hereinafter called "the Bank") are bound unto **The Commissioner, THANJAVUR City Municipal Corporation** *[name of Employer]*

(hereinafter called "the Employer") in the sum of .....<sup>1</sup> 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 ..... 2014

**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 27;

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 .....<sup>2</sup> 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.

## PERFORMANCE BANK GUARANTEE

To:

The Commissioner,  
THANJAVUR CITY MUNICIPAL  
CORPORATION,  
THANJAVUR ,  
THANJAVUR District,  
Tamil Nadu.

**WHEREAS** *[name and address of Contractor]* (hereinafter called "the Contractor") has undertaken, in pursuance of Contract No. .... dated ..... to execute the Providing Water Supply Improvement Scheme to THANJAVUR City Municipal Corporation in THANJAVUR District  
.....  
.....*[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 we have agreed to give the Contractor such a Bank Guarantee;

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]* .....*[in words]*, such sum being payable in the types and proportions of currencies in which the Contract Price is payable, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of .....*[amount of guarantee]*<sup>1</sup> as aforesaid without your 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 Contract or of the Works to be performed there under or of any of the Contract documents which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall be valid until ..... (i.e.) 28 days from the date of expiry of the Defects Liability Period.

Signature and seal of the guarantor .....  
Name of Bank .....  
Address .....  
Date .....

.....  
An amount shall be inserted by the Guarantor, representing the percentage of the Contract Price specified in the Contract and denominated in Indian Rupees.

# PERFORMANCE BANK GUARANTEE

(for unbalanced items)

To:

**The Commissioner,**  
THANJAVUR  
CORPORATION,  
THANJAVUR ,  
THANJAVUR District,  
Tamil Nadu.

**WHEREAS** ..... *[name and address of Contractor]* (hereinafter called "the Contractor") has undertaken, in pursuance of Contract No..... dated .....to execute Providing Water Supply Improvement Scheme to THANJAVUR CORPORATION in THANJAVUR District

.....  
.....*[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** we have agreed to give the Contractor such a Bank Guarantee;

**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]* ..... *[in words]*, such sum being payable in the types and proportions of currencies in which the Contract Price is payable, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of .....*[amount of guarantee]*<sup>1</sup> as aforesaid without your 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 Contract or of the Works to be performed there under or of any of the Contract documents

which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

**This guarantee** shall be valid until ..... (i.e.) 28 days from the date of issue of the certificate of completion of works.

Signature and seal of the guarantor .....

Name of Bank .....

Address .....

Date .....

.....

- 1 An amount shall be inserted by the Guarantor, representing additional security for unbalanced Bids, if any and denominated in Indian Rupees.

# BANK GUARANTEE FOR ADVANCE PAYMENT

To:  
**The Commissioner,**  
THANJAVUR  
CORPORATION,  
THANJAVUR  
Tamil Nadu.

-----*[name of Contract]*

Gentlemen:

In accordance with the provisions of the Conditions of Contract, sub clause 51.1 ("Advance Payment") of the above-mentioned Contract, \_\_\_\_\_*[name and address of Contractor]* (hereinafter called "the Contractor") shall deposit with Commissioner, THANJAVUR City Municipal Corporation *[name of Employer]* a bank guarantee to guarantee his proper and faithful performance under the said Clause of the Contract in an amount of \_\_\_\_\_*[amount of guarantee]* <sup>1</sup> \_\_\_\_\_*[in words]*.

We, the \_\_\_\_\_ *[bank or financial institution]*, as instructed by the Contractor, agree unconditionally and irrevocably to guarantee as primary obligator and not as Surety merely, the payment to \_\_\_\_\_*[name of Employer]* on his first demand without whatsoever right of objection on our part and without his first claim to the Contractor, in the amount not exceeding \_\_\_\_\_<sup>1</sup> *[amount of guarantee]* \_\_\_\_\_*[in words]*.

We further agree that no change or addition to or other modification of the terms of the Contract or of Works to be performed there under or of any of the Contract documents which may be made between Commissioner, THANJAVUR City Municipal Corporation \_\_\_\_\_*[name of Employer]* and the Contractor, shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall remain valid and in full effect from the date of the advance payment under the Contract until **The Commissioner, THANJAVUR City Municipal Corporation** [*name of Employer*] receives full repayment of the same amount from the Contractor.

Yours truly,

Signature and seal: \_\_\_\_\_

Name of Bank/Financial Institution: \_\_\_\_\_

Address: \_\_\_\_\_

Date: \_\_\_\_\_

- 
- 1 An amount shall be inserted by the bank representing the amount of the Advance Payment, and denominated in Indian Rupees.

**GOVERNMENT OF TAMIL NADU**

**THANJAVUR CORPORATION**

**BID DOCUMENT**

**PROVIDING WATER SUPPLY IMPROVEMENT SCHEME TO  
THANJAVUR CORPORATION IN THANJAVUR DISTRICT**

**PART A**

**Volume – II**

**SECTION 5: TECHNICAL SPECIFICATIONS**

**Name of Work :-** Providing Water Supply Improvement Scheme to THANJAVUR CORPORATION in THANJAVUR District.

**Estimate Amount :-** Rs.45.69 Crore.

## **SECTION 5: TECHNICAL SPECIFICATIONS**

### **SPECIFICATIONS**

#### **Content s**

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## TECHNICAL SPECIFICATIONS

### CHAPTER 1

#### SPECIAL SERVICE TO BE PROVIDED BY THE CONTRACTOR

##### 1.0 SPECIAL SERVICES TO BE PROVIDED BY CONTRACTOR

The following services are to be provided by Contractor during the entire period of the Contract. These items are not included separately in the Bill of quantities but the cost of providing these services are deemed to be included in the pay items of the Bill of Quantities

##### 1.1 Surveying Equipment

1.1.1 The Contractor shall provide at the site, at his own expense, two approved sets of surveying and measuring equipment. The sets shall be used by the Contractor for requirement at site and also shall be made available from the commencement of contract for the use of the Engineer's Representative. The set shall consist of the following instruments:

###### ITEMS QUANTITY

- a) Total Station 2
- b) Pogo with Reflector 4
- c) Big Tripod 2
- d) Small Tripod 2
- e) Fiber glass tape (cased 30m) 4
- f) Steel Pocket tape, 3 6
- g) Surveying Umbrellas 2
- h) Ranging Poles, 2.5m long 10
- i) Level books – as required
- j) Field books – as required

1.1.2 All equipment shall be supplied with their tripods, staff and such other equipment/item as the Engineer's Representative may require for the measuring, or setting -out of the work.

1.1.3 The Contractor shall be solely responsible for the maintenance of all such instruments and equipment and shall ensure they are, at all times, in good repair and adjustment. All equipment other than expendable items shall revert to the Contractor upon completion of the works.

- 1.1.4 The Contractor shall provide the Engineer, throughout the Contract period, with all necessary surveyors and survey assistants to assist with surveying work. The assistant shall keep the survey equipment in good order.
- 1.1.5 There is no pay item for provision of survey equipment or survey support. Payment for the provision of surveying instrument and support service is deemed to be included in the rates for other pay items of the bill of quantities.
- 1.1.6 The Telemetry system and their components should be verified by the third party qualified concerned before making payment by the ULB.

## **1.2 Laboratory Testing and Laboratory**

### **1.2.1 Description**

Testing of materials for items such as embankment and concrete structures shall be carried out by a site laboratory established and allocated exclusively for that purpose; all testing shall be carried out under the direction and supervision of the Engineer's staff.

All tests shall be performed in strict accordance with the appropriate Indian Standards or other standards as approved by the Engineer.

- 1.2.2. The Laboratory shall be adequately staffed by the contractor with materials technicians and assistants in the numbers deemed necessary by the Engineer so that no interruption of unnecessary delay shall occur to construction activities due to delays in sampling or testing, in-site or in the laboratory, as required by the Contract. The testing equipment provided in the laboratory shall be sufficient to carry out the following tests:

- a) Crushing strength of 150mm size concrete cubes.
- b) Sieve analysis

- 1.2.3 Alternatively the contractor can get the testing done in an approved laboratory as agreed to by the Engineer. If in case the tests are to be done in an approved laboratory, such an approval shall be obtained from the Engineer within 15 days of commencement of Contract.
- 1.2.4 Any testing relating to the Works as required by the Engineer which cannot be carried out in the site laboratory or in the approved external laboratory shall be carried out at the Contractor's expense, at an independent laboratory approved by the Engineer.
- 1.2.5 The provision of laboratory facilities on site, as specified, shall in no way relieve Contractor of the responsibility for providing additional laboratory space and testing equipment as necessary in order to control materials at mixing plants and elsewhere and enable him to fulfill his obligations under the Contract.



### **Laboratory Building**

- 1.2.6 The Contractor shall provide, furnish, equip, keep clean and maintain to the satisfaction of the Engineer, a laboratory building of a floor area sufficient to accommodate all the testing requirements. The building shall be provided with electrical power, potable water, drainage, and shall have adequate daylight and artificial lighting.

The Contractor shall, at the Commencement of the Contract, submit a detailed list of the equipment he is proposing to provide showing for each item its type and model, serial number, manufacturer's name and year of manufacture for the Engineer's approval.

The testing of the works by the Engineer, in no way, absolves the Contractor from his responsibilities to carry out his own testing of the quality of his works and the materials used.

The laboratory building and equipment shall be used exclusively for the purposes for which they are intended and shall, together with all equipment, all samples and records, be open to inspection by the Engineer during all working hours.

The contractor has to make his own arrangements for locating the laboratory in an appropriate site near the work area.

### **Contractor's Senior Materials Technician**

- 1.2.7 The Contractor shall provide a full-time senior materials technician to be responsible for the day-to-day activities of the laboratory and for site testing. He shall be directly and solely responsible to the Engineer or designated members of his staff.

The senior materials technician shall have not less than ten years experience of the testing of earthworks and of concrete for structures, and shall be fully conversant with the testing of materials as per latest Indian Standards. The experience and qualifications of the senior materials technician shall be to the approval of the Engineer.

### **Sample**

- 1.2.8 The Contractor shall submit samples of all materials and goods for inclusion in the works to the Engineer and only those approved by the Engineer and to the standards specified elsewhere in the Contract may be ordered for supply. Samples shall be submitted promptly in order not to delay the works.

All work executed shall be of equal standard in all respects to the approved samples and the Engineer may reject any work which, in his opinion, does not comply with the approved samples.

### **1.2.9 Payment**

There is no pay item for provision of establishment of testing laboratory or testing of materials. Payment for the provision of surveying instrument and support service is deemed to be included in the rates for other pay items of the bill of quantities

### **1.3 Site surveys, Setting out and detailing**

#### **1.3.1 Description**

The Contractor shall be responsible for the true and proper setting-out of the works in relation to the lines and levels of reference given by the Engineer in Charge or shown on the Drawings and for the correctness of the position, levels, dimensions and alignment of all parts of the works and for the provision of all necessary instruments, appliances and labour used in connection therewith.

He shall carry out a detailed route alignment survey of the site in advance of his commencement of Construction work, and shall supply full details to the Engineer as specified in the following sub clauses of Technical Specifications.

All setting out and levelling shall be based on permanent Benchmarks provided by the Employer.

#### **1.3.2 Existing levels and Layouts**

1.3.2.1 Before commencing operations of any section of the works, the Contractor shall survey all existing detail in that section, in plan and in level and shall plot the results in such detail and to such scales as shall be to the satisfaction of the Engineer. These survey plots shall be supplied to the Engineer at least four weeks before the intended commencement of construction on the section. Unless otherwise instructed by the Engineer the detailed survey plots will be supplied in 1:200 scale both as soft and hard copy.

1.3.2.2 In addition to the above mentioned requirements above, horizontal control lines shall be marked out by pegs at intervals of not more than 20m and the lines traversed with total station, by steel band or by any other method acceptable to the Engineer. The alignments established shall be referenced by pegs offset at suitable distance on each side of the horizontal control lines. These offset pegs shall be painted in a conspicuous colour.

1.3.2.3 Cross sections of the existing ground and of the ground after completion of earthworks shall be taken at intervals not exceeding 20m along the horizontal control lines in an approved and acceptable manner.

### **1.3.3 Bench Marks, Survey Points and Deliverables**

1.3.3.1 As the work proceeds, the Contractor shall establish, at suitable location, substantial permanent benchmarks, clear of the works, from which, all subsequent setting out and levelling shall be carried out. The location of the benchmarks shall be agreed with the Engineer before they are established.

Benchmarks shall be constructed in class 20/20 concrete, with minimum dimensions of 0.3x0.3m, the upper surface being approximately 50mm above ground level. 20mm diameter mild steel rod, not less than 300mm in length, shall be cast into the concrete so that it projects about 10mm above the centre of the surface of the concrete. The concrete surface shall be clearly engraved with the reference number of the benchmark. The co-ordinates and level of each benchmark shall be determined in metres to 3 decimal places.

Plan of the road showing the location of the proposed water main alignment, the width of right of way of roads on both sides of the carriageway, the existing services and obstructions to proposed pipelines and edges of existing asphalt carriageway. The drawing shall clearly indicate the location of the plot boundary walls wherever available. The existing services, as determined by site excavation, should also be marked up on these plans. The Contractor shall check co-ordinates and levels of benchmarks at monthly intervals and immediately notify the Engineer of any discrepancies.

1.3.3.2 The cost of alignment survey as explained above shall be included in the quoted items.

### **Technical Specifications**

#### **1.3.4 Working and Shop Drawings**

##### **1.3.4.1 General**

The Contractor is advised to note that the following requirements are part of the Contract and he will not have any right to claim at any time for delays or for expenditure incurred by him in fulfilling the same.

##### **1.3.4.2 Tender Drawings**

The drawings are prepared in such detail as are necessary to give a comprehensive idea of the works. These drawings may be, to suit the site requirements clarified subsequent to the tender, modified, expanded or replaced subsequent to opening of tender. The Drawings if stands finalized at the time of executing the agreement, together with additional drawings and / or modified drawings, signed and made part of the contract will be called Construction drawings for the Contract. Any questions or alterations affecting the requirements or information on the Contract Drawings shall be submitted in writing to the Engineer and shall be reviewed by the Engineer. The lines indicated on the Construction Drawings denoting locations of the existing utilities or services are approximate locations. The Contractor is not to assume that they are exact. He has to confirm the exact location of the utilities in consultation with the relevant authorities.

1.3.4.3 The locations, layout and scope of works may be altered and in such cases the Contractor shall not be entitled to any claim whatsoever for such alterations over and above the measured works or measured variations at the tendered rates except in accordance with the provisions of relevant Clauses of the Conditions of Contract.

#### **1.3.4.4 Working drawings**

The Construction Drawings shall be supplemented by working drawings or shop drawings prepared by the Contractor which are required for the execution of the works. These working drawings shall include, pipe laying details, electrical single line drawings to suit the contractor's submission, mechanical drawings, piping drawings, reinforcement details such as bar bending schedules, manhole schedules, setting out details, layouts, utility relocation and protection if any required, and any other detail the Engineer may ask during construction. Schedules shall be drawn up for each pipeline with the details of depth, levels of pipes, and benching details. The working drawings/shop drawings and documents, including diagrams and schedules shall show the details of proposals for the execution of the works at specific chainages and shall include every information necessary for the following purposes:

- To illustrate in detail the arrangement of the various section of the works and to identify the various components.
- To integrate the various sections of the works
- All drawings shall be computerized and shall be submitted both in hard copy as well as digital data.

The costs of furnishing working drawings shall be included in the rates for various paying items given in the Bill of Quantities. Working drawings and documents shall be made available in sufficient time in order to maintain the Programme of Work on site. The Contractor shall also provide as part of the mobilization to site, latest model Pentium Computers and software together with new colour printer, for the preparation of his working Drawings by his staff. The Engineer shall have access to this Computer. In case the Contractor fails to mobilize such staff and equipment as described above to site, the Employer reserves the right to mobilize the necessary staff and deduct the cost of such mobilization from any money due to the Contractor.

#### **1.3.4.5 Approvals of working drawings and Materials**

The Contractor shall liaise with the Engineer for the period required for any approval, which shall be a maximum of two weeks. The Contractor shall ensure that all items to be ordered by him can be accommodated in the positions shown on the drawings and for taking all necessary dimensions on site together with any supporting information which may be necessary for preparing working drawings.

No materials or equipment shall be ordered nor construction of the associated works be commenced until such approval has been obtained from the Engineer. The Contractor shall be deemed to have obtained a full and proper understanding of the Engineer's design and design intents and to have satisfied himself with their accuracy and suitability. In this respect, the Engineer will meet all reasonable requests made by the Contractor in furnishing design information to the Contractor. No claim in respect of lack of knowledge will be admissible.

#### **1.4 Soil Investigation and Report**

1.4.1 A soil investigation has been undertaken during the Design phase. However in case additional investigations are required during the course of construction the Contractor shall be advised of such requirement and the Contractor shall promptly carry out such investigations as advised by the Engineer.

#### **1.5 Site Safety**

##### **1.5.1 Safety of General Public/Utilities**

In order to improve the general vehicular traffic condition and to guarantee public safety from and around the work the Contractor shall provide all labour, and materials, and construct and maintain temporary traffic diversions throughout the construction activities, to the directive and approval of the Engineer. It is therefore recognised that there is a particular responsibility placed upon the Contractor to take special precautions for public safety and to minimize the scale and extent of disruption to public and commercial life. Plans for traffic diversion shall always be submitted to the Engineer and to the traffic police for their prior approval.

##### **1.5.2 Safety on Site**

The Contractor shall ensure that the works are carried out in a safe manner according to internationally accepted guidelines on safe working procedures and to the satisfaction of the Engineer. The following requirements shall be complied with by the Contractor:

a) **Excavation** - All excavations shall be adequately supported to avoid collapses and effective safety barriers shall be erected with warning signs and devices around all open excavations to the satisfaction of the Engineer.

Struts and walling shall not be used as ladders and for the purpose of access to the base of excavation the Contractor shall provide proper ladders which shall be suitably secured. Reflective overalls shall be worn by all workmen on or close to a road and, here necessary, temporary road signs and cones shall be provided to ensure a safe working area. While excavating along the road reserve, sufficiently strong and wide timber bridges shall be provided for pedestrian crossings. As far as possible the excavations in front of entrances shall be backfilled the same day. Sufficient written notice shall be given to the residents who may be affected by the excavation.

**b) Protective Clothing** - The Contractor shall ensure that all personnel on site are supplied with the necessary protective clothing such as safety helmets, goggles, face masks, ear muffs, gloves, boots, depending on the operations being performed.

**c) Scaffolding** - Suitable and sufficient scaffolds shall be provided and properly maintained for all work that cannot safely be carried out from the ground or from part of the structure or from a ladder. Every scaffold shall be of good construction, of suitable and sound material and of adequate strength for the purpose for which it is used. Unless designed as an independent structure, every scaffold shall be rigidly connected to a part of the structure which is of sufficient strength to afford safe support. Protective headgear shall always be worn.

**d) Lifting Device** - Every rope, chain, pulley, bloc, hook, winch, crane or other lifting gear used for raising or lowering pipes or as a means of suspending them shall be of good construction, sound material, adequate strength and free from defects. They shall be properly maintained and tested at regular intervals by a competent person, who shall be to the approval of the Engineer.

**e) Working in existing pipelines etc.:** Checks shall be carried out before entry to ensure that the atmosphere is fit for respiration and no smoking naked lights or flames are to be permitted in any pipeline or chambers or in their vicinity when these are open.

The equipment which shall be made available shall include but not limited to:

- a) Gas detector lamps with lead acetate papers.
- b) Lifting harness with ropes
- c) Hand lamps with spare batteries
- d) First aid kit.
- e) Protective head gear.
- f) Rubber Gloves.
- g) Breathing apparatus.

1.5.3 Throughout the period of the Contract, the Contractor shall provide safety helmets and high reflectivity jackets to all employer's staff and visitors. Barriers must be provided to all excavations for the safety of the public and flagmen must be used for all items of plant for the safety of the operatives, supervision staff and members of the public.

## **1.6 Traffic Management**

Before commencing the works, the Contractor shall consult with and obtain from the Traffic Police, Employer and the Engineer their requirements for temporary traffic signs, road markings, lighting and other measures necessary to ensure the safety of the public, and shall comply with these requirements, though such compliance alone will not relieve the Contractor of his obligations under the Contract. The Contractor shall also take a No Objection Certificate from Consultants supervising other Contracts in the area, get details of newly installed and temporary services and obtain access requirements for other contractors.

The Contractor shall deploy a safety officer, as a full time member of his site staff for the duration of the contract, whose duties shall include the production and implementation of traffic management schemes and the safety of vehicular and pedestrian traffic. Qualification and experience of the safety officer (traffic management staff) shall be subject to the approval of the Engineer.

Throughout the Contract, the Contractor shall maintain vehicular and pedestrian access to all properties adjacent to and within the site at all time. The contractor is solely responsible for obtaining the necessary permissions and approvals from the Traffic Police, service authorities and all other concerned authorities for the diversions and closure of sections of the existing roads and footpaths. Details of all proposed traffic management schemes shall be prepared well in advance of their intended implementation and shall be submitted to the Engineer and to other interested parties for approval.

Approval by the Engineer of a scheme will not relieve the Contractor of his responsibility to gain approval from the Traffic Police or other concerned authorities. Ignorance of any restrictions as to the timing and /or placing of diversions imposed by the Traffic Police or other authorities will not be accepted as a basis for claims for additional costs or delays arising from such restrictions.

Adequate warning and direction signs are to be erected wherever necessary and as advised by Traffic Police and diversions are to be maintained in good condition to the satisfaction of the Engineer.

Temporary diversions shall be constructed and maintained to the standards approved by both the Traffic Police and the Engineer. Upon completion of the Permanent works, the temporary diversions shall be removed and the site restored to the satisfaction of the Engineer.

The Contractor shall arrange with the appropriate authorities for any additional land required for temporary diversions. All traffic diversions must be constructed and maintained to the highest standards with regular washing of cones and daily maintenance of flashing lights. The signs and cones should be self-stabilising, and if extra stability is required, only small sandbags with reflective painting should be used.

All stockpiles of material to be used in the works must be fenced off and all unsuitable material must be removed from site on a daily basis and not stockpiled on site. Payment for Traffic management shall be considered as included in the various pay items of BoQ. The Employer shall reserve the right to deduct penalties from any monies due to the contractor for failure to follow these conditions.

## **1.7 Utility Services**

### **1.7.1 Contractor to establish location of Utilities**

Before the Contractor may proceed with the Works in any given area he is required to establish the precise location of all services in that area. Existing service plans are only approximate and may not be taken as an accurate indication of the positions of all services. The contractor will therefore be required, acting in strict co-operation with the Engineer, THANJAVUR City Municipal Corporation and other concerned authorities, to open up hand excavations, at points to be agreed, in order to establish the precise location of the existing services. The contractor is to locate all existing services by cutting trenches across the road's right of way at least at an interval of 100m. The trench shall be excavated manually without the use of machinery, so as not to damage any service. The width of the trench shall be decided at site. Once the service is located, its position, location and depth together with any other significant details, shall be marked up on a road layout drawing, provided by the Engineer, and got approved by the Engineer. After collecting the details the trench shall be backfilled with the permission of the Engineer. The backfilling shall follow the specification for earthwork excavation.

The Contractor is required to make adequate allowance in his programming for this process and may be required to adapt his programme to accommodate the service protection and /or relocation works ordered as a result of these investigations. The Contractor shall provide for in his rate for quoted items for minor shifting of utilities.

If any major shifting or realignment of water supply, gas pipelines, electric and telephone lines is necessary then the same may be done by the contractor. The cost of such shifting shall be borne by the Employer.

### **1.7.2 Protection of Utilities**

The Contractor is wholly responsible for the protection and /or facilitating relocation of such utilities as may be required. If any utility is damaged during the execution of works by contractor, the Contractor shall reinstate the utility at no cost to the Employer.

### **1.8 Protection of the Works during Contract period**

It is clearly understood that any damage occurring to the Works (completed or under execution) is the responsibility and no claims will be entertained by the Employer since the matter shall be covered by the relevant Insurances.

### **1.9 Discrepancies in Alignment**

Discrepancies in alignment and levels etc., noticed during construction and/or on completion shall be rectified by the Contractor at his own cost, Engineer's approval does not relieve the Contractor of his responsibilities.



### **1.10 Temporary Water and Power Supply**

All costs, both for temporary installations and water required for testing of pipelines and tanks, shall be borne by the Contractor. All costs for power supply in connection with testing of equipment shall be borne by the contractor.

### **1.11 Progress Photographs**

1.11.1 The Contractor shall submit to the Engineer each month, throughout the period of the Contract, one set of progress photographs comprising 2 copies of 12 A4 size photographs selected by the Engineer from not less than 24 exposures of views of the works taken at the direction of the Engineer. The camera used for this purpose shall be such that the date is printed out on the negative.

1.11.2 In addition three copies of each of the 30 previously selected progress photographs and mounted in three separate and suitable albums shall also be delivered to the Engineer on the Preliminary Handing-over of the works. The arrangements for the progress photographs are subject to the approval of the Engineer and shall be discussed at as early a date as possible so that complete coverage can be assured.

### **1.12 As Built Records**

On or before the completion of the works, at the direction of the Engineer, the Contractor shall prepare detailed drawings and other records, as required, of the works executed. The Contractor is required to submit the soft copy as well as two hard copies of the as built records to the scale advised by the Engineer.

### **1.13 Programme of works**

1.13.1 In respect of the programme of works required under Clause 25 of the General Conditions of Contract the following specific requirements shall apply:

- The works shall be programmed in such a way as to minimise disruption to public traffic.
- Works shall not be carried out simultaneously over large areas of the site but shall be sequenced so that all operations likely to cause disruption to public traffic shall be undertaken and completed in discrete area before commencement of operations in other areas.
- Works which, by their nature, will create disruption and / or obstructions to vehicular or pedestrian traffic, such as pavement rehabilitation or trench – work shall be programmed to be undertaken in a continuous sequence of events from the initial disruption until the restoration of access without and significant delay between operations.
- The programme submission shall be accompanied by outline traffic management plans in sufficient detail to indicate to the Engineer that the Contractor has considered this aspect the work in his programme. Notwithstanding, acceptance of the Contractor's programme

will not in any way relieve of his responsibilities for traffic management under Clause 1.6 of this Specification.

- The Contractor's Programme shall, insofar as it is practicable to do so, take into consideration the commercial interest of individual shopkeepers e.g. operations should not be sequenced so as to disrupt access to individual shops having only one access from the road.

1.13.2 The Contractor's Programme of Works, submitted shall be subject to the approval of the Engineer and of Employer. If the Contractor's programme, in the opinion of the Engineer/Employer has not properly achieved the objectives of the programme, then the Contractor shall be instructed to revise his Programme and the Contractor shall do so forth; for this reason the Contractor is advised to liaise closely with the Engineer during the production of his Programme.

1.13.3 In addition to the Works Programme required the Contractor shall produce individual programmes for each element of the works likely to cause significant disruption to public and vehicular traffic, for the approval of the Engineer and prior to commencement of the element of the works, clearly showing the sequencing of construction operations in such a manner as to minimise the duration of the disruption.

1.13.4 The Contractor shall note that different work in various parts of site by other contractors may be in progress or may commence during the Contract Period. It will be the Contractor's responsibility to liaise with contractors on adjacent sites in order to ensure the detail progress. The Contractor's Programme may be phased and the Contractor shall make full allowance for the need for a co-operative timing with adjacent contractors.

#### **1.14 Notice Boards**

The Contractor shall provide, erect and maintain for the duration of the contract, two steel framed timber notice boards for the works, in location approved by the City Municipal Corporation and the Engineer's Representative. Notice Boards shall have a block board panel size of around 3m as detailed on the Drawings or equally approved. Prior to sign writing, the board shall be painted with two coats of white oil based paint back and front. The board shall be supported above the ground on steel struts painted matt black and fixed into concrete foundations, all to the approval of the Engineer. The sign shall be painted by a skilled sign writer to show the details described in the Contract. The Contractor is responsible for obtaining all necessary approvals for the erection of these notice boards.

The Contractor shall include the following details in the notice board:

- the name of the project and the financing agency
- the name and address of the Employer, the Contractor and the Engineer
- the name and address of the Design and quality control Consultant
- A short description of the project

- The amount of the Contract Price and
- and the Commencement and completion Dates

Under no circumstances, shall sub-contractor's or supplier's name boards be fixed on hoarding or elsewhere on site.

### **1.15 Advertising**

1.15.1 Neither the Contractor nor any of those in his employment shall give information concerning the works for publication in any form without the written approval of the Engineer.

1.15.2 Neither the Contractor nor any of his sub-contractors shall erect placards or advertisements within the site other than the notice boards permitted under Clause 1.14

### **1.16 Contractor's offices, yard, stores and plant area**

1.16.1 The contractor shall find on his own site for setting up his offices, yard, stores and plant area. The Contractor's main office shall be used for the purposes of administering the Project but may not be used for the storage of construction materials nor for storage or maintenance of plant and shall not be allowed to become unsightly.

1.16.2 The Contractor's other offices, yard, stores and plant area shall be provided, by the Contractor, at location(s) to the approval of the Employer. The Contractor shall be responsible for all associated expenses including rents, assessments or temporary occupation license fees, establishment, running and maintenance costs, the supply of all services, as well as the obtaining of any appropriate No Objection Certificates.

1.16.3 Within 7 days of the Commencement date of the Contract, the Contractor shall submit, for the approval of the Employer, a drawing showing detailed plans for his offices, yard, stores and plant area, together with all sanitary arrangements, and for the supply of water and electricity. Until the Employer has given his approval in writing, no construction of any of the Contractor's buildings, fences, services or roads shall commence. The area shall be fenced in accordance with City Municipal Corporation regulations.

1.16.4 The Contractor shall not be permitted to erect temporary building or structures elsewhere without the specific permission in writing of the Employer, including approval of the dimensions and specifications of such buildings or structures and their location.

1.16.5 The Contractor shall take all steps necessary as directed by the Employer to minimise or eliminate dust, noise or any other nuisance, which may occur. Plant emitting dust, smoke, excessive noise or other nuisance shall not be permitted to be sited at any location which shall

cause nuisance to any building or other installation, whether complete or under construction, site offices, camps, or other similar buildings.

- 1.16.6 Under no circumstances shall overnight accommodation be permitted on site except for Site watchman in carrying out their duties.
- 1.16.7 Throughout the period of the Contract, the Contractor shall maintain the area of his operation within the limits of the site in a clean, tidy and safe condition by arranging materials and the like in an orderly manner. All rubbish, debris, waste materials and the like shall be systematically cleared from the site as it accumulates.
- 1.16.8 The Contractor shall satisfy himself as to the means of access to the site and other relative items affecting him, his sub-contractors and suppliers.
- 1.16.9 Upon completion of the Contract, or, in the case of facilities required by the Contractor during the Period of Maintenance, on completion of the period of maintenance the Contractor shall remove all buildings and other facilities from the site including all foundations and services, clean and level the site and restore the ground to its original condition.

## **1.2 SITE PREPARATION**

### **1.2.1 General**

The Contractor shall maintain close liaison with all Service Authorities and the Municipal Council Authorities and shall obtain their approval prior to removal of any service installation. Where Service Authority installations are to be removed, they shall be removed after the existing facilities have been relocated and commissioned or after they have been redundant and after any electrical supply has been made safe by the Authority or the Contractor whichever is appropriate. It is deemed that except for the items mentioned in this bill, costs of all other works in connection with site clearance are included in various pay items of other bills. If up stand kerb and/or flush kerbs to be removed are part of an asphaltic pavement to be removed, then, no separate payment will be considered for removal of kerbs.

### **1.2.2 Removal of Trees**

#### **a) General**

1. This item consists of the removal of trees of any girth, their disposal as instructed by the Employer and Engineer and the backfilling of the hole left after uprooting the tree.
2. If any tree is conflicting with the road works then Contractor shall inform the Consultant.

The Contractor shall remove the trees only after obtaining the necessary approval from competent authority through the Employer.

#### **b) Measurement and Payment**

Payment under this item shall be made per unit of trees removed. The unit price shall constitute full compensation for the removal, hauling, disposing off of the tree of any girth as

described herein and as directed by the Engineer and for all material, labour equipment, supplies and incidentals necessary to complete the Work.

No payment shall be made for the removal of bushes, stumps, roots etc., whose cost is considered as included in other pay items of the bill.

### **1.2.3 Removal and Reinstallation of Traffic Signs**

The Contractor shall carefully remove the traffic signs and posts and or any similar directional signs located along the alignment by breaking out foundations/base/backing, disposal of all debris to Contractor's tip, backfilling of voids with suitable material in an approved manner, taking item to a store until required for re-erection, or delivery to the Municipal Stores or elsewhere as directed. The Contractor shall reinstate the traffic sign with foundation after completing the pipe laying and backfilling. Payment for the removal and reinstatement of traffic signs is deemed to be included in the quotable items.

#### **a) Measurement and Payment**

Payment under this Item shall be made per linear metre of fence removed. The unit price shall constitute full compensation for the works described herein and as directed by the Engineer and for all material, labour equipment, supplies and incidentals necessary to complete the Works.

### **1.2.4 Removal of Concrete Structures**

#### **a) General**

The Contractor shall remove wholly or in part and satisfactorily dispose of all structures (manhole, slabs, walls, small building or any other concrete structure) as indicated on the Drawings / obstructing the pipeline alignment or as directed by the Engineer, and which are not specifically described under a separate Clause of this Specification. All material removed and all structures demolished shall be removed from the Work Site, hauled away and disposed off in approved disposal area and as approved by the Engineer. The voids or depression which are the result of the demolition of structures shall be backfilled with borrow material as approved by the Engineer. Backfilling material shall be placed in horizontal layers of over 15cm in depth and compacted to not less than 98%.

#### **b) Measurement and Payment**

Payment for the removal and disposal of all structures and related obstructions as described above will be at the cubic metre rate included in the Bill of Quantities which shall include all labour and equipment to demolish, remove the obstructions as building materials, concrete, debris etc., loading, hauling irrespective of haulage distance, disposing off all materials removed, and backfilling with borrow material and depression of voids, as indicated on the Drawing, specified herein and as directed by the Engineer.

## **TECHNICAL SPECIFICATIONS**

### **CHAPTER 2**

#### **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 that are classified for ISI marking should be supplied with ISI marking only.

##### **2.1 Cement**

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.

The cement procured by the contractor shall comply with the requirements of IS:269/1976 with the latest revision thereof for ordinary port land cement and IS:8112/1989 with the latest revision thereof for 43 grade ordinary portland cement. It shall be of the best normal setting quality unless specially rapid hardening or quick setting quality if expressly instructed by the Engineer to be supplied. Each bag shall bear ISI Certification mark and as per specification no.10 of TNBP volume 1.

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.

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 if he finds that any deterioration in the quality thereon has taken place.

##### **2.2 Steel**

The steel bars shall comply with the requirements set forth in the IS:432 Part 1, 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 band. Each band containing the bars shall bear the ISI Certification marks.

The Cement/steel shall be tested in nearby laboratories of Polytechnic or Engineering College by the Employer. Two samples should be taken by the Engineer in charge in the presence of the contractor or his authorized 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.

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

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

## **2.3 Aggregates**

### **2.3.1 Sand**

Sand for use in masonry and plaster works shall conform in relevant specification in TNBP (Specification No.7) and IS:2116/1985, IS:1542/1977.

The course and fine aggregates for concrete shall conform to IS:383/1970 and as specified in the relevant clauses of IS:456/2000. 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 contractors cost.

The maximum quantities of deleterious materials in the aggregates, as determined in accordance with IS:2386/ (Part II/1963 shall not exceed the limits given in table 1 of IS:383. Unless other wise specified all course aggregate in RCC shall be graded aggregate of 20mm nominal size. All aggregates shall be stored in hard impervious surface to ensure exclusion of all foreign materials and as per IS:4082/1977 and specification no.5 of TNBP Volume 1.

## **2.4 Water required for Construction**

The water used in the construction shall be of potable quality and shall be tested at the contractor's cost. The contractor has to make his own arrangements at his cost for water required for construction, testing, filling, etc., either from local bodies or from elsewhere by paying the charges directly and arranging tanker etc., as per necessity. No claim for extra payment on account of non-availability of water near by extra lead for bringing water shall be

entertained. All required the contractor at his cost should make piping arrangements and pumping if required for water. Water for mortar mixing and curing of concrete shall be free from harmful mater or other substances that may be deleterious to concrete or steel and taken from a source approved by the Engineer. Ground water for mixing and curing shall conform to the provisions in the class 4.3 of IS:456/2000

## **2.5 Form work and Centering**

Steel /wooden form centering shall be used. If wooden formwork is used, it shall consist of planks not less than 40mm thick and strong props. This shall be provided complying with clause 10 of IS:456/1978 and specification no. 30.8 of TNBP. The timber for form works shall be best hard wood and got approved by the Engineer in charge. This shall be deemed to be included in the items of contract even otherwise specified.

## **2.6 Separator (Cover Block)**

For bottom cover of beams, slabs etc., separators of pre cast cement mortar blocks of suitable size with wire embedment as directed shall be used and tied to the reinforcement. Between layers of reinforcements, separators consisting of pieces of bars of suitable diameter shall be used. The required cover shall be provided as per clause 24-4 of IS:456/1978

## **2.7 Pipes, Specials and Valves.**

### **2.7.1 General**

All types of pipes required for the works should be of good quality conforming to relevant BIS and should be procured from reputed manufacturer or his authorized dealer. Each pipe should bear the trade mark of the manufacturer, the nominal diameter, class, weight, batch number and the last two digits of the year of manufacture suitably and legibly marked on it. The Engineer shall have the right to conduct any test to ascertain the quality of the pipes supplied by the contractor. The contractor should make all necessary arrangements for testing the pipes. All the charges and expenses towards the testing shall be borne by the contractor. The materials, which are classified for ISI marking, should be supplied with ISI marking only.

If on examination of any sample from any portion of the supply, the material is found to be sub standard and not fully in accordance with the relevant specification, the entire consignment shall be rejected. In case of doubt whether the materials confirm to the specification or not, the decision of the Executive Engineer shall be final.

### **2.7.2 PVC Pipes**

- The unplasticised PVC rigid pipes shall strictly conform to IS:4985/1988 and as 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 pipes 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 specific gravity, impact strength, internal hydraulic pressure test, diameter, thickness etc, in authorized laboratory.
- The PVC pipes 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.

### **2.7.3 PVC Specials & Fittings**

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

### **2.7.4 GI pipes - Deleted**

### **2.7.5 GI Specials and Fittings - Deleted**

### **2.7.6 AC pipes - Deleted**

### **2.7.7 AC Specials and Fittings - Deleted**

### **2.7.8 CI pipes**

- The Cast Iron pipes shall strictly conform to IS:1536/2001 and as amended from time to time and shall carry ISI marking in every pipe.
- The contractor should procure the CI 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 pipes used in the works.
- In addition to third party inspection, wherever felt necessary, the Engineer shall have the power to test the CI pipes for its quality such as specific gravity, impact strength internal hydraulic pressure test, diameter, thickness etc, in authorized laboratory.
- The CI pipe joints shall be push-on joint for Spigot & Socket pipes conforming to IS:1538 & IS:13382.
- 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 CI specials required for use in conjunction with CI pipes, should be got approved by the Engineer-in-charge.

### **2.7.9 CI Specials and Fittings**

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

#### **2.7.10 DI pipes**

- The Ductile Iron pipes shall strictly conform to IS:8329/1994 and as amended from time to time and shall carry ISI marking in every pipe.
- The contractor should procure the DI 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 pipes used in the works.
- In addition to third party inspection, wherever felt necessary, the Engineer shall have the power to test the DI pipes for its quality such as specific gravity, impact strength internal hydraulic pressure test, diameter, thickness etc, in authorized laboratory.
- The DI pipe joints shall be push-on joint for Spigot & Socket pipes conforming to IS:9523.
- 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 DI specials required for use in conjunction with DI pipes, should be got approved by the Engineer-in-charge.

#### **2.7.11 DI Specials and Fittings**

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

#### **2.7.12 HDPE pipes**

- The HDPE pipes shall strictly conform to IS:4984/1995 and as amended from time to time and shall carry ISI marking in every pipe.
- The contractor should procure the HDPE 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 pipes used in the works.
- In addition to third party inspection, wherever felt necessary, the Engineer shall have the power to test the HDPE pipes for its quality such as specific gravity, impact strength internal hydraulic pressure test, diameter, thickness etc, in authorized laboratory.
- 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 HDPE specials required for use in the conjunction with HDPE pipes, should be got approved by the Engineer-in-charge.

#### **2.7.13 HDPE Specials and Fittings**

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

## **2.8 Testing of Pipes**

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.

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.

## TECHNICAL SPECIFICATIONS

### CHAPTER 3

#### CIVIL WORKS

##### 3.0 General

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.

Where any provision of the TNBP is repugnant to or at variance with any provision under BIS or description of work, technical specifications and conditions of contract, the provisions of the later shall be deemed to supercede the provision of the TNBP.

##### 3.1 Earth work

###### 3.1.1 Specification

Tamil Nadu Detailed Building Practice (specification No.23 to the extent applicable) shall be followed for earthwork excavation.

###### 3.1.2 Conveyance

The excavated earth, blasted rubble etc., shall be conveyed and deposited in the departmental lands within 150m of work site and as directed by the Engineer in charge.

###### 3.1.3 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 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.

###### 3.1.4 Disposal of surplus Earth

The excavated soil, which is surplus to that, required for filling and after allowing for settlement will have to be removed, spread and sectioned at places shown on the site during excavation for purpose of widening or leveling. 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 removal of surplus earth to disposal site approved by the Engineer in charge, its spreading and sectioning at the bidder's expense.

### **3.1.5 Shoring, Strutting and Bailing 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 channelised to flow away without stagnation or inundating the adjoining surfaces and properties.

## **3.2 Concrete**

### **3.2.1 Specification**

Concrete for use in the works shall generally comply with TNBP specification No.30 and the relevant BIS. The concrete mix shall be in specified proportions satisfying the maximum aggregate size, water cement ratio and required cube strength and workability as per IS 456-2000. Such concrete must be adequately vibrated to form solid mass without voids. The entire concreting works should be done only with the prior approval and in the presence of Engineer-in-charge.

### **3.2.2 Fabrication Steel Reinforcement**

Supplying, fabricating and placing in position MS/RTS Steel reinforcements for all RCC Works as per design/drawing etc. as per standard specifications.

### **3.2.3 Mixing Concrete**

The concrete shall be proportioned as far as cement and aggregates are considered by volume. The amount of water required being measured either by weight or volume the adjustments must be made to frequent intervals at the discretion of the Engineer or his assistant to account for the moisture content of the aggregates. The mixing operation shall be performed only in a mechanical concrete mixer and shall continue until the whole batch of uniform consistency and colour. The mixing of concrete shall be done in accordance with clause 8 and 9 of IS:456-2000.

### **3.2.4 Transporting, Placing and Compacting Concrete.**

3.2.4.1 Transportation, placing and compaction of concrete mix by mechanical vibrators shall be done in accordance with clause 12 of IS:456-2000. It is imperative that all concreting operations be done rapidly and efficiently with minimum rehandling and adequate manpower shall therefore be employed to ensure this.

3.2.4.2 The forms shall be first cleaned and moistened before placing concrete.

3.2.4.3 The mix should not 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.

- 3.2.4.4 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.
- 3.2.4.5 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.
- 3.2.4.6 Construction joints required in any of the structural members shall be provided generally complying with clause 12.4 of IS:456-2000 and as directed by the Engineer-in-charge.. The efficiency of tempering and consolidation will be judged by complete absence of air pockets, voids and honey combing after removal of form works.

### **3.3 Curing**

- 3.3.1 Curing shall be done to avoid excess shrinkage or harmful effort to the members generally complying with clause 12.5 of IS:456-2000.
- 3.3.2 The method adopted shall be effective and any special method used must be approved by the Engineer and be subject to complete supervision.
- 3.3.3 Any deficiency in concreting such as cracking, excessive honey combing exposure of reinforcement or other fault which entail replacement of the defective part by fresh concrete without hampering the structural safety and architectural concept, all at the cost of contractor.

### **3.4 Removal of Form Work**

- 3.4.1 Removal of form work shall be done as per TNBP and BIS and as directed by the Engineer in such a manner that no damage is caused to the structures. The stripping time shall not be less than that indicated in clause 10.3 of IS:456-2000.

### **3.5 Testing of Concrete**

- 3.5.1 During the course of construction works, preparation of test specimens, curing and casting of concrete shall be done in accordance with IS:1199 and IS:516 to ascertain the strength requirements and acceptance criteria indicated in IS:456-2000. The contractor shall provide all apparatus, labour and arrange to test the cubes at his own cost at the test laboratory decided by the Engineer.
- 3.5.2 In addition to the above tests, any other test which may if desired by the Engineer-in-charge be carried out from time to time as per relevant specifications at the cost of contractor. In case the concrete does not meet the strength required, all corrective measures shall be taken at once at the contractor's cost.
- 3.5.3 The inspection and testing of structures shall be done in accordance with clause 16 of IS 456/2000.

### **3.6 Masonry**

- 3.6.1 All masonry works such as Random Rubble/Brick work / Partition wall in Brick Work must be done as per TNBP Specification and Bid schedule specification.
- 3.6.2 Dismantling:
- a) Dismantling brick work in Cement Mortar and clearing away the debris's and carefully stacking materials useful for reuse for any thickness of wall etc. complete as directed.
  - b) Dismantling brick work in Cement Mortar and depositing the debris in low lying areas and leveling the debris as directed.
  - c) Brick on edge are conforming to standard specification No.39C of TNBP.

### **3.7 Plastering**

- 3.7.1 Plastering would be 10mm, 12mm & 20mm thick cement plaster .either plain or waterproof as may be specified.
- 3.7.2 The plastering items shall be executed in thickness and cement mortar of proportion as detailed in respective items in the BOQ. Similarly the plastering shall be either ordinary or waterproof as specified in respective item in the BOQ.
- 3.7.3 In case of water proof plaster standard approved water proofing compound shall be mixed in cement mortar in required percentage as directed and then the plaster is applied.
- 3.7.4 The finishing shall be either smooth or rough as may be directed by the Engineer unless otherwise specifically mentioned in the BOQ.
- 3.7.5 Neat finish wherever directed by the Engineer shall be done at no extra cost.
- 3.7.6 Curing and watering shall be one as directed and plaster shall be in alignment and level. Any sub standard 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.

### **3.8 Flooring & Base Concrete**

- 3.8.1 100mm thick cement concrete 1:4:8 / 1:5:10 shall be provided for flooring as base concrete. The size of metal shall not be more than 40mm 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. Floor finish shall be of:

1. Granolithic Flooring
2. Ceramic tiles
3. Cuddappah Slab
4. Granite Stone
5. Polished Granite

### **3.9 Doors and Windows.**

- 3.9.1 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.
- 3.9.2 The work shall be executed as per the size of frame thickness of shutter type viz. Plain planked panelled, glazed etc., and fixture, etc., as described in tender item. Iron bars for windows and ventilators are to be provided if specifically mentioned in the tender item at Contractor's cost. Specifications in TNBP shall be applicable.
- 3.9.3 The design of shutters and quality of wood shall be got approved from the Engineer-in-charge before manufacture. The CW/TW to be used for wood work shall be uniform in substance straight, free from large dead knots, flows flanks. The work shall be done as per specification of TNBP latest edition. The joints shall be perfect.
- 3.9.4 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.
- 3.9.5. 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 wood work is approved by the Engineer-in-charge.
- 3.9.6 Any substandard work not conforming to the specifications are liable to be outrightly rejected and Executive Engineer's decision in such case shall be final and binding on the Contractor.
- 3.9.7 The mode of measurement shall be on units as mentioned in BOQ.

### **3.10 White Washing, Colour Washing & Painting.**

- 3.10.1 The work shall be carried out as per the description of the tender item and as directed by Engineer-in-charge. It shall be white washing, distempering and/or cement painting. Shade and make shall be as directed by the Engineer and for decorative purpose. Engineer may ask for different shades to be provided for different components or different parts of the same component which the Contractor shall have to do within his tendered rate only at no extra cost to the Employer. Cost of priming coat as directed, scaffolding etc. shall be included in the tender rate. The work shall be executed as per the specifications of TNBP for painting including metal surfaces.

In general, all items of works must be done as per TNBP specifications and bid schedule specifications.

Painting two coats with approved cement paint over one coat of cement primer on the new plastered wall surface, ceiling and other new surface and including cleaning, preparing the surface and curing etc. complete complying with standard specifications.



## TECHNICAL SPECIFICATIONS

### CHAPTER 4

#### WATER SUPPLY WORKS

##### 4.0 General

4.1 The earthwork for the pipe laying work shall generally conform to the details given below.

Sl. No.	Size of pipe in mm	Depth of Excavation (cm)	Width of trench at bottom (cm)
1	For other pipes upto 100	105	60
2	For other pipes 150	105	75
3	For other pipes 200	110	80
4	For other pipes 250	120	80
5	For other pipes 300	135	80
6	For other pipes 350	145	90

4.2.1 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.

4.2.2 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.

- a) Cast iron Pressure Pipes : Clause 6 of IS 3114/1985
- b) PVC Pressure Pipes : Clause of IS 7634/1975
- c) DI Pressure Pipes : Clause of IS 7634/1975

In portion of pipeline, where the pipes have developed cracks or sweating, such pipes with jointing materials shall be removed and re laid with new pipes at the contractor's cost and the pipe line shall be re tested to the entire satisfaction of the Engineer in charge. No extra payment will be made on this account. The bidder has to make his own arrangements for the procurement of the required equipments for testing of pipes which shall be subjected to such test as the Engineer-in-charge deems fit to ensure the accuracy of the gauge.

4.2.3 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 watering and compacting each layer. The refilling may be done up to a height of 20 to 30cm than the natural ground level to allow that sinking afterwards. If the refilling gets sunk below the natural ground level at anytime till the completion of the work, the contractor at his cost should make good the refilling to the required level as may be directed by the Engineer in charge.

- 4.2.4 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.
- 4.2.5 If the work is in a residential area, the contractor should carry out the excavation carefully to avoid collapse of any structure.
- 4.2.6 Valves shall be provided with valve pits with proper cover to bear the loads coming on it as per bid documents and departmental drawings and specification Public fountains, Fire hydrants shall be provided as per type design and specification.
- 4.2.7 Adequate protective measures should be taken against surge pressure. Zero velocity valves and air cushion valves should be provided at the appropriate places Thrust blocks and anchor blocks should be provided at all bends and appropriate places.
- 4.2.7 Water required for testing the pipeline shall be arranged by the contractor at his cost.

**4.3 PVC PIPES - Deleted.**

**4.3.1 Laying and Jointing Pipes – Deleted.**

**4.4 ASBESTOS CEMENT PIPES - Deleted**

**4.5 LAYING OF CAST IRON PIPES - Deleted.**

**4.6 LAYING AND JOINTING OF DI PIPES**

**4.6.1 TRANSPORTATION**

The transportation of materials to work site and stacking shall be done in such a manner as to cause minimum inconvenience to the traffic and other construction works. Pipes shall be protected during handling against impact, shocks and free fall to avoid cracks and damage. Pipes shall be loaded for transportation in such a way that they are secured and no movement can take place on the vehicle during transit. The same care shall be taken if pipes are transferred from one vehicle to another, however short the journey may be. The cement mortar lining of pipes that are damaged during transportation is to be repaired by hand application if possible; otherwise it has to be rejected. The decision for rejection shall be taken by the Engineer in charge.

**4.6.2 UNLOADING OF PIPES:**

Each pipe consignment shall be inventoried and inspected with care upon arrival even though the pipes have been inspected and loaded with care at the factory. Overall examination shall be made during unloading to ensure that the pipes have reached destination in good condition. If there is any sign of rough treatment on the coating, each pipe shall be inspected for damage.

While unloading, pipes shall not be thrown down from the truck to the hard roads. Cranes or Mechanical equipment shall be used for unloading the pipes from the truck. If mechanical equipment is not available, care should be taken to unload the pipes on timber skids. Unloading them on timber skids without a steadying rope and thus allowing the pipe to bump hard against one another should not be allowed. In order to avoid damage to the pipes specially to the spigot end, pipe should not be dragged along concrete and similar pavements with hard surfaces.

The pipes shall be laid on timber battens and secured with wooden wedges. The pipes shall be stacked with each tier at right angles to the preceding tier.

#### **4.6.3 LOWERING OF PIPES AND FITTINGS:**

The pipes shall be lowered cautiously to prevent disturbances of the bed and sides of the trench. Proper implements, tools and facilities satisfactory to the Authority shall be provided and used for the safe and convenient execution of the work. All pipes, fittings, valves and hydrants shall be carefully lowered into the trench, piece by piece, by means of a derrick, ropes or other suitable tools or equipment, in such a manner as to prevent damage to pipes materials and protective coatings and linings. Under no circumstances shall pipes materials be dropped or dumped into the trench. Pipes over 300mm diameter shall be handled and lowered into trenches with the help of chain pulley blocks or preferably by cranes. Tripod supports used for this purpose shall be regularly checked to prevent all risks of accidents.

#### **4.6.4 CLEANING OF PIPES AND FITTINGS:**

All lumps, blisters and excess coating material shall be removed from the socket and spigot end of each pipe. The outside of the spigot and the inside of the socket shall be wire-brushed and wiped clean and dry and free from oil and grease before the pipe is laid.

#### **4.6.4 LAYING:**

Before lowering the pipe, the trench section shall be got approved from the Engineer in charge. Trenches are to be dug to the specified level / grade. Sufficient cushion shall be provided for protection from surface traffic, future changes in the ground elevation. The width of the trench shall be to the required specifications providing room for pipe laying operation, backfilling, compaction etc., Trenches should be shored and braced when conditions so warrant.

The bottom of the trench shall form a continuous bed for the pipe. Where rock is encountered, trenches shall be dug deeper and then filled and compacted to grade with suitable bedding material. The Contractor shall have to provide and maintain sight rails and boning rods wherever required till the completion of work. The pipe shall be laid in reasonably dry condition and under no circumstances they shall rest on slushy bedding.

The pipes shall be lowered slowly into the trench by means of chain pulley block and tripod stand or with the help of ropes and suitable size of wooden bullies or with the help of cranes. They shall be brought to the required level by giving packing with wooden sleeper pieces and ultimately with well-consolidated hard murum if required. The chain pulley block and tripod stand must be approved from the Engineer in charge. Under no circumstances pipe shall be allowed to be thrown in the trenches. At the end of each day, the end of the pipe should be plugged to prevent entry of rodents, foreign substances, water etc.

#### **4.6.5 SUPPORT OF PIPE FOR NALLAH / RIVER CROSSING:**

Venteak piles are proposed for portion of pipeline which crosses the nalla / river or slushy soils. Each pipe shall be supported on a pair of Venteak piles driven upto 3.50m or firm ground whichever is met earlier.

One pair of timber piles shall be driven 150mm behind the shoulder of toe socket and another pair about 750mm in front of the spigot end of the pipe.

The size of timber section to be used for Venteak piles shall be:

100mm x 100mm for pipe sizes upto 300mm

150mm x 150mm for pipe sizes above 300mm

A cross piece of section same as that of pile shall be bolted to a pair of piles which have been driven to the required depth.

The level of the cross piece should be such that when the pipe rests on its top, its Invert level coincides with the proposed invert of the pipe.

The pipe shall be aligned for straightness and secured in position by wooden wedges nailed down to the wooden cross piece. The spigot end of each pipe shall be thoroughly homes in to socket of preceding pipe and jointing made. The pipe shall be further secured from moving upwards by timber cross pieces bolted to the supporting piles. The section of the cross piece shall be same as that of pile.

The socket ends of all pipes shall face up hill irrespective of the direction of water flow. Any deviation either in plan or elevation of less than  $11 \frac{1}{4}$  deg. angle shall usually be effected by laying straight pipes round a flat curve; of such radius that rubber gasket shall not be disturbed in its place. Wherever new pipes laid are to be jointed with existing pipe line, first pipe laying work of new pipes are to be completed. Jointing of new pipe line with existing pipe line has to be completed within a stipulated time as per the instructions of Engineer in charge to keep the distribution system ready to supply water to the city. No extra payment will be made for this time bound urgent work.

#### 4.6.6 TESTING:

After laying and jointing, the pipe line must be pressure tested to ensure that the pipes and joints are sound enough to withstand the maximum pressure likely to be developed under working conditions. The Contractor shall submit for the Engineers approval, details of his proposed methods and programme for testing including details of test equipments and shall provide for all tests to be carrying out testing and cleaning including water pumps, gauges, piped connections, stop ends, and all other temporary works.

Pipe lines shall be properly completed and supported before being put under test. No testing will be permitted until ten days after thrust blocks and other holding down works have been completed. In addition to any tests of individual joints or other interim tests which may be specified elsewhere, the Contractor shall submit, all parts of the pipe lines to a final test. Notwithstanding the foregoing, the Contractor may at any stage of construction, carry out such other tests as he considers desirable to check materials and workmanship on the pipe lines but this shall not relieve the Contractor of his obligations to achieve successful test under the contract.

All water required for testing and cleaning the pipelines shall be potable water and shall be provided by the Contractor at his cost. The test can be carried out by means of a hand pump or a pressure pump.

Pipelines shall be tested in lengths between valve pits or such lengths as the Engineer may direct or permit.

Fittings required for temporarily closing the openings in pipelines to be tested shall be properly designed for this purpose and shall be adequately strutted to withstand the pressure specified. To completed pipe line may be tested in sections, the length of section should be decided by considering:

- a) the availability of suitable water;
- b) the number of joints to be inspected; and
- c) the difference in elevation between one part of the pipe line and another.

The maximum length that can be tested in one operation shall be restricted to 500m and minimum length shall be 50m.

Where joints are left uncovered until after testing, sufficient materials should be back filled over the centre of each pipe to prevent movement under the test pressure. 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 pipe, specials and connections are firmly passed by the Engineer. If the testing apparatus and equipments are available with the TWAD Board, they can be hired by the Contractor at usual conditions and charges.

The length to be tested shall be provided with two blank flanges fastened on the usual manner by collar bands and bolts to the end pipes or if the length to be tested shall have a sluice valve at each end, such blank flanges may be dispensed with.

The length of pipes to be tested shall first be filled in with from a higher section of pipes already laid or with clean water obtained from a service connection, as the Contractor may arrange with the approval of the Engineer.

Before the actual testing pressure is applied, any air which has logged in the length of pipe to be tested shall be got rid of, by screwing on at the highest part of the length of pipes or temporary air valve, or by opening a temporary stop – cock or by means as the Engineer may direct.

The test pressure shall not be less than  $10 \text{ kg / cm}^2$ .

Each pipe line or section thereof, shall be filled with water and all air removed. The pressure in the pipe lines shall be raised steadily until the site test pressure is reached in the lowest part of the section. This pressure should be disconnected and no further water permitted to enter the pipe line for a period of 1 hour. At the end of this period, the reduced pressure in the pipe line should be measured, the original test pressure restored by pumping and the loss measured by drawing off water from the pipe line until the pressure has fallen to match the reduced pressure previously noted.

The loss shall not exceed 0.02 litre per mm diameter per Kilometer per 24 hours for each bar of head applied. If the pipeline fails to pass the test, the faults shall be located and repaired and the pipeline retested until it passes the pressure test. All exposed pipe, fittings, valves and joints shall be visually inspected during the tests.

If the length of pipeline under test is found to be satisfactory and no leaks or sweating are found at the pipe joints or at the joints of specials and connections, then this length of pipeline will be passed by the Engineer.

But should any pipe, joint, special or connection be found to sweat or leak, Contractor shall make good at his cost such defective joints and the length of pipe line shall be retested until all pipes, joints specials and connections are found to be satisfactory.

After satisfactory test, the Contractor shall remove water from the pipeline and clean it after testing at his own cost, without flooding adjoining areas.

**Duration of Hydraulic Test:**

The test is for 1 hour only. The rate of allowable leakage is given on per day basis. The leakage observed within one hour shall be converted to per day basis and compared with criteria given.

**Maximum field test pressure for pipes with flexible joints:**

Table – 1 on page 11 of IS:12288 is not applicable in this case as our test pressures are well below the maximum field hydraulic test pressures given in the table.

**Allowance of test pressure for lower elevations:**

As regards allowance for lower points, there is marginal level difference in levels, between 2 points in the section to be chosen for testing and hence the difference in pressure developed will be insignificant.

**Saturation of pipe material:**

As regards saturation of material, it is significant in case of RCC, PSC pipes for DI pipes it is insignificant. We are not clear whether the remark is aimed at saturation of inner CM lining. The adequate curing of the lining will take care of this. Also the duration of the test is long enough to discount such possibility.

**4.6.7 INTERCONNECTION WORK:**

The interconnection work between the existing main and the proposed main to be laid under this contract shall proceed from the new main to the existing main. Before actually proceeding with the interconnection work, the Contractor shall make ready necessary tools and plants required for the work at site, such as pump sets, shoring materials etc. He shall also keep ready at site necessary pipes, jointing materials, specials and valves required for the work.

The Contractor shall keep necessary skilled workmen of sufficient strength at site and once the work 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, excavating, timbering, pumping out water from the trenches, lowering, aligning, jointing specials and valves, cutting the existing mains, dealing with water, inserting the necessary branches, jointing, testing, refilling etc., is included in the item of providing, laying and jointing DI pipes. Any ancillary work either of Temporary or Permanent nature required for interconnection and not covered by schedules shall be executed by the Contractor at no extra cost.

#### **4.6.8 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 three ply and of approved thickness. The packing should be of the full diameter of the flange with proper pipe hold and bolt holes cut out evenly on both the inner and outer edges. Where the flange is not full faced, the packing may be of diameter of the packing strip only, proper placing of the packing should be checked before another pipe is jointed on.

#### **4.6.9 DISINFECTION OF MAINS:**

Upon completion of a newly laid main or when repairs to existing pipes are made, the main shall be disinfected as directed by the Engineer. The main shall be flushed prior to disinfection except when the tablet method is used. After initial flushing, the hypochlorite solution shall be applied to the water main with mechanically or electrically powered chemical feed pump designed for feeding chlorine solutions. For small applications, the solution may be fed with a hand pump. In the case of mains of large diameter, water from the existing distribution system or other approved source shall be made to flow at a constant measured rate into the newly laid pipeline. The water shall receive a dose of chlorine also fed at a constant measured rate.

The two rates shall be proportioned so that the concentration in the water entering the pipeline is maintained at not less than 300 mg/l. The chlorine shall be applied continuously and for a sufficient period to develop a solid column of 'Slug' of chlorinated water that will, as it passes along the line, expose all interior surfaces to a concentration of at least 300 mg/l for atleast 3 hours. As the chlorinated water flows through tees and crosses, related valves and hydrants shall be operated so as to disinfect the appurtenances.

In the case of newly laid mains in which scrupulous cleanliness has been exercised, the tablet method can be adopted and in this method. The initial flushing is dispensed with the calcium hypo chlorate tablets are placed in each section of pipe and also in hydrants, hydrants branches and other appurtenances. The tablets shall be attached by an adhesive and must be at the top of the main. The main shall then be filled with water and the water shall remain in the pipe for atleast 24 hours. After the applicable retention period, the heavily chlorinated water shall be flushed from the main until the chlorine concentration in the water leaving the mains is no higher than that generally prevailing in the system or less than 1 mg/l. After final flushing and before the water main is placed in service, a sample or samples shall be collected from the end of the line and tested for bacteriological quality and shall show the absence of coliform organisms. If the initial disinfection fails to produce satisfactory samples, disinfection shall be repeated until satisfactory samples have been obtained. When the samples are satisfactory, the main may be placed



in service.

The Contractor is expected to carry out the disinfection work as a part of laying the pipes and his rates for laying the pipes should include the disinfection and other connected works till the main is placed in service unless otherwise specified in the schedule.

#### **4.7 Fixing Sluice Valve**

The sluice valves to be fixed on the pipelines shall be examined, cleaned and placed in the positions as shown in the drawings. The valves shall be placed on the pipeline and valve chambers constructed according to drawings. The depth at which the valve is to be laid and the dimensions of concrete and masonry shall be varied when necessary under the orders of the Engineer.

As the pipes in some instances may be required to be fixed at a less depth than will permit the top of the valve spindle being below the level of the road (but this may only be in cases where the position of the valve is to one side of the metalled road) the walls of the valve chamber shall in such cases be carried up to such height as 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.

#### **4.8 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.

#### **4.9 Fixing Air Valve**

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

#### **4.10 Interconnection Work**

The Interconnection Work between the existing main and proposed main to be laid under this contract shall proceed from the new main to the existing main. Before actually proceeding with the interconnection work, the Contractor shall make ready necessary tools and plants required for the work at site, such as 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 works 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 interconnections.

#### **4.11 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.

#### **4.12 Cleaning of Mains**

During the execution of the work the contractor shall keep the interior surface of the mains free from cement, brick, soil or other superfluous matter and shall hand over the mains perfectly clean and free from deposit on completion.

#### **4.13 Masonry chambers**

Chambers for sluice valves, inspection, scour valves, air valves shall be constructed on the pipes in the positions as shown in the drawings or in such positions as the Engineer may direct. The work shall be done strictly in accordance with the detailed drawings or as ordered by the Engineer.

The excavation shall not be made lower than necessary to admit of the earth being properly timbered. The bottom of the excavation shall be properly levelled, rammed and a bed of concrete laid thereon. When the concrete has sufficiently set the building of the brick walls shall then be proceeded with and all iron work fixed in as the building proceeds. The inside of all chambers shall be plastered with cement mortar 20 mm thick and the outside with cement mortar 12mm thick.

The chamber shall be topped with pre-cast RCC Slab 1:2:4 or cast iron surface box of valve cover as ordered by the Engineer. The surface box or valve cover shall be fixed on the top of the RCC 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 RCC lintels shall be provided to avoid load of the walls transmitted to the pipes.

Cast Iron steps shall be built in each chamber as the Work proceeds on being inserted to every 4 courses of brick work, horizontal distance center to center of each row being 30cm.

The Contractor shall include in his rate for brick work cost for fixing steps, frame, cover etc., for completing all chambers in accordance with the drawings and with the above specifications.

#### **4.14 Restoring Road Surface**

The surface of the road or ground shall be finished off to the proper level with the same kind of materials 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 upto 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 the cost of the contractor.

#### **4.15 Collection of Rubbish**

The Contractor shall, at his cost, on the completion of the Work remove all water and all materials or rubbish of every description which may have been collected in the works find a deposit thereof and anything which may have been collected within the works, during the period of maintenance shall also be removed before the Works are finally accepted by the Employer.

#### **4.2 Earth work excavation**

##### **4.2.1 General**

Before commencing the work, and also during the progress of the work the contractor shall give notice to the concerned authorities viz., the Panchayats, the Municipalities, the Railway, 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 cooperate 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 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.

#### **4.2.2 Trench excavation**

The width and depth of excavation of trench shall be as per relevant BIS. The rate for excavation shall include charges for shorting, 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 item.

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

Whenever 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 half 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.

#### **4.3 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 crow bars 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 stacked at site as shown by the Departmental officers which are the property of City Municipal Corporation. The stacking shall be as directed by the Engineer.

#### **4.4 Lowering of pipes and jointing of pipes and specials**

4.4.1 All laying and jointing shall be in accordance with Clause 9.1, IS:783-1985 for laying of concrete pipes. All the 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 bolts. Iron chain or iron crow bars 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 lying. 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.

4.4.2 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.

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

#### **4.5 Special Fittings**

4.5.1 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.

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

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

#### **4.6 Testing pipes on position**

4.6.1 The finished pipe line 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 pipe line static pressure or maximum working pressure plus surge pressure which may be 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 pipe line 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 pipe lines, a seepage allowance of 2.5 liters per kilometer per hour per centimeter diameter of the pipe shall be permissible.

#### 4.6.2 **Joint Testing**

When testing the finished pipe line hydraulically after filling the pipe line 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 pipe line 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 calibrated container. The rate of flow of water from the container shall be determined at regular intervals. The pipe line is satisfactory provided the successive measurements show a diminishing quantity. An allowance of 3 liters per millimeter diameter of pipe per kilometer of pipe line per day per each 30 meter head of pressure applied shall be allowed.

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

- a) 1½ times the maximum sustained operating pressure
- b) 1½ times the maximum pipe line static head; and
- c) 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.

#### 4.7 **Back filling trenches**

4.7.1 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 7.5 cm- layers and rammed well until the backfill materials reaches 15 cm above the crown him of the pipe. Mechanical rammers may also be used.

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

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

#### **4.8 River crossings.**

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

#### **4.9 Railway Crossings**

Required permission for laying, jointing and testing the pipe line 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.

#### **4.10 Road Crossings**

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

#### **4.11 Distance indicators**

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

#### **4.12 Drawings**

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

#### **4.13 Disinfections of Mains**

Upon completion of a newly laid main or when repairs to an existing pipe are made, the main shall be disinfected as directed by the Engineer.

The mains shall be flushed prior to disinfections except when the tablet method is used. After initial flushing, the hypo chlorite solution shall be applied to the water main with mechanically or electrically powered chemical feed pump designed for feeding chlorine solutions. For small applications, the solution may be fed with a hand pump.

In the case of mains of a large diameter, water from the existing distribution system or other approved source of supply shall be made to flow at a constant measured rate into the newly laid pipe line. The water shall receive a dose of chlorine also fed at a constant measured rate. The two rates shall be proportioned so that the concentration in the water entering the



pipeline is maintained at not less than 300 mg/l. The chlorine shall be applied continuously and for a sufficient period to develop a solid column of 'Slug' of chlorinated water that will as it passes along the line expose all interior surfaces to a concentration of at least 300 mg/l. for at least 3 hours. As the chlorinated water flows past tees and crosses, related valves and hydrants shall be operated so as to disinfect the appurtenances.

After the applicable retention period, the heavily chlorinated water shall be flushed from the main until the chlorine concentration in the water leaving the mains is not higher than the generally prevailing in the system or less than 1 mg/l. After final flushing and before the water main is placed in service, a sample or samples shall be collected from the end of the line and tested for bacteriological quality and shall show the absence of coliform organisms. If the initial disinfect ion fails to produce satisfactory samples, disinfections shall be repeated until satisfactory samples have been obtained. When the samples are satisfactory, the main shall be placed in service.

#### **4.14 General**

1. The water for the works shall be as far as practicable free from earthing vegetable or organic matter and from salts or other substance likely to interface with the setting of mortar or otherwise prove harmful to the work.
2. All items of work shall be done in accordance with the relevant classes of T.N.B.P and agenda volume to the TNBP or amendments from time to time.
3. The contractor shall be responsible for the safe custody of all the departmental materials once they are handed over to the contractor at the departmental stores. The cost of any materials in the custody of the contractor stolen, lost, destroyed or damaged or if rendered unfit for the work will be recovered from the contractor at the issue rate.
4. For testing the concrete and aggregate the contractor must procure the following equipments and make them available at site:-
5. Steel mould for making 45cm cube of concrete (The mould will be in two halves for easy removal)
6. Slump cone for testing consistency (slump test) the cone will be 30cm height truss casted cone with top and bottom diameters of 1cm and 20 cm respectively. In addition a steel rod 15cm diameter and 50cm in length and with tamping and rounded is to be procured.
7. For finding fineness modules and coarse aggregate hand operated over a apparatus may be procured along with weighing machine for weighing the aggregate and the sand.
8. In the case of any breach of the terms of the contract the contract will be closed at the risk and the costs of the contractor in addition to the forfeiture of the EMD & security deposit.
9. The testing is to be done at the contractor's cost for all building materials and also for concrete cubes.
10. The work shall be executed and measured as per metric dimension given in the schedule of quantities drawing etc. (F.P. units where indicated are for guidance only)

11. Unless otherwise specified the entire rate quoted by the contractor shall be for works at all levels of the buildings.
12. Rates for every item of work to be done under this contract shall be for all lifts and leads, heights, depths, lengths and widths.
13. Except when specifically mentioned in the item, otherwise nothing extra will be paid on this account.
14. The rate for all item in which use of cement is involved is inclusive of charges for curing.

## TECHNICAL SPECIFICATIONS

### CHAPTER 5

#### WATER RETAINING STRUCTURES

- 5.0 Elevated Service Reservoir/Ground Level Service Reservoir/Sump etc
1. Each service reservoir shall be executed as per the drawings and specifications and as directed by the Engineer in charge.
  2. The service reservoirs shall be provided with suitable size CI D/F Pipes for inlet, delivery, overflow and scour connections and painted with two coats of anticorrosive paint as per BoQ/Drawing.
  3. Suitable size sluice valves with gear arrangements wherever necessary shall be provided for all inlet and outlet connections with valve pits.
  4. Water level indicators enamel painted with float and painted with graduations in metric units shall be provided to indicate water level inside the reservoir.
  5. Suitable size and required number of ventilators, manhole covers shall be provided as directed by the Employer.
  6. RCC spiral staircases shall be provided for outside and access ladder inside the service reservoirs as per Specifications.
  7. The finishing colour of the service reservoirs shall be aesthetically selected after its approval by Employer and double coating shall be applied after water tightness certificates is given by the Engineer.
  8. Letterings to indicate the capacity and other details as directed by the Employer shall be written on the side wall of the service reservoirs.
  9. Valves shall be provided with valve pits and cover to bear the loads coming on it as per departmental type design and plans.

#### 5.1 Testing for Water Tightness

- 5.1.1 For water retaining structures above ground level, the requirement of the test shall be deemed to be satisfied if the external face shows no sign of leakage and remain apparently dry over a period of observation of seven days after filling upto maximum water level and allowing seven days period for absorption.
- 5.1.2 In case of underground structures with top covered the tanks shall be deemed to be water tight if the total drop in water level over a period of seven days does not exceed 40mm.
- 5.1.3 If the structure does not satisfy the condition of the test period, the test may be extended for a further period of seven days and if the specified conditions of the test are satisfied the structures shall be considered to be water tight.

**5.1.4** In case of unsatisfactory test result, the contractor; shall ascertain the cause, make all necessary repairs and repeat the procedure in the preceding clauses until the test has been passed satisfactorily at no extra cost to the Employer.

**5.1.5** The fact carrying out water tightness test should be recorded in 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 stamp paper for a value of Rs.22.50 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 upto maximum water level in the case of service reservoir/over head tank/water retaining structure). If defects are noticed within the stipulated period of 24 months of satisfactory performance, the defects should be rectified by the contractor at his own cost and the performance period again shall be reckoned from the date of completion of the rectification of defects by the contractor. In the case of service reservoir/over head tanks and other water retaining structures during this period, structure under full working head of water should show no sign of leakage. The test for water tightness should be arranged to be carried out and completed within 30 days from the date of intimation, by the Engineer. The testing of the service reservoir/OHT/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 specification as per IS:3370 (Part-1)-1965 as amended from time to time and the other specifications as mentioned in the bid document.

## **5.2 C.I. Pipe Connections**

5.2.1 The vertical pipe connections shall be hoisted and fixed true to plumb without any deviation from the verticality as directed by the Engineer-in-charge.

5.2.2 The jointing of pipes shall conform to the requirement and all required jointing materials shall be arranged by the contractor at his cost.

## **5.3 Scour**

5.3.1 Scour and overflow arrangements should be connected and let to a common pit from where it will lead to the nearest open drain.

## **5.4 Maintenance**

5.4.1 During the maintenance period, the contractor should clean the elevated service Reservoir and sump at the intervals as directed by the Engineer.

## TECHNICAL SPECIFICATION

### CHAPTER – 6

#### APPURTENANCES

##### A. SLUICE VALVES

###### 6.1 GENERAL:

All valves shall be double – flanged valves of Indian manufacture and in the size range to 300mm <sup>50mm</sup> conforming to IS:14846 – 2000 or any other national standard equivalent or higher than the Indian Standards mentioned. The materials used in construction, the design and all other relevant features shall be such that the valves are entirely suitable for use of force mains. Valves shall be of suitable pressure rating which shall not be less than twice the normal operating pressure.

###### DESIGN:

The design of the valves will be such that erosion, cavitation, vibration and head loss (in the fully open position) shall be a minimum.

###### 6.2 SLUICE VALVES:

Sluice valves shall generally conform to IS:14846 – 2000. Valves should close with clockwise rotation of the hand wheel. The direction of closing should be marked on the hand wheel. Valves shall be flanged (flat faced) and drilling shall conform to IS: 1537.

###### 6.3 MATERIALS OF CONSTRUCTION:

Body	-	C.I to IS: 210 Gr. FG 200
Wedge	-	C.I. to IS: 210 Gr. FG 200
Seat Rings	-	Bronze / SS 304
Channel lining	-	Gun Metal
Shoe	-	Gun Metal
Spindle	-	SS AISI 431

###### Parameters:

Quantity	-	As per Bill of Quantities
Size	-	As per Bill of Quantities
Rating	-	10 Bar (PN 1.0)

###### Shop Testing Witnessing:

Seat leakage test	-	10 bar (1.0 M)
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Pa) Body Hydrostatic test - 15 bar  
(1.5 M Pa) Back Seat Leakage test -  
15 bar (1.5 M Pa)

#### 6.4 VALVE BODIES:

##### A.

##### **Castings**

:

The structure of the castings shall be homogeneous and free from non-metallic inclusions

and other injurious defects. All surface of casing which are not machined shall be smooth and shall be carefully field to remove all foundry irregularities.

##### B.

##### **Forgings**

:

All major stress bearing forgings shall be made to a standard specifications, which shall be submitted if required to the Engineer for approval before work is commenced. Forgings shall be subjected to non-destructive tests to detect flaws if any. Forgings shall be heat treated for the relief of residual stresses. The name of the maker and particulars of the heat treatment proposed for such forging shall be submitted to the CMWSSB. The Executive Engineer or his inspector may inspect such forgings at the place of manufacture with a representative of the Contractor.

##### C.

##### **Workmanship**

:

Workmanship and general finish shall be of first class commercial quality and in accordance with best workshop practice.

All similar items of the valve and their component parts shall be completely interchangeable. Spare parts shall be manufactured from the same materials as the originals and shall be accurate and to specified tolerances so that replacements made to manufacturer's drawings may be readily installed.

All parts, which can be worn or damaged by dust, shall be totally enclosed in dust proof housings.

##### D. **Protective Coating:**

Protective coating shall comply with IS:14846 – 2000.

#### 6.5 LUBRICATION:

All the points where lubrication is needed, the Contractor shall furnish full details of the method to be employed. The supply of the requisite lubricating equipment and lubricants for

commissioning and operating and maintaining the valves shall be furnished.

**6.6 FLANGES:**

Valves of sizes 80mm – 300mm shall have flat flanges as per IS:1538 Part IV Table – 1. The flange –

to – flange distances shall be as per IS 14846.



#### **6.7 JOINTING MATERIALS:**

Each valve shall be supplied under this contract, with all requisite joint rings, nuts, bolts and washers for making the joints on all the valves to be installed under this contract. Jointing material between the connecting flanges shall conform to the relevant IS code. Unless otherwise specified bolting used for jointing exposed connections shall be of carbon steel, conforming to IS 210 Grade 20 Grade B, with galvanized finish.

#### **6.8 FACTORY TESTS:**

All the valves shall be tested at the factory for smooth, trouble free operation and operating torque requirements by operating between fully open and fully closed position three times.

The hydrostatic tests shall consist of Closed End Tests where valve is held on both sides. Each valve is subjected to three hydraulic testes.

- a) Wedge open and pressure applied for 5 minutes to the whole body of the valve pressure given in Section 19.4.
- b) Second Test shall be applied to one face with pressure given in Section 19.4
- c) Third Test shall be similar to second, but pressure applied to the other side of the wedge with same pressure.

For valves having terminal position shall be subjected to open-end test. Testing for valves from Foreign Manufactures:

- **Sampling:** Each valve is recommended to be tested.
- **Testing and Inspection:** For foreign manufacturer: The testing and inspection procedure in this case shall confirm with respective equivalent code.

#### **B. AIR VALVES**

##### **6.9 CONSTRUCTIONAL FEATURES:**

Double ball air valves shall be of the kinetic, double orifice type able to release air in small quantities under pressure and in large quantities during filling. They have to allow for large inflow of air during emptying. The type and locations shall be fixed according to the detailed design and after approval by the Engineer in charge. The valves shall have an integrated sluice valve. If required, they shall be installed on a flange welded on the MS pipe / special. The possible air velocity (inflow and outflow) must be at least 20 m/s

**Materials of Construction and Pressure Rating :**

Body	CI to IS Gr. FG 200
Cowl	CI to IS Gr. FG 200
Valve seat, nut	Leaded tin bronze
Spindle	SS. AISI 304
Orifice	SS. AISI 304
Ball	Seasoned teak wood, covered with neoprene rubber

Ball seat	Anti-stick material such as nitrile rubber or equivalent
Pressure	Suitable for 16 Kg / sq.cm, Working Pressure

## **6.10 FIXING OF VALVES:**

### **6.10.1 General:**

The specification lays down the requirement for lowering, laying and jointing Sluice Valves.

### **6.10.2 Preparation:**

The sluice valves and tailpieces shall be examined before laying for cracks and other flaws. Only undamaged S.S. shall be used.

The sluice valve shall be operated and checked before laying. All grit and foreign material shall be removed from the inside before placing. All the four faces shall be thoroughly cleaned and coated with a thin layer of mineral grease. The tightening of gland shall be checked with a pair of inside calipers. Clearance between the top of stuffing box and the underside of the gland shall be uniform on all sides.

### **6.10.3 Jointing Materials:**

The Contractor shall provide all the necessary jointing materials such as nuts, bolts, rubber packing, white zinc, jute, lead wool et., at is cost. All tools and plant required for installation of sluice valve shall be provided by the Contractor at his cost. All the jointing materials shall be got approved from the Engineer in charge before use. The nuts and bolts shall confirm to IS:1364 and the rubber packing shall confirm to IS:638.

### **6.10.4 Installation:**

The sluice valve shall be lowered into trench carefully, so that no part is damaged during lowering operation. If necessary tailpieces shall be fitted with sluice valve first outside the trench and then lowered into the trench.

The rubber packing shall be three ply and of approved thickness. The packing shall be of full diameter of the flange, with necessary holes and the sluice valve bore. It shall be even at both the inner and outer edge. The flange faces shall be thoroughly greased. If flanges are not free the Contractor shall use thin fibres of lead.

After placing the packing, nuts and bolts shall be inserted and tightened to make the joint.

The valve shall be tightly closed being installed to prevent any foreign materials from getting in between the working parts of the valve.

Each flange bolt shall be tightened a little at a time taking care to tighten diametrically opposite bolts alternately.

The sluice valve shall be installed in such a way that spindle shall remain in truly vertical position. The other end of the tailpiece shall be fitted with pipes so that continuous lines can

work. Extra excavation necessary to facilitate the lowering and fixing of sluice valve shall not be paid for.

**6.10.5 Testing:**

After installation of sluice valve the same is tested to 1 ½ times of its test pressure. The joints of sluice valve shall withstand the test pressure of pipelines.

Defects noticed during test and operation of sluice valve shall be rectified by the Contractor at his own cost, without any extra claim, to the entire satisfaction of the Engineer in charge.

**6.10.6 Mode of Measurement and Payment:**

The measurement shall be taken per number of sluice valves of specified size and payment shall be on number basis for providing and fixing.

**6.11 Fixing of Air Valves:**

**6.11.1 General:**

The specification placed down requirement for lowering laying and fixing Air Valves.

**6.11.2 Preparation:**

The air valves and the isolating valves shall be examined before laying for cracks and other flaws. Only undamaged air valve shall be used. The air valves shall be opened and shaken for the air opening below the vulcanite balls on the bronze seats of the balls before fixing. All grid and foreign material shall be removed from the inside before placing. The flanged face shall be thoroughly cleaned and coated with a thin layer of mineral grease. In case of screw down type, the threads shall not be in damaged condition.

**6.11.3 Jointing Materials:**

The contractor shall provide all the necessary jointing materials, such as nuts, bolts, rubber packing, white zinc jute, lead wool et., at his cost. All tools and plant required for installation of air valve shall be provided by the Contractor at his cost. All the jointing materials shall be got approved from Engineer in charge before me. The nuts and bolts shall conform to IS: 1364 and the rubber packing shall conform to IS:638.

**6.11.4 Installation:**

The air valves shall be fixed on a branched flange Tee on the main pipe line. the air valve and isolating sluice valve shall be housed in a chamber.

**6.11.5 Testing:**

The specification pertaining to sluice valve shall also apply to air valves.

**6.11.6 Mode of measurement and payment:**

The measurement shall be taken per number of air valves of specified size and payment shall be on number basis for providing and fixing.

## **6.1 Fixing of C.I. M.H. Frame and Cover in RCC slab:**

### **6.1.1 General:**

The specification includes all requirements of fixing C.I. M.H. frame and cover of specified size and weight in the RCC slab with locking arrangement. For Fixing the C.I. M.H. frame and cover of specified size and weight, the frame shall be fixed generally at the time of casting RCC slab with proper anchoring.

After fixing the M.H. frame and cover locking arrangement shall be provided as per following unless specified in the wording of the item. The size of the M.S. flat shall be 50 x10mm with MS bar U shape of 16mm diameter. The U shape M.S. bars shall be properly embedded in the RCC roof slab and anchored. The C.I. M.H. frame and cover and the locking arrangement after fixing shall be painted with anticorrosive black paint. The work shall be done to the entire satisfaction of the Engineer in charge.

### **6.1.2 Mode of measurement and payment:**

The item shall include:

- a) All labour for fixing M.H. frame and cover
- b) All material and labour of locking arrangement
- c) Painting of the frame, cover and locking arrangement

## **6.2 PRESSURE GAUGES:**

### **6.13.1 Material:**

The brief specifications for pressure gauges are as follows:

The pressure gauges shall be of Bourdon type having a range between 0 to 9 kg/ sq.cm. The diaphragm material should be of 316 SS. Accuracy of the pressure gauge shall be 1% with a dial diameter of

150mm. The case shall be of IP 65, die cast Al. The pressure gauge shall be directly mounted with connection of ½ " N.P.T.M.

### **6.13.2 Erection:**

The pressure gauges shall be, mounted as near to the process as possible. Impulse tubing / piping length shall be minimum possible. The pressure gauges shall be mounted in a vibration free location. They shall be readily accessible from grade, platform, fixed walkway or fixed ladder and shall be visible from where related equipment is operated.

The pressure gauges shall have one isolating valve and one drain / vent valves for depressuring. The drain / vent valve shall be plugged. The valves used shall be having ½ "NPTF connections and the material shall be ASTM A 216 GR. WCB or ASTM A 105 unless otherwise specified. The trim shall

be AISI 410 unless otherwise specified. All connection shall be made using thread seals preferably

PTFE  
tape.

Right tools shall be used and any limits regarding torque for tightening shall be strictly adhered to. Impulse piping shall be done using ½" O.D. seamless annealed SS tubing to ASTM A 269 GR. TP –

136 L with minimum wall thickness of 1.65mm. Compression fittings shall be used. The impulse piping must be supported by an angle of channel and strapped at every meter length. The angle / channel itself must be supported by welding it to some structure. The pressure gauge shall be covered with box.

## TECHNICAL SPECIFICATIONS

### CHAPTER 8

#### MAINTENANCE PERIOD

1. It is the sole responsibility of the contractor to Operate and maintain the entire system up to Overhead Tanks to assure the designed quantity and quality successfully for the maintenance period of 12 calendar 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 head works, 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, chemicals, repairs and renewals shall be borne by the firm / Contractor.
  - The electrical energy charges payable to TNEB during the maintenance period shall be borne by the Employer
  - The contractor shall ensure complete quality service 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



TECHNICAL

SPECIFICATION CHAPTER 9

ENVIRONMENTAL MANAGEMENT PLAN - Water  
Supply

PRE - CONSTRUCTION PHASE MITIGATION  
MESURES

Sl. No.	Potential Negative Impacts	Mitigation Measures	Time frame	Responsible agencies
<b>PRE-CONSTRUCTION STAGE</b>				
1	Clearances	All clearance required for Environmental aspects during construction shall be ensured and made available before start of work.	Before construction	ULB / PIA / Concerned Departments & agency / Contractor
2	Tree Cutting	i) Try to save the trees by changing the alignment  ii) Provide adequate protection to the trees to be retained with tree guards (e.g. Masonry tree guards, Low level RCC tree guards, Circular Iron Tree Guard with Bars) as required.  ii) Identify the number of trees that will be affected with girth size & species type along the sewer mains, pumping / lifting station sites and sewerage treatment plant site. The details to be indicated in a strip map plan.  iii) Trees shall be removed from the construction sites before commencement of construction with prior permission from the concerned department. iv) Undertake afforestation in nearby areas. v) Compensatory plantation by way of Re-plantation of at least twice the number of trees cut should be carried out in the project area.	Pre-construction & construction phase	Contractor / PIA
3	Utility Relocation	i) Identify the common utilities to be affected such as: telephone cables, electric cables, electric poles, water pipelines, public water taps, etc ii) Affected utilities shall be relocated with prior approval of the concerned agencies before construction starts.	Pre-construction & construction phase	PIA / Concerned departments
4	Baseline parameters	Adequate measures shall be taken and checked to control the Baseline parameters of Air, Water and Noise pollution. Base line parameters shall be recorded and ensured conformance till the completion of the project.	Pre-construction, construction and post-construction phase	Prospective contractor / PIA

Sl. No.	Potential Negative Impacts	Mitigation Measures	Time frame	Responsible agencies
5	Planning of temporary Traffic arrangements	<p>i) Temporary diversion will be provided with the approval of the Engineer. Detailed traffic control plans will be prepared and submitted to the Engineers for approval, one week prior to commencement of works.</p> <p>ii) The traffic control plans shall contain details of temporary diversion, details of arrangements for construction under traffic, details of traffic arrangement after cessation of work each day, SIGNAGES, safety measures for transport of hazardous</p>	Pre-construction & construction phase	Prospective contractor / PIA
6	Disposal of waste water.	<p>i) The waste water quality shall comply with the standards of TNPCB to let out into the stream / nullah /open land /irrigation purposes, and necessary permission to be obtained from the concerned department.</p> <p>ii) Ensure efficient working condition of treatment</p>	Pre-construction & construction phase	PIA
7	Storage of materials	The contractor shall identify the site for temporary use of land for construction sites /storage of construction materials, etc.	Pre-construction & construction phase	Prospective contractor / PIA
8	Construction of labour camps	<p>Contractor shall follow all relevant provisions of the Factories Act, 1948 and the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction and maintenance of labour camp.</p> <p>The location, layout and basic facility provision of each labour camp will be submitted to Engineer prior to their construction.</p> <p>The construction will commence only upon the written approval of the Engineer.</p> <p>The contractor shall maintain necessary living accommodation and ancillary facilities in functional and hygienic manner and as approved by the Engineer.</p> <p>All temporary accommodation must be constructed and maintained in such a fashion that uncontaminated water is available for drinking, cooking and washing. The sewage system for the camp must be planned. Adequate health care is to be provided for the work force.</p> <p>The layout of the construction camp and details of the facilities provided should be prepared and shall be approved by the Engineer.</p>	During the construction	Prospective contractor

ENVIRONMENTAL MANAGEMENT PLAN – WATER SUPPLY  
PROJECTS CONSTRUCTION & OPERATION PHASE MITIGATION  
MESURES

Sl. No.	Systems / Impacts	Action to be taken	Responsible agencies	Time frame for
3	Distribution Network and OHTs			
3.1	Shifting of community utilities	Ensure community consensus and minimum impact to community utilities like telephone cable, electric cables and electric poles, water taps. Proper clearance to be obtained from the concerned authorities and sent to the	Prospective contractor	Pre-construction and Construction
3.2	Laying of distribution pipelines	i) Traffic regulation: Adequate actions to direct and regulate traffic shall be taken in consultation with PIA, Dept. of Police to prevent jamming of roads during construction. While planning alternative routes, care to be taken to minimize congestion and negative impacts at sensitive receptors such as Schools & hospitals. ii) Adequate precautions should be taken while laying the water distribution lines to avoid	Prospective contractor	During construction
3.3	Using of modern	Using of modern machineries such as JCBs, backhoes etc, shall be used to minimize the construction period.	Prospective	During construction
3.4	Disposal of construction debris and excavated materials.	i) A suitable site should be identified for safe disposal, in relatively low lying areas, away from the water bodies, residential and agricultural fields etc., and got approved by the Engineer. ii) Care should be taken that dumped material does not affect natural drainage system. iii) Minimize the construction debris by balancing the cut and fill requirements.	Prospective contractor	During construction
3.5	Dust Pollution near settlements	i) Unpaved haul roads near / passing through residential and commercial areas to be watered thrice a day. ii) Trucks carrying construction material to be adequately covered to avoid the dust pollution	Prospective contractor	During construction
3.6	Vehicular noise pollution at residential / sensitive receptors.	i) Idling of temporary trucks or other equipment should not be permitted during periods of loading / unloading or when they are not in active use. The practice must be ensured especially near residential / commercial / sensitive areas. ii) Construction activity induced noise level shall be mitigated at the residential and sensitive receptors. The Contractor shall employ mitigation measures as directed by the PIA. iii) Stationary construction equipment will be kept at least 500m away from sensitive receptors. iv) All possible and practical measures to control noise emissions	Prospective contractor	During construction

Sl. No.	Systems / Impacts	Action to be taken	Responsible agencies	Time frame for
3.7	Protection of residential / sensitive receptors.	i) Noisy construction operations in residential and sensitive areas should be restricted between 7.30 am and 6.00 pm. ii) Preventive maintenance of construction equipment and vehicles to meet emission standards and to keep them with low noise. iii) Provision of enclosing generators and concrete mixers at site. iv) Sound barriers in inhabited areas shall be installed during the construction phase. v) Adequate barricading / other measures to protect dust pollution near sensitive	Prospective contractor	During construction
3.8	Barricading site	The construction site should be barricaded at all time in a day with adequate marking, flags, reflectors etc. for safety of general traffic movement and pedestrians	Prospective contractor	During construction
3.9	Safety Aspects	i) Adequate precautions shall be taken to prevent the accidents and from the machineries. All machines used shall conform to the relevant Indian standards Code and shall be regularly inspected by the PIA. ii) Provide temporary crossing / bridges wherever necessary to facilitate normal life and businesses iii) Where loose soil is met with, shoring and strutting shall be provided to avoid collapse of soil. iv) The contractor shall supply all necessary safety appliances such as safety goggles, helmets, safety belts, ear plugs, mask etc to workers and staffs. v) A readily available first aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules in every work zone	Prospective contractor	During construction
4.0	<b>Environmental enhancement and special issues:</b>		<b>Implementing Agency</b>	<b>Location</b>
4.1	Flora and Chance found Fauna	The contractor will take reasonable precaution to prevent his workmen or any other persons from removing and damaging any flora (plant/vegetation) and fauna (animal) including fishing in any water body and hunting of any animal. If any wild animal is found near the construction site at any point of time, the contractor will immediately upon discovery thereof acquaint the Engineer and carry out the Engineer's instructions for dealing with the same. The Engineer will report to the near by forest office (range office or divisional office) and will take appropriate steps/ measures, if required in	Prospective contractor	Project area
4.2	Chance Found Archaeological Property	All fossils, coins, articles of value of antiquity, structures and other remains or things of geological or archaeological interest discovered on the site shall be the property of the Government and shall be dealt with as per provisions of the relevant legislation.	Prospective contractor	Project area

Sl. No.	Systems / Impacts	Action to be taken	Responsible agencies	Time frame for
		<p>The contractor will take reasonable precautions to prevent his workmen or any other persons from removing and damaging any such article or thing. He will, immediately upon discovery thereof and before removal acquaint the Engineer of such discovery and carry out the SC's instructions for dealing with the same, waiting which all work shall be stopped.</p> <p>The Engineer will seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence the work in the site.</p>		
4.3	Monitoring of environment parameter	The contractor shall undertake seasonal monitoring of air, water, noise and soil quality through an approved monitoring agency. The parameter to be monitored, frequency and duration of monitoring plan shall be prepared	<b>Prospective contractor</b>	Corridor of Impact
4.4	Sensitive Areas	The sensitive areas like Schools, hospitals to be provided with suitable noise barriers and safety measures, prior to the start of work in order to minimize the dust and noise impacts due to vehicle movement during construction and their effectiveness to be checked during operation phase.	<b>Prospective contractor</b>	Corridor of Impact
4.5	Clearing of construction camps and restoration	Contractor to prepare site restoration plans for approval by the Engineer. The plan is to be implemented by the contractor prior to demobilization. On completion of the works, all temporary structures will be cleared away, all rubbish cleared, excreta or other disposal pits or trenches filled in and effectively sealed off and the site left clean and tidy, at the contractor's expenses, to the entire satisfaction of the Engineer.	<b>Prospective contractor</b>	All construction workers camps
4.6	Tree Protection,  Tree Planting,	<ul style="list-style-type: none"> <li>Giving due protection to the trees that fall in the shoulders /corridor of impact shall be the prime focus during Construction/post construction</li> <li>Masonry tree guards, Low level RCC tree guards, Circular Iron Tree Guard with Bars, use of plate compactors near trees may also be considered where necessary</li> <li>Re-plantation of atleast twice the number of trees cut should be carried out along the project road. Since the major portion of the project road may pass through open lands, planting of trees along the entire stretch of the road is recommended as an enhancement measure.</li> </ul> <p>Growth and survival of trees planted shall be ensured and monitoring done at least for a period of 3 years .Survival status shall be reported on monthly basis to Engineer in-charge.</p>	Concerned agency/Contractor / PIA	All tree plantation / greenery areas of the project

## Environmental Monitoring Plan

To monitor the extent of environmental impact of the proposed /implemented project, the contractor has to periodically monitor the ambient environmental quality along the proposed project area. The monitoring requirement for the different environmental components is presented in table below

### Environmental Monitoring Plan

<b>Air Quality Monitoring</b>	
Project stage	Pre Construction , Construction & operation period (as agreed)
Parameter	SPM, RPM, SO <sub>2</sub> , NO <sub>x</sub> , CO and Pb
Sampling Method	Use method specified by CPCB for analysis
Standards	Ambient Air Quality Standards, CPCB, 1994, Air (Prevention and Control of Pollution) Act,1981
Frequency	Once before start of work & once every season of the year during construction period & upto 18 months (operation Period)
Duration	Continuous 24 hours / or for 1 full working day
Location	Sensitive locations, especially in the downwind direction along the pipe laying work, pumping / lifting station locations, WTP site.
Measures	Wherever air pollution parameters increase above specified standards, additional measures as decided by the Engineer shall be adopted
Implementation	Contractor through approved monitoring agencies
Supervision	Implementing agency
<b>Water quality Monitoring</b>	
Project stage	Pre Construction, Construction & Operation period (as agreed)
Parameter	<ul style="list-style-type: none"> <li>• pH, BOD, COD, DO, TDS, Pb, Oil &amp; Grease and Detergents for Surface water.</li> <li>• Water pH, TDS, Total hardness, Sulphate, Fluorides, Chloride, Fe, Pb for groundwater.</li> </ul> In addition to parameters (E.coli) determining drinking water quality.
Sampling Method	Grab sample collected from source and analysis as per Standard Methods for Examination of water and Waste water.
Standards	Indian standards for Inland Surface Water (IS; 2296, 1982) and for Drinking water (IS; 10500,1991)
Frequency	Twice a year (pre monsoon and post monsoon seasons) during the construction period
Duration	Grab sampling
Location	locations representing water quality at <ul style="list-style-type: none"> <li>• source &amp; surface water quality in the vicinity</li> <li>• transmission lines</li> <li>• storage points,</li> <li>• distribution at representative locations including tail end.</li> </ul>
Measures	At locations of variation in water quality/increased pollution, remedial measures to be adopted /all inflow channels shall be checked for pollution loads and channels delivering higher pollution load to the source shall be terminated from feeding the water source.
Implementation	Contractor through approved monitoring agencies
Supervision	Implementing agency

<b>Noise Level Monitoring</b>	
Project stage	Pre Construction , Construction & operation period (as agreed)
Parameter	Noise levels on dB (A) scale.
Special guidance	<ul style="list-style-type: none"> <li>Free field at 1 m from the equipments whose noise level are being determined.</li> <li>Equivalent noise levels using an integrated noise level meter kept at a distance of 15m from edge of pavement</li> </ul>
Standards	National Ambient Air Quality Standards in respect of Noise, Noise Pollution (Regulation and Control) Rules, 2000
Frequency	Once every season (except monsoon) for each year of construction
Duration	Reading to be taken at 15 seconds interval for 15 minutes every hour and then averaged
Location	<ul style="list-style-type: none"> <li>Wherever the contractor decides to locate the equipment yard.</li> <li>At sensitive locations such as school, hospitals etc</li> </ul>
Measures	In case of noise levels causing disturbance to the sensitive receptors, management measures as suggested in the EMP shall be carried out.
Implementation	Contractor through approved monitoring agencies
Supervision	Implementing agency
<b>Soil Quality Monitoring</b>	
Project stage	Pre Construction, Construction & Operation (as agreed)
Parameter	Monitoring of Pb, SAR and Oil & Grease
Sampling Method	<ul style="list-style-type: none"> <li>Sample of soil collected to be acidified and analysed using absorption spectrophotometer</li> </ul>
Standards	Threshold for each contaminated set by IRIS database of USEPA until national standards are promulgated
Frequency	<ul style="list-style-type: none"> <li>During the pre monsoon post monsoon seasons each year for the entire construction and operation phase</li> </ul>
Duration	Grab sampling
Location	<ul style="list-style-type: none"> <li>At pumping / lifting station, WTP locations, OHT/distribution points etc</li> </ul>
Measures	At location of increased in pollution levels, source shall be identified and shall be diverted.
Implementation	Contractor through approved monitoring agencies
Supervision	Implementing agency

Apart from the above mentioned monitoring requirements, any major accidents / spillage during bulk transport of hazardous materials by the contractor, depending on the type of spillages / accidents, the parameters to be monitored will be decided by the Engineer and should be carried out by the contractor through approved monitoring agencies and supervised by the Implementing agency at their own cost.

#### **FORMATS FOR REPORTING:**

Formats for reporting / monitoring the progress / parameters achieved will be finalized in consultation with the successful bidder.

#### **Environmental Compliance Report**

The contractor shall submit a monthly progress report as per the reporting format approved by the Engineer, on the status of the implementation of the EMP, and get it duly approved by the Engineer for its compliance and for proceeding with the work. The Engineer and the Environmental and Social Safeguard (ESS) Manager, who will have access and authority to monitor the status based on the same and for which necessary facilities shall be made by the contractor.

## TECHNICAL SPECIFICATONS

### CHAPTER 9

#### REFERENCE /CODE OF PRACTICE (Latest Version shall apply)

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 1 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	383-1970
For concrete.	4082/1977
Sand for Masonry Mortar	2116-1965 and 1542/1977
Methods of tests for aggregates for concrete	2386-1963 (Part 1 to 8)
Part 1-Particle size and shape	2386-1963 (Part-1)
Part II-Estimation of deleterious Materials & Organic impurities	2386-1963 (Part-II)
Part III – Soundness	2386-1963 (Part-III)
Methods for sampling of aggregates for concrete	2430-1986
Specifications for test sieves	460-1978
Part-1-Wire cloth test Sieves	(Part-I)
Common Burnt clay building bricks	1077-1976



### **Mild Steel and Medium tensile steel bars and hard**

Drawn steel wire, concrete reinforcement, Part-I-Mild Steel & Medium tensile steel Bars Part-II-Hard drawn steel wire	432-1982
High Strength deformed steel bars and wires for Concrete reinforcement	1786-1985
Bending and flexing of bars for concrete reinforcement	2502-1969
Recommendations for detailing of reinforcement in reinforced concrete works	5525-1969
Method for tensile testing of steel wire	1521-1972
Method of test for determining modulus of elasticity	2854-1964
Glossary of terms relating to cement concrete (Part 1 to 12)	6461-1972
Methods of test for strength of concrete	516-1959
Methods of sampling and analysis of concrete	1990-1959
Methods of testing bond in reinforced concrete Pull out test	2770-1967
Methods of test for permeability of cement Mortar and concrete	3085-1965
Methods of test for splitting tensile strength Of concrete cylinders	5816-1970
Methods of tests for determining setting time of Concrete by penetration resistance	8142-1976
Code of practice for construction of	2911 (Part I)
Pile foundations (concrete piles)	Sec-1-1979
Driven cast-in-situ concrete piles	Sec-2-1979
Bored cast –in-situ piles	Sec-3-1979
Driven pre-cast concrete piles	Sec-4-1984
Bored pre-cast concrete piles	
Code of practice for construction of raft foundation	2950-1981
Design Aids for reinforced concrete	SP 16-1980
Explanatory Hand Book on Codes for earth Engineering	SP 22-1982
Explanatory Hand Book on IS Code 456-19 Hand Book on causes and prevention of cracks in buildings	SP24-1983 SP 25-1984
Hand Book on concrete reinforcement & detailing	SP 34-1987
Brick Masonry	2212-1962

Construction of Stone Masonry	1957-1967
Centrifugally Cast (Spun) Iron pressure pipes for Water, gas and sewage including fittings	1536-1989
Specifications for Centrifugally Cast (Spun) D.I Pipes for Water, Gas and Sewage	8329-1990
DI Fittings for pipes for water, gas & sewerage	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)
Rubber rings for jointing C.I. Pipes, RCC Pipes & AC Pipes	5382-1969
Pig Lead (caulking lead)	782-1978
Hemp yarn	6587-1966
Rubber Insertion to be used in jointing CI D/F pipes	638-1979
Bolts & Nuts to be used in jointing CI D/F Pipes	1363-1967
Unplasticized PVC Pipes for potable water supplies.	4985-1988
Injection moulded PVC socket fittings with Solvent cement joints for water supplies.	7834-1987 (Part 1 to 8)
Fabricated PVC fittings for potable water supplies	10124-1988 (Part 1 to 13)
Methods of test for unplasticized PVC pipes for Potable water supplies	12235-1986 (Part 1 to 11)
Sluice valves for water works purposes (50 to 300 mm 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 Cast-Iron Pipes	3114-1985
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 Scaffolds	3696-1966 (Part I)
Part II-Ladders	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
Hard rolled mils steel for concrete	1139-1966
Hard drawn Steel Wire	1566-1982
<b>American Society for Testing of Materials</b>	
British Standard	2494-1955 (Part I)
Welding Electrodes	814-1970
Steel Sheets	225-1975
Guinitting	7322-1994
Welded Joints	3589-1966 and 2041-1962
Tensile Test	223-1950
<b>Mechanical and Electrical Works</b>	
Submersible Pump	8030-1976
Submersible Motor	9283-1979
Earthing	3043-1966
Transformer	1180-1964
Generator	22 53-4722

## **ADDITIONAL SPECIFICATION**

1. The arrangements of MS rods for all RCC works shall be in accordance with the working drawing supplied.
2. (i) Payments for centering works for all RCC items shall be made only after the concrete is laid, even though separate items for centering works are included in the schedule. The centering and form work shall be provided to the extent and area ordered by the Executive Engineer during execution.  
(ii) All cement concrete for RCC works shall be machine mixed and vibrated.  
(iii) All lime mortar shall be ground in mortar will be as per TNBP.

### **CEMENT**

The contractor has to make his own arrangements for the procurement of Cement of required Specifications for the works subject to the followings:

- (a) The contractor shall procure cement required for the works only from reputed cement factories (main producer or their authorized agents, manufacturing cement to ISI standard) acceptable to the Engineer – in – charge. The Contractor shall be required to furnish to the Engineer – in – charge bills of payment and cost certificates issued by the manufacturers or their authorized agents to authenticate procurement of quality cement from the approved cement factory. The contractor shall make his own arrangement for safe haulage and adequate storage of cement.
- (b) The contractor shall procure in standard packing of 50kg per bag from the authorized manufacturers. The contractor shall make necessary arrangement at his own cost to the satisfaction of Engineer – in – charge for actual weightment of random sample from the available stock and shall conform to the specification laid down by the Indian Standard Institution or other standard foreign institution as the case may be. Cement shall be go tested for all the tests as directed by the Engineer–in–charge atleast one month in advance before the use of cement bags brought and kept at site godown.
- (c) The employer will furnish air reccraing agents and admixtures required to the contracts free pf cost at the employer stores. The use of such admixtures and agents shall be made as per the instructions of the Engineer–in–charge. The cost of cartage / storage handling, batching mixing shall be borne by the Contractor and shall be included by him to unit rate tendered for concrete.
- (d) The contractor should store the cement of 60 days requirement atleast one month advance to ensure the quality of cement to brought to site and shall not remove the same without the written permission of Engineer–in–charge.  
The contractor shall forthwith remove from the works area, and the cement that the Engineer–in–charge may disallow for use on account of failure to meet with required quality and standard.

- (e) The contractor will have to construct sheds for storing cement having capacity not less than the cement required for 90 days use, at approved locations. The Engineer-in-charge or the representative shall have free access to such store at all times.
- (f) The contractor shall further at all times satisfy the Engineer-in-charge on demand by production of records and test books or by submission of returns and other proofs as directed that the cement is being used as tested and approved by the Engineer-in-charge for the purpose and the contractor shall at all times, keeps his record upto date and enable the Engineer – in – charge to apply such checks as he may desire.
- (g) Cement which has been unduly long in storage with the contractor or alternatively has deteriorated due to inadequate storage and thus become unfit for use on the works will be rejected by the Department and no claim will be entertained. The contractor shall forth with remove from the work area any cement the Engineer – in – charge may disallow for use of work and replace it by cement complying with the relevant Indian standards.

**STEEL**

The contractor shall provide mild steel (MS) reinforcement basis, High Yield strength deformed (HYSD) bars, rods and structural steel etc., required for the works, only from the main and secondary producers manufacturing steel or other authorized agents to the prescribed specifications. Bureau of Indian standards requirements and licensed to affixing ISI set certificate issued by the Government approval laboratory certification are to be produced to Engineer-in - charge before use on works.

The Diameters and weight of steel should be as follows:-

Sl. No.	Diameter of Rod	Sectional Weight in kg per running meter both for plain & HYSD Steel
1.	6 Millimeters	-
2.	8 Millimeters	-
3.	10 Millimeters	-
4.	12 Millimeters	0.89
5.	14 Millimeters	0.21
6.	16 Millimeters	1.58
7.	18 Millimeters	2.09
8.	20 Millimeters	2.47
9.	22 Millimeters	2.98
10.	25 Millimeters	3.85
11.	28 Millimeters	4.83
12.	25 Millimeters	6.35
13.	20 Millimeters	4.03
14.	32 Millimeters	6.31
15.	36 Millimeters	6.71
16.	40 Millimeters	7.99
17.	42 Millimeters	8.06
18.	48 Millimeters	10.88

Note: - If any rods other than those specified above are used the weight shall be as per standard steel tables.

# THANJAVUR CITY MUNICIPAL CORPORATION TOWN MAP

SCALE: 1CM - 128 METRE  
EXTENT - 36.31 Sq.Km



**REFERENCE:-**

Municipal Boundary	
Ward Boundary	
River	
1. Municipal Office	
2. Collector Office	
3. Dhadeeswarar Temple	
4. Shivanagai Garden	
5. Railway Junction	
6. New Bus Stand	
7. Old Bus Stand	
8. Palace	
9. Manimandham	
10. Medical College	

# THANJAVUR CITY MUNICIPAL CORPORATION WATER SUPPLY NETWORK



