TAMILNADU WATER SUPPLY AND DRAINAGE BOARD
TRICHY-PUDUKKOTTAI CIRCLE,TRICHY

BID DOCUMENT
Volume – I (COVER- I)

NAME OF WORK: Replacement of existing 140mm dia PVC pipes with 150mm DI S/S K7 pipes from Kolakudipatty BS to Appananallur in the CWSS to Kolakudi in Thottiyam union of Trichy district under MNP fund for Budget for the year 2019-2020 (REACH II) including trial run for 6 months and free maintenance for 6 months (period of completion 6 Months)

Last date of submission : Up to 03.00 P.M. on 26.09.2019.

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TAMILNADU WATER SUPPLY AND DRAINAGE BOARD
INVITATIONS FOR BIDS - TWO COVER – PERCENTAGE TENDER SYSTEM

Bid No	03 –second call/ F. TENDER / DO1 /DB/TPC/TRY/ 2019 / dt. 05.09.2019
Eligibility	Class -I
Tender Invitee	The Superintending Engineer, TWAD Board, Trichy – Pudukkottai Circle, Integrated Office Complex, No.35, J.K. Nagar, Kajamalai (Post),Trichy – 620 023.
Sale of Bid & Place of Sale	**12.09.2019 to 25.09.2019** at O/o the Executive Engineer, TWAD Board Maintenance Division, **Trichy,** by cash or Demand Draft for Rs.1000 + 12% GST
Downloading	www.tenders.tn.gov.in and www.twadboard.gov.in. (free of cost)
Pre Bid meeting	20.09.2019 at 11.00 AM at the office of the Tender Invitee
Bid Submission	26.09-2019 before 3.00 PM at the office of the Tender Invitee.
Bid Opening	26.09.2019 at 3.30 PM at the office of the Tender Invitee

Sl.No	**Name of Work**	**Value of work (Approx.) Rs. in lakhs**	**Bid Security in Rupees**
1	Replacement of existing 140 mm dia PVC pipes with 150mm DI S/S K7 pipes **FROM KOLAKKUDIPATTY BS TO APPANANALLUR** in the CWSS to Kolakudi in Thottiyam union of trichy district . Under MNP funds for budget for the year 2019-2020 (REACH-II)	83.60	50,000/-

Sd.A.Senthilkumar 05.09.2019
Superintending Engineer (i/c)TWADBoard,
Trichy-Pudukkottai Circle, Trichy

To
All the registered contractors (Class – I)
Copy submitted to the Managing Director, TWAD Board, Head Office, Chennai.5 for favour of kind information.
Copy submitted to the Chief Engineer, TWAD Board, Thanjavur for favour of kind information.
Copy to all the Superintending Engineers of TWAD Board for vide publicity.
Copy to all the Executive Engineers of this circle for vide publicity.
Spare copy – 5 Nos.

forSuperintending Engineer,TWADBoard,
Trichy-Pudukkottai Circle, Trichy

TENDERER SUPERINTENDING ENGINEER/TWAD,

TAMIL NADU WATER SUPPLY AND DRAINAGE BOARD

INVITATIONS FOR BIDS - TWO COVER – PERCENTAGE TENDER SYSTEM

AMENDMENT-1

As a IFB No.03 –second call/ F. TENDER/DO1/DB/TPC/TRY/ 2019/ dt. 05.09.2019
partial modification in Tender value of the following Amendment-1 is issued

Sl No.	Name of work	Approximate value of work (Rs. in Lakhs)	
		Already given	**Now read as**
1	Replacement of existing 14 0mm dia PVC pipes with 150mm DI S/S K7 pipes **FROM KOLAKKUDIPATTY BS TO APPANANALLUR** in the CWSS to Kolakudi in Thottiyam union of trichy district . Under MNP funds for budget for the year 2019-2020 (REACH-II)	83.60	85.10

The other terms and conditions stipulated in the tender notice remain unaltered.

A.Senthil kumar
Superintending Engineer (i/c), TWADBoard
Trichy-Pudukkottai Circle, Trichy

To
All the registered contractors (Class – I)
Copy submitted to the Managing Director, TWAD Board, Head Office, Chennai.5 for favour of kind information.
Copy submitted to the Chief Engineer, TWAD Board, Thanjavur for favour of kind information.
Copy to all the Superintending Engineers of TWAD Board for vide publicity.
Copy to all the Executive Engineers of this circle for vide publicity.
Spare copy – 5 Nos.

forSuperintending Engineer,TWADBoard,
Trichy-Pudukkottai Circle, Trichy

II. LETTER OF APPLICATION

(Letter head paper of the Applicant, or lead partner of the Joint Venture, including full postal address, telephone no., fax no., cable address, and E-Mail)

Dated

To

The Superintending Engineer, TWAD Board,
Trichy – Pudukkottai Circle,
Integrated Office Complex,
No.35, J.K. Nagar, Kajamalai (Post),
Trichy – 620 023.

Sir,

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

INVITATION FOR BID NO.

03 –second call/ F. TENDER / DO1 /DB/TPC/TRY/ 2019 / dt. 05.09.2019

Name of work: Replacement of existing 140mm dia PVC pipes with 150mm DI S/S K7 pipes from Kolakudipatty BS to Appananallur in the CWSS to Kolakudi in Thottiyam union of Trichy district under MNP fund for Budget for the year 2019-2020 (REACH II) including trial run for 6 months and free maintenance for 6 months (period of completion 6 Months)

. Attached to this letter please find copies of original documents defining

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

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

This application is made in the full understanding that

- bids by the applicants will be subject to verification of all information submitted for consideration, at the time of bidding.
- Your Agency reserves the right to
- amend the scope and value of any contract bid under this project

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

- Your Agency shall not be liable for any such action and shall be under obligation to inform the Applicants of the grounds for them

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

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

The Income Tax Clearance Certificate / Latest Income tax assessment order on their income tax return and GST Registration& GST return filing copy in currency are enclosed

The Bid Security of **50,000/- (Rupees Fifty thousand only**) is enclosed in the shape of (enter the form and other details of the bid security) drawn in favour of **the Executive Engineer, TWAD Board Maintenance Division, No.35, J.K. Nagar, Kaja Nagar (Post), Trichy**. It is hereby agreed that in case the bid is accepted, the Performance Security to the value and in the manner/form prescribed by the Employer will be submitted and agreement entered into within the time frame stipulated for the due fulfillment of the contract. It is agreed that in the event of non-remittance of the required Performance Security and execution of the Agreement within the stipulated time frame, the Bid Security deposited with the bid will be forfeited. In the event of non acceptance of the bid offered by the Applicant, the Employer shall intimate the applicant of the rejection of his bid, upon which the applicant can get his Bid Security refunded on an application for the same. Any notice required to be served on the applicant shall be deemed to have been sufficient if delivered personally or left at the address given here in or sent by post either by registered mail or ordinary. Such notice shall, if sent by post shall be deemed to have been served on the applicant at the time when in due course of post it would be delivered at the address to which it is sent. For all purposes, the address given herein will serve as permanent address and any change therein will be promptly intimated then and there

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

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

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

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

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

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

Dated this day of
Month of

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

TENDERER SUPERINTENDING ENGINEER/TWAD,

III . INSTRUCTIONS TO BIDDERS

A.GENERAL

1.Scope of the Bid

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

1.1 **The Superintending Engineer, TWAD Board, Trichy- Pudukkottai Circle, Trichy** , (hereinafter referred as "Employer" in these documents) invites bids for the construction of works (as defined in these documents and referred as "the works") as detailed in the Bill of Quantities. The bidder shall submit his offer for all the works detailed in the Bill of Quantities as overall tender excess/less percentage than/over total departmental value in Schedule-A .

1.2 The works covered in this turnkey bid would be as under:

NAME OF WORK:

Replacement of existing 140mm dia PVC pipes with 150mm DI S/S K7 pipes from Kolakudipatty BS to Appananallur in the CWSS to Kolakudi in Thottiyam union of Trichy district under MNP fund for Budget for the year 2019-2020 (REACH II) including trial run for 6 months and free maintenance for 6 months (period of completion 6 Months)

Details of Work Covered :

Replacement of 140 mm PVC pipe by 150 mm DI S/S K 7 pipe.			
Sl. No	**Description**	**Reach**	**Length (m)/ Nos**
1.	PUMPING MAIN and Branch pumping main	150 mm DI S/S K7 pipe	4205 m
	Supply and delivery of valves	150mm Sluice valve	1 No
2.		100mm scour valve	1 No
		50 mm Air valve	4 Nos
	Valve Pits	150mm Sluice valve	1 No
		100mm scour valve	1 No
		50 mm Air valve	4 Nos
3.	Thrust Blocks	150mm dia DI K7 DS bend 90 deg	3 Nos.
		150mm dia DI K7 DS bend 45 deg	2Nos.
		150mm dia DI K7 DS bend 22.50 deg	1 No

MAINTENANCE:

Maintenance of the entire project for a period of **6 Months (Free of maintenance)**.

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

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

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

The documents can be down loaded free of cost from the web site www.tenders.tn.gov.in by the tenderer. Tender should, thereafter be submitted duly filled and signed along with all required documents to the tender inviting authority as notified in the IFB subject to the following:

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

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

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

The Bid Document can be purchased from **the Executive Engineer/Maintenance Division, Trichy r**emitting the required cost of Bid Document as stipulated in Invitation for Bid.

2. METHOD OF BIDDING

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

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

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

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

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

3. ONE BID PER BIDDER

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

4. COST OF BIDDING.

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

5. SITE VISIT.

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

5.2 The bidder and any of his personnel or agents will be granted permission by the Employer to enter upon its premises and lands for the purpose of such visit, but only upon the express condition that the bidder, his personnel or

agents, will release and indemnify the Employer and his personnel or agents from and against all liability in respect thereof, and will be responsible for death or personal injury, loss of or damage to property, and any other loss, damage, costs and expenses incurred as a result of the inspection.

5.3 The bidder should carefully inspect the site to assess the prevalence of differing soil classifications and quote the rate for trench excavation for laying pipeline taken into account of all soil classifications that are likely to be encounter and no extra rate will be paid for excavation of trench on account of any variation in the classification of soil met with during actual execution.

B.ELIGIBILITY / QUALIFICATION CRITERIA

6 ELIGIBLE BIDDERS

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

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

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

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

7. QUALIFICATION OF THE BIDDER

7.1 GENERAL

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

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

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

7.1.4 Total monetary value of construction works performed during each of the last five years should be furnished in annexure-I.

7.1.5 Annual turnover for the past five financial years (audited balance sheet for the last five financial years) should be enclosed. Annual turnover for the past five financial years should be certified by a Registered Chartered Accountant. The certificate should be affixed with the seal of the office of the Chartered Accountant with the Registration number legibly.

7.1.6 Experience in works of similar nature and magnitude during each of the previous five financial years, the details of works on hand and works for which bid already submitted should be furnished in the annexures II, III and IV respectively.

7.1.7 List of equipments available with the bidder for deployment in the project should be furnished in annexure V

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

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7.1.9 Litigation details of the bidder with the details of the parties concerned and the amount involved should be furnished in annexure VII. The bidder should indicate clearly whether the bidder or any partner of the Joint venture has been black listed, banned or debarred in any other organisation Non – Production of this information (or) concealing the same will lead to disqualification.

7.1.10 Proposals to sub contract components of the works with experience details of the sub contractor in similar nature of works proposed to be sublet should be furnished in annexure VIII. Any sub contractor to whom one or more components are to be sublet by the main contractor, in such cases the sub contractor should have completed particular component for a value of 40% of that component, in addition to satisfying the physical experience criteria

7.1.11 An undertaking to execute and complete the work within the stipulated period as per the programme schedule should be enclosed.

7.1.12 Income Tax Clearance Certificate / latest Income tax assessment order on their income tax return (with reference to the year in which the bid is opened)

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

7.2 PERFORMANCE ELIGIBILITY.

The bidder individually should have completed and commissioned the following work for any of the Central/State Government Departments/Quasi Government / Private Organisations / Government under takings during last five financial years.

Sl. No.	Description of Component	Eligibility
1	Supply, Delivery, Laying and Jointing of Connecting main and Pumping main (150 mm DI K7 S/S pipe = 4205 m	Should have completed and commissioned atleast 1 KM length. (of respective material)

Note: i) The performance eligibility shall pertain to the similar works executed by the tenderer in any of the Central/State Government Departments / Quasi Government / Private Organisations and Government Undertakings. The performance experience should be supported by performance certificates issued by the concerned organization by an officer not less than the rank of Executive Engineer/responsible person of the private organization.

The experience gained in the last five years alone shall be taken into account to assess the performance eligibility of the bidder.

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

7.2.1 Performance certificate:

As per site bid condition, the performance experience, should be supported by performance certificates issued by the concerned organization by an officer not less than the rank of Executive Engineer /responsible person of the private organization. The experience certificate issued by an officer below the rank of Executive Engineer or on behalf of the Executive Engineer should not be considered.

For the experience certificate obtained from the departments outside the state, clarification may be obtained from the concerned department whenever felt necessary as to whether the details furnished in the certificates are genuine, before finalisation of evaluation at Circle level.

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

7.3.FINANCIAL ELIGIBILITY

a) The bidder should have achieved a minimum annual turnover of **Rs. 21.28 Lakhs (Rupees Twenty 0ne lakhs and twenty eight thousand only**) in any one of the previous five financial years.

b) Assessed bid capacity should be more than the total value of work put to tender

1) Assessed available bid capacity: **(A x N x 1.5) – B**

A: Maximum value of construction works executed in any one of the last five years (updated to current price level, i.e. at 6% per annum)

N: Number of years prescribed for completion of the works for which bids are invited.

B: Value at current price level of existing commitments and ongoing works to be completed in the **next 6 Months**.

The assessed available bid capacity should be more than the total bid value put to tender.

7.4. DISQUALIFICATION:

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

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

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

iii) been debarred as in the date of application whose previous performance is found to be poor/not satisfactory, will not be taken up for evaluation.

C.BID DOCUMENTS

8. CONTENTS OF BID DOCUMENTS

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

Invitation for Bids
Instruction to Bidders
Eligibility/Qualification Criteria
Forms of Bid
Project Completion and Milestone
Payment Schedule
General Conditions of the Contract
Technical Specifications
Bill of Quantities
Drawings
Forms of Agreement
Indemnity Bond

9. CLARIFICATION OF BID DOCUMENTS.

9.1 A prospective bidder requiring any clarification of the bid documents may notify the employer in writing or by cable (hereinafter the term cable is deemed to include telex and facsimile) at the employer's address indicated in the invitation for bid. The employer will respond to any clarification, which is received earlier than 15 days prior to the dead line for submission of bids. Copies of the employer's response will be forwarded to the purchaser of the bidding documents including a description of the enquiry but without identifying its source.

10. AMENDMENT TO BID DOCUMENTS

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

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

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

D.PREPARATION OF BIDS

11. LANGUAGE OF THE BID

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

12. DOCUMENTS COMPRISING THE BID

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

COVER – 1 (TECHNICAL BID)

i. The Bid Documents duly filled and signed.
ii) List of Annexures
a) Performance of the Bidder showing value of construction work for the past five years – (7.1.4)
b) Experience in work of similar nature and magnitude in the previous five financial year – (7.1.6)
c) Commitments of works on hand – (7.1.6)
d) Works for which Bid already submitted – (7.1.6)
e) List of Equipments available with the Bidder – (7.1.7)
f) Qualification/Experience of key personnel proposed for technical and administrative functions under this project – (7.1.8)
g) Details of litigation – (7.1.9)
h) Details of components proposed to be sublet and sub contractors involved – (7.1.10)
i) Technical staff to be employed (para 10 of General Conditions)

iii. List of Certificates.

a) Signature of the proprietor or proprietary attested by the Notary Public (2.2)
b) Signature of all the partners/power of attorney attested by the Notary Public (2.3)
c) Registration of the firm, signature of the authorized person attested by the Notary Public – (2.4)
d) A copy of the listed power of attorney authorizing the signatory of the bidder – (7.1.2)
e) Proof of registration of firm/Company (7.1.3)
f) Audited Balance Sheets – (7.1.5)
g) An Undertaking for Completion of the Project as per Programme Schedule.
h) Income Tax Clearance Certificate – (7.1.12)
i) GST Return - (7.1.13)
j) Certificate of performance issued by not less than the rank of Executive Engineer / responsible person of the private organization.
iv) Bid Security
v) Any other material required to be completed and submitted by the bidders in accordance with these instructions.

COVER – II (PRICE BID)

Priced Bill of Quantity duly signed.

12.2 The Bid should be submitted only in the original documents as issued by the Employer. No alteration or correction should be made under any circumstances in the Bid Documents issued by the Employer.
12.3 Conditional tenders are liable for rejection

13. BID PRICES

13.1 The contract shall be for the whole works as described in sub clause (1.1), based on the overall tender excess/less percentage over/than total departmental value in Schedule A in the bill of quantities submitted by the bidder.

13.2 The bidder shall fill overall tender excess/less percentage over/than total departmental value in Schedule A (both in figures and words) for the works described in the Bill of quantities. Corrections, if any, shall be made by crossing out, initialing, dating and rewriting. If there is any discrepancy between words and figures in the percentage quoted by the bidder, the lower of the two will govern.

13.3 GST applicable @12% as per Govt. of India Notification No. 20/2017 – Central Tax(Rate) Dt.22.8.2017 and G.O.MS No.264, Finance(Salaries) Dept., Dt.15.09.2017 & G.O.MS. No.296/Finance(Salaries) department/dated 09.10.2017 and as amended from time to time. The successful tenderer who is liable to be registered under CGST/IGST/UTGST/SGST/act shall submit GSTIN along with other details required under CGST/IGST/UTGST/SGST/act to TWAD Board immediately after the Award of contract. The contract shall be responsible for deposition of applicable GST to the concerned authority.

The GST amount should be arrived for the Total basic cost of all the items. From every payment made to the firm/Contractor, deduction at source towards GST shall be made for civil work contract subject to issue of amendments from time to time.

13.4 The final tender percentage excess/less quoted by the Bidder shall be fixed for the duration of the Contract and shall not be subject to adjustment on any account.

14.CURRENCIES OF BID AND PAYMENT

14.1 The unit rates and the prices are entirely in Indian Rupees.

15. BID VALIDITY

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

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

16. BID SECURITY

16.1. The bidder shall furnish, as part of his bid, a bid security of **Rs.50,000/- (Rupees Fifty thousand only)** in anyone of the following forms.

- Demand Draft drawn on a Nationalized Bank/ Scheduled banks in favour of the **Executive Engineer, TWAD Board Maintenance Division, Trichy** at banks pledged of the **Executive Engineer, TWAD Board Maintenance Division,Trichy** Call receipt of Scheduled **in, No.35,J.K.Nagar,Kaja Nagar,Trichy.**
- Government Security and National Savings Certificate pledged in favour of the **Executive Engineer, TWAD Board Maintenance Division, Trichy**.(purchased within the state of Tamil Nadu)
- Post office Savings Bank deposits pledged in favour of the **Executive Engineer, TWAD Board Maintenance Division, Trichy** (purchased within the state of TamilNadu)

- Fixed deposit receipts from Scheduled banks pledged in favour of the **Executive Engineer, TWAD Board Maintenance Division, Trichy**
- FDR and Deposits at call receipts should contain lien certificate issued by the Bank for encashment by Department. The FDR furnished by the firm should also bear the signature of the authorised signatory on Revenue stamp at the back of FDR.

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

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

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

16.5. The bid security shall be forfeited.

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

17. COMPLIANCE TO TECHNICAL DESIGN AND SPECIFICATIONS.

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

18. FORMAT AND SIGNING OF BID

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

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

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

19. PRE BID MEETING:

19.1 The bidder or his authorised representative, who are desirous, may attend the pre bid meeting which will take place at **Superintending Engineer Chamber, TWAD Board, Trichy at 11.00 A.M. on 20.09.2019**

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

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

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

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

E.SUBMISSION OF BIDS

20. SEALING AND MARKING OF BIDS

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

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

20.3 No indication direct or indirect, implicit or explicit regarding the tender percentage excess/less should be made in the technical bid or any other documents submitted in the first cover.

20.4 The second cover shall contain the Price Bid alone.

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

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

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

COVER I - TECHNICAL BID
COVER II - PRICE BID

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

20.8 All the envelopes shall be addressed to the Employer at the following address.

The Superintending Engineer, TWAD Board,
Thanjavur Circle,
No.35, J.K.nagar
Kaja Nagar(post) ,
Trichy– 620023

and bear the following identification

Replacement of existing 14 0mm dia PVC pipes with 150mm DI S/S K7 pipes FROM KOLAKKUDIPATTY BS TO APPANANALLUR in the CWSS to Kolakudi in Thottiyam union of Trichy district . Under MNP funds for budget for the year 2019-2020 (REACH-II)

Bid reference no 03 –second call/ F. TENDER / DO1 /DB/TPC/TRY/ 2019 / dt. 05.09.2019

Do Not Open Before **3.30 PM on 26.09.2019**

(time and date of bid Opening as per Clause 24 of "Bid Opening and Evaluation")

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

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

21. DEADLINE FOR SUBMISSION OF THE BIDS

21.1 Bids must be received by the Employer at the address specified in clause 20.8 above not later than **3.00 PM on 26.09.2019.** 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.

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

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

22. LATE BIDS

22.1 All bids received by the Employer after the deadline prescribed in clause 21 of “Submission of Bid” will be returned unopened to the bidder.

23. MODIFICATION, SUBSTITUTION AND WITHDRAWAL OF BIDS

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

23.2 The bidder’s modification, substitution or withdrawal notice shall be prepared, scaled, marked and delivered in accordance with provisions of clause 20 and 21 of “Submission of Bid”, with the envelope additionally marked **‘MODIFICATION’, ‘SUBSTITUTION’ or ‘WITHDRAWAL**’ as appropriate. The modification /substitution for price bid cover should be superscribed as price modification /substitution cover

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

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

F. BID OPENING AND EVALUATION

24. BID OPENING

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

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

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

25. PROCESS TO BE CONFIDENTIAL

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

26. CLARIFICATION OF BIDS.

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

27. EXAMINATION OF BIDS AND DETERMINATION OF RESPONSIVENESS

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

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

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

28. CORRECTION OF ERRORS

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

- Where there is a discrepancy between the tender percentage excess/less quoted in figures and in words the least of the two will govern and
- Where there is an arithmetical discrepancy in the page total as well as grand total, the corrected total by the Employer will govern

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

29. EVALUATION AND COMPARISON OF BIDS

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

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

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

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

29.4 If the Bid of a successful Bidder is seriously unbalanced in relation to the Engineer's estimate of the cost of work to be performed under the contract, the Employer may require the Bidder to produce detailed price analysis for any or all items of the Bill of Quantities to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analysis, the Employer may require that the amount of the Performance Security set forth in Clause 34 of; "Award of Contract" be increased at the expense of the successful Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract.

G. AWARD OF CONTRACT

30. AWARD CRITERIA.

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

31. EMPLOYER'S RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR ALL BIDS

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

32. NOTIFICATION OF AWARD

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

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

33. REGISTRATION IN TWAD

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

34. PERFORMANCE SECURITY

34.1 Within 15 days from the date of the Letter of Acceptance, the successful bidder shall deliver to the Employer a Performance Security

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

(or)

ii) Unconditional and irrevocable bank guarantee issued by any one of the branches of "Nationalized Bank (or) Scheduled Bank " with in the State of Tamilnadu as per the prescribed format furnished in the bid document in favour of the **Executive Engineer, TWAD Board Maintenance Division, TRICHY** . for an amount of Rs……..(equivalent to 2% of the total value of the contract)

a. For tenders with any plus % & up to minus 5% of Dept. value :- 2% of contract value.

b.. For Tenders with minus 5% & up to minus 15% of Dept. value :- 4% of contract value.

c.. For tenders with more than minus 15% of Dept. Value :- 5% of contract value

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

35. SIGNING OF AGREEMENT

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

35.2 The Bidder should remit the performance security prescribed by the Employer in the form as in Clause 34 above and sign the agreement in the presence of the Employer within 15 days from the date of Letter of Acceptance notifying the award of contract.

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

35.4 Failure of the successful bidder to comply with the requirements of Clause 34 & 35 and 35.2 of "Award of Contract" shall constitute a

breach of contract, cause for annulment of the award, forfeiture of the bid security and any such other remedy the Employer may take under the contract

35.5 **Amendment to Agreement**

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

36. FORFEITURE OF PERFORMANCE SECURITY

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

IV - PROGRAMME SCHEDULE

37. PROJECT COMPLETION AND MILESTONE

37.1 The fifteenth day from the date of issue of work order shall be reckoned as the start date of the contract period.

37.2 Entire project must be completed in all respects within **5 (Five)** months from the start date.

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

Sl. No.	Description	% of Achievement	Cumulative % of Achievement
1.	Up to 1st month	10 %	10%
2.	Up to 2nd month	15%	25%
3.	Up to 3rd month	25%	50%
4.	Up to 4th month	25%	75%
5.	Up to 5th month	25%	100%

38. PROGRAMME SCHEDULE/RATE OF PROGRESS/MILESTONE

38.1 "The Source should be created first and ascertain the quality and quantity and then proceed the other component of the scheme". The Contractor, within seven days from the date of signing of the agreement shall submit to the Engineer for approval a Programme showing the general methods, arrangements, order, and timing for all the activities in the Works.

38.2 An update of the Programme shall be a Programme showing the actual progress achieved on each activity and the progress to be achieved on the remaining work including any changes to the sequence of activities. The Contractor shall submit to the Engineer in charge, for approval, an updated Programme. The Employer reserves the right to approve or reject the updated programme without prejudice to levying of penalty for slow progress.

39. PENALTY FOR DEFECTIVE CONSTRUCTION

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

40. PENALTY FOR SLOW PROGRESS

40.1 Provided the firm/contractor fails to maintain the required rate of progress/mile stones stipulated for the project as whole or in any of the component or in the case of works not commenced, the engineer in charge shall have the right to impose penalty of such an amount as he may deem fit for every day of delay caused in the progress of the project as a whole or in part as well as for the portion of the work remaining not commenced, subject to the condition that the total penalty imposed shall not exceed 5% of the total contract value. The penalty levied on the firm/contractor is however subject to modification at the discretion of the Chief Engineer for valid reasons which are to be recorded.

41. PROCEDURE FOR LEVYING OF PENALTY

41.1 The program schedule drawn for the project entrusted on turnkey basis, should be kept up by the firm/contractor without any slippage. The Executive Engineer concerned shall monitor properly the execution of the work with reference to the programme schedule stipulated. The Executive Engineer, on identification of any defective construction or any slippage in the programme schedule in any of the component, shall issue a show cause notice either by RPAD or through personal service to the firm/contractor, giving 15 days time for furnishing the reasons therefor by the firm/contractor. In cases, where the reasons adduced by the firm/contractor are not convincing, the penalty contemplated in the agreement conditions shall be invoked.

42. LIQUIDATED DAMAGES

42.1 Provided the firm/contractor fails to complete the work as a whole or part thereof within the stipulated period, the firm/contractor shall be liable to pay liquidated damages at 0.10% of the value of the unfinished works per week of delay till the completion of the work in full in all respects and handing over to the department. The amount recoverable towards liquidated damages shall however be restricted to 5% of the total contract value. The imposition of the liquidated damages clause will be without prejudice to the rights of the Employer to terminate the contract as time barred.

42.2 For imposing liquidated damages, detailed show cause notice shall be served on the defaulting firm/contractor either by RPAD or through personal service. The first notice shall be served allowing 15 days time to the firm/contractor for furnishing the reply by them. In case of non receipt

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

43. FORECLOSURE OF WORKS

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

43.2 SPECIAL CONDITION

The contractor should take up other component of the works such as construction of pump room, Supply, Delivery of pumpsets, Conveying main, including supply of pipes and specials, construction of elevated service reservoir etc. only after ascertaining the required yield and potability of water.

V - PAYMENTS AND RECOVERIES

44. PAYMENT SCHEDULE

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

CIVIL WORKS:-

Payment may be released up to 90% of the measured and Check measured quantity and balance 5% on Commissioning of the Scheme and balance 5% on Completion of maintenance period subject to the condition in para 4 to and of bid documents me

PUMPING MAIN, GRAVITY MAIN, DISTRIBUTION SYSTEM

A. After supply at site	:	Up to 50%
B. After laying jointing and testing of pipes	:	Upto 90%
C. After commissioning of the entire length of main	:	Upto 95%
D. After completion of the maintenance period of 5%the scheme as a whole.	:	Balance

Note:

- The percentage of payment mentioned above are with reference to the total value of each component as per the agreement entered into by the firm/contractor except pumping main and distribution system.
- The payment shall be made for each component as per the actual measurement upto the percentages mentioned above for the stage of progress of each component. In the case of actual value of works carried out becoming lesser than the percentage limits prescribed for the stages, the payments shall be restricted to the actuals.
- 5% of the value of every running bill shall be retained by the Employer as additional performance security.
- Payments shall become eligible only for finished items of works in all respects
- No payment shall be made for supply of materials alone except in the case of treatment works and pumping plant.

44.2 **Preparation of bills**:

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

The Contractor shall submit their bills to the Executive Engineer or to any of his subordinate officer under his control, as directed by the Executive Engineer. The Executive Engineer is responsible to scrutinize the claim within 15 days from the date of submission of bills of the contractor.

45. RELEASE OF PERFORMANCE SECURITY & RETENTION AMOUNT

45.1 In addition to the withheld amount, 40% of the amount of each bill of the contract shall be deducted and will be retained till the date of receipt of certificate of water tightness from the Executive Engineer, TWAD Board. The whole of the above sum of together with any recovery from the payments already made to the contractor as may be assessed by the Executive Engineer shall be forfeited to the TWAD Board if the RCC reservoir develops structural defects or leaks. The above recovery shall be exclusive of the amount deposited towards security deposit. The fact of carrying out water tightness test should be recorded in the M.Book. The last part bill should be passed only after above certificate is issued. However, the contractor shall be permitted to execute an indemnity bond in lieu of the recovery of 40% in each bill in prescribed form in non judicial 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 tanks/water retaining structure). If defects are noticed within the stipulated period of 24 months of satisfactory performance, the defects should be rectified by the contractor at his own

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

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

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

46. RECOVERY OF MONEY PAYABLE TO THE TWAD BOARD

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

thereof, if necessary by legal proceedings and or by resorting to revenue recovery act against the contractor.

47. INCOME TAX

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

47.2. GST

From every payment made to the firm/contractor,deduction at source towards GST shall be made for contract as per Government of India,Ministry of Financial/Department of Revenue,New Delhi Notification No.20/2017-Central Tax(Rate)/Dt.22.08.2017G.O.MS No.264, Finance(Salaries) Dept., Dt.15.09.2017 & G.O. MS. No.296/Finance(Salaries) department/dated 09.10.2017 and as amended from time to time.

48. Fund contribution for Manual workers:

Towards contribution of fund for the benefit of manual workers employed in the construction works an amount equivalent to one percent of total estimated cost of the construction work proposed will be paid by the Employer direct to the respective welfare Board, as per G.O. Ms. No. 295/ Labour and Employment (I2) Department/ Dated: 17.12.2013, subject to issue of amendments from time to time by the respective department of Government of Tamil Nadu. (Lump sum provision for this contribution may be appropriately made in the Estimates sanctioned for the schemes and the amount would be remitted at the end of the financial year to the labour welfare Board, as per G.O Ms. No.283, MAWS Dept, Dated: 11.11.2010)

VI – CERTIFICATES AND ANNEXURES
LIST OF ANNEXURES

Sl. No.	Description	Para No.
I	Performance of the Bidder showing the value of construction work for the past five years	7.1.4
II	Experience in work of Similar Nature and Magnitude the previous 5 financial years.	7.1.6
III	Commitments of Works on Hand	7.1.6
IV	Works for which Bid Already Submitted	7.1.6
V	List of Equipments available with Bidder	7.1.7
VI	Qualification / Experience of key personnel proposed for Technical and Administrative functions under this project.	7.1.8
VII	Details of Litigation	7.1.9
VIII	Details of Components proposed to Sublet and Sub Contractors involved	7.1.10
IX	Technical Staff to be employed	Para 10 of General Conditions

LIST OF CERTIFICATES

Sl. No.	Description of Certificate	Para No.
1	Signature of the Proprietor or Proprietress attested by the Notary Public	2.2
2	Signature of all the Partners/Power of Attorney attested by the Notary Public.	2.3
3	Registration of the Firm, signature of the authorised person attested by the Notary Public	2.4
4	Copy of the Listed Power of Attorney authorising the Signatory of the Bidder	7.1.2
5	Proof of Registration of Firm/Company	7.1.3
6	Audited Balance Sheets	7.1.5
7	Credit line Certificate from Financial Institutions	7.1.9
8	An Undertaking for Completion of the Project as per the Programme Schedule	7.1.11
9	Income Tax Clearance Certificate	7.1.12
10	GST Certificate	7.1.14
11	Certificate of Performance issued by not less than the rank of Executive Engineer / responsible person of the private organisation	7.2

ANNEXURE I

Performance of the Bidder showing Value of Construction work performed in the last Five Years

Year	Value of Construction work (Rs. In lakhs)
2014-2015	
2015-2016	
2016-2017	
2017-2018	
2018-2019	

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

ANNEXURE II

Experience in works of similar Nature and Magnitude in the previous 5 financial years

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

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

ANNEXURE III

Commitments of works on hand

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

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

ANNEXURE IV

Works for which Bid Already Submitted

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

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

Annexure V

List of Equipment Available with Bidder

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

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

ANNEXURE VI

Qualification/Experience of key personnel proposed for technical and administrative functions under this contract

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

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

ANNEXURE VII

Details of Litigation

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

Should be attested by the Notary public

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

ANNEXURE VIII

Details of Components proposed to be sublet and subcontractors involved

Sl. No	Name of component proposed to be sublet	Name of the sub contractor	Details of experience in similar work	Annual turnover for the last 5 years (Rs. In lakhs)

ANNEXURE IX

Technical Staff to be employed

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

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

TENDERER

SUPERINTENDING ENGINEER/TWAD,

VII - GENERAL CONDITIONS OF CONTRACT

1. DEFINITIONS

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

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

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

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

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

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

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

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

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

"Turnkey Contract" means execution of the water supply and sewerage works including the supply and installation of all materials, machineries, equipments

etc in accordance with specifications stipulated in the Bid Document and in conformity with the quality parameters laid down in relevant BIS, TNBP, Bid Documents etc and competing the entire works in all respects satisfactorily and commissioning within the stipulated period and maintaining the scheme for the specified period.

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

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

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

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

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

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

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

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

'ISS" means Indian Standard Specifications

"BIS" means Bureau of Indian Standards

"TNBP" means Tamil Nadu Building Practice

"Day" means a Calendar day from midnight to midnight)

"Week" means seven consecutive days.

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

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

Rupees means Rupees in Indian Currency

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

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

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

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

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

"Commencement Date" means the 15th day from the date of issue of work order shall be reckoned as the start date of the project.

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

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

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

2. INTERPRETATION

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

The Employer will provide instructions clarifying the queries about the contract

3. AUTHORITY OF ENGINEER IN CHARGE

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

4. SUFFICIENCY OF BID

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

5.PRIORITY OF CONTRACT DOCUMENTS

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

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

6.SECRECY OF THE CONTRACT DOCUMENT

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

7. INSTRUCTION IN WRITING

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

8. COMMENCEMENT OF WORKS

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

9.REFERENCE MARKS

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

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

10. SUPERVISION

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

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

Sl.No	Value of Contract	Scale and minimum qualification prescribed for the employment of technical staff	Rate of Penalty Per month
1)	Above Rs.25.00 Lakhs	One BE (Civil) or equivalent engineering degree holder with atleast three year experience or retired AEE of TWAD or other Engineering Department in addition to two LCE/DCE/LSE holders	Rs.5000/-per month for (Degree holder) + Rs.4000/-per month (Rs.2000/- per month for each Diploma Holder)

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

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

11. SUBLETTING OF CONTRACT

Assignment of the contract is not permissible

Transfer of the contract is not permissible on any grounds

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

12. SPECIFICATIONS AND CHECKS

Stated dimensions in the drawings are to be taken for consideration and no measurements based on scaling of the drawings shall be considered. In case of discrepancy between the description of items in the schedule of quantities and the specifications, the later shall prevail. In case of the description, any work having not fully described or doubts prevail, the contractor shall forthwith write to the Engineer in charge and clarify himself before executing that portion of the work. However, this cannot be a cause for any delay in the progress and the contractor should take advance action in this regard ensuring timely completion of the works.

Before commencement of the work, it will be obligatory on the part of the contractor to furnish a detailed plan of action along with layouts showing the position of the construction plants and other facilities required and proposed to be provided for this contract.

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

13. CUSTODY AND SUPPLY OF DRAWINGS AND DOCUMENTS

The drawings shall remain in the sole custody of the Engineer in charge, but two copies thereof shall be provided to the contractor free of charge. The contractor shall make at his own cost any further copies required by him. Unless it is strictly necessary for the purposes of the contract, the drawings specifications and other documents provided by the Employer or the Engineer

in charge shall not, without theconsent of the Engineer in charge, be used or communicated to a third party by the contractor. One copy of the Drawings, provided to or supplied to the Contractor as aforesaid, shall be kept by the Contractor at the site and the same shall be made available for inspection and use by the Engineer and by any other person authorised by the Engineer.

14. BILL OF QUANTITIES

The bill of Quantities shall contain items of works relating to each component of the scheme to be carried out by the contractor. The bill of quantities will be used to calculate the contract price. The contractor shall be paid for the quantum of work done at the rate mentioned for each item in the bill of quantities. (Including tender premium in case of Percentage tender system)

15. CHANGE IN THE QUANTITIES

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

16. ADDITIONAL ITEMS

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

17. ORDER BOOK

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

18. INDEPENDENT INSPECTION

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

19. COVERING AND OPENING OF WORKS.

No work shall be covered or put out of view without the approval of the engineer in charge. The contractor shall give due notice to the Engineer in charge whenever such works are ready for examination and the Engineer in charge within a reasonable period, arrange for the inspection and measuring of the work as may be necessary. No portions of the work shall be covered up without the consent of the Engineer in charge. The cost of opening any portion of the works that was covered without the consent of the Engineer in charge and the cost of covering thereafter shall be borne by the contractor.

The contractor shall open the covered portion of the works for inspection by the Engineer in charge on a request and the inspection or examination shall be carried out promptly by the Engineer in charge. In the case of defects notified by the Engineer in charge, the contractor shall rectify the same as may be instructed by the Engineer in charge. All costs of opening, covering and rectification shall be on to the account of the contractor. Should the contractor refuse to open such portions of works the Engineer in charge shall open such portions with other persons and inspect the part of the works as he may feel necessary. On inspection, the works being not in accordance with the requirements of the contract documents, the Engineer in charge shall carry out necessary rectification and the entire cost of opening, rectification and closing shall be on to the contractor's account.

20. TEMPORARY DIVERSION OF ROADS AND COMMENCEMENT OF WORK.

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

21. NOTICE TO TELEPHONE, RAILWAY AND ELECTRIC SUPPLY UNDERTAKING.

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

23. WATCHING AND LIGHTING

The Contractor/firm shall at his expense shall provide at the site of works sufficient fencing, barricading, watching and lighting during day and night. The contractor/firm shall in every respect conform to the police regulations in these matters and shall free and relieve the Board on all such matters. Should the contractor/firm fail/neglect to do these arrangements, the same shall be carried out by the Engineer in charge and the costs thereof shall be recovered from the contractor/firm.

24. MEASUREMENT OF WORK

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

25. TOOLS AND PLANTS

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

26. INFORMATION AND DATA

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

27. COEXISTENCE WITH OTHER CONTRACTORS.

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

28. GENERAL RESPONSIBILITIES AND OBLIGATIONS OF THE CONTRACTOR

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

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

The contractor shall promptly inform the Employer and the Engineer in charge if any error omission, fault and other defects in the specification or design of

the works which are identified at the time of reviewing the contract documents or during the execution for proper rectification thereof.

All notices, certificates connected with the work served by the employer relating to the contract shall be sent by post or by hand to the contractor' principal place of business as mentioned in the document or at other places as may nominated by the contractor in writing for this purpose. Any change in the address of the contractor should be promptly intimated to the Employer in writing then and there.

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

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

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

29. LABOUR

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

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

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

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

30. RESTRICTION OF WORKING HOURS

Subject to any provisions contained in the Contract, none of the works shall, save as hereinafter provided, be carried on during the night or on locally recognised days of rest without the consent of the Engineer, except when

work is unavoidable or absolutely necessary for the saving of life or property or for the safety of the Works, in which case the Contractor shall immediately advise the Engineer, Provided that the provisions of this clause shall not be applicable in the case of any work which is customary to carry out by multiple shifts

31. RIGHT OF WAY AND FACILITIES

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

32. REMOVAL OF IMPROPER WORK, MATERIAL AND PLANT

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

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

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

Notwithstanding the previous tests of the materials by the Engineer in charge or his representative, if any portion of the work, in the opinion of the Engineer in charge is not in order, the contractor shall redo such work to the satisfaction of the Employer at no extra cost. In case of default on the part of the contractor in carrying out such orders, then the Employer shall have the

right to carry out such works through some other persons and the expenses thereon or incidental thereto shall be recoverable from the contractor.

33. DEFAULT OF CONTRACTOR IN COMPLIANCE

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

34. DEFAULT BY CONTRACTOR

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

a) Has abandoned the contractor or

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

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

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

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

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

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

h) has not made payment of labour dues.

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

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

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

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

35. POWER TO VARY WORK

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

36. EXTRA FOR VARIED WORKS

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

37. OMISSIONS

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

38. NOTICES REGARDING SHORING ETC.,

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

39. COST OF REPAIRS

Loss or damage to the Works or materials to be incorporated in the works between the Start Date and the end of the Defects Liability 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

40. SUSPENSION OF WORK

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

41. SUSPENSION OF PROGRESS

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

42. TERMINATION

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

If the contract is terminated, the contractor shall stop work immediately, make the site safe and secure and leave the site as soon as reasonably possible on termination of the contract, the Engineer shall issue a certificate for the value of work done less payments received up to the date of the issue of certificates, less other recoveries due in terms of the contract, less taxes due to be deducted at source as per applicable law and less the percentage to apply to the work not completed. If the total amount due to the Employer exceeds any payment due to the Contractor the difference shall be treated as

debt payable to the Employer and can be recovered from any amount due or may become due to the contractor.

In the case of termination, works that are pending for the proper completion of the project, shall be carried out by the Employer either by themselves or through any other agency. Any additional expenditure over the value finalised in the contract for any component or for the whole project, incurred by the Employer by the Employer due to such termination, shall become recoverable from the contractor/firm whose contract stands terminated, from the money due or may become due to him/them
All materials on the Site, Plant, Equipment, Temporary Works and Works are deemed to be the property of the Employer, if the Contract is terminated because of Contractor's default

43. PLANT ETC NOT TO BE REMOVED

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

43. CONTRACTOR NOT TO OCCUPY LAND ETC

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

44. POWER SUPPLY

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

45. COMPLETION AND DELIVERY OF THE WORKS

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

46. FINAL CERTIFICATE

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

47. COMPLETION CERTIFICATE

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

48. TAKING OVER

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

49. PERFORMANCE GUARANTEE

The period of guarantee for the entire works shall be 24 months from the date of completion and commissioning of the project to the satisfaction of the Engineer in-charge of the work. This will include the maintenance of the entire project by the firm/contractor for a period of 1 month If defects are noticed during the guarantee period, the firm/contractor shall rectify/replace wherever necessary at its/his own cost within 30 days of such intimation. If the contractor/firm fails to carry out rectification within the stipulated time, the rectification works shall be carried out by the Employer at the risk and

cost of the contractor/firm and contractor/firm will become ineligible for the payment of the retention amount for the said purpose.

50. MAINTENANCE OF THE PROJECT

The contractor/firm shall successfully maintain the project for the stipulated period from the successful commissioning of the project. 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 the TNEB during the maintenance period shall be borne by the Employer.

51. OPERATING AND MAINTENANCE MANUAL

Deleted

52. WORK ON PRIVATE PROPERTY

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

53. PROTECTION

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

54. ACCIDENT OR INJURY TO WORKMEN

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

55. RISK INSURANCE

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

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

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

If the Contractor does not provide any of the policies and certificates required, the Employer shall effect the insurance which the Contractor should have provided land recover the premiums the Employer has paid from payments otherwise due to the Contractor or, if no payment is due, the payment of the premiums shall be a debt due Alterations to the terms of an insurance shall not be made without the approval of the Engineer.

56. **CARE AND RISK**

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

Date of commencement of maintenance will be from the date of commissioning of the schemes in all respects i.e. after supply effected to all beneficiaries covered under this scheme.

In case where the work could not be completed due to the reasons beyond the control of the contractor viz. due to delay in getting permission from Railways/ Highways etc. authorities, the partial commencement of the maintenance will be permitted for other completed works/ components from the date in which these components / works were commissioned and water supply affected to the beneficiaries and of separate maintenance period may be adopted as per agreement conditions for the component after its completion.

57. **SAFETY PROVISIONS**

The contractor shall arrange for the safety provisions in his operation as required including the provisions in the safety manual published by the central water and power commission. New Delhi (January 1962 edition). In case the contractor fails to make such arrangements the Engineer in charge shall be entitled to cause them to be provided and to recover the cost there of from the contractor.

For failure to comply with the provision of Safety Manual, the contractor shall without prejudice to any other liability, pay the Employer a sum for each day of default at the rates that will be fixed by the Employer.

58. **PROVISION OF HEALTH AND SANITARY ARRANGEMENTS**

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

Water of good quality fit for drinking purposes shall be provided for the work people on a scale of not less than 15 liters per head per day. Each water supply storage shall be at a distance of not less than 15 meters from any latrine, drain or other source of pollution. Where water has to be drawn from an existing well which is within such proximity of latrine, drain or other

sources of pollution, the well shall be properly chlorinated before water is drawn from it for drinking.

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

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

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

59. PATENT RIGHTS

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

60. ROYALTIES

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

61. OLD CURIOSITIES

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

62. CONTRACTOR DYING, BECOMING INSOLVENT OR INSANE

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

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

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

63. **FORCE MAJEURE**

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

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

64. **PAYMENT OUT OF PUBLIC FUNDS**

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

65. **BRIBERY AND COLLUSION**

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

66. **TECHNICAL AUDIT**

It is a term of this contract that department shall have the right to carry out post payment audit and technical Audit by the Engineers of Technical audit cell (or by an approved consultant of repute). The Technical audit officer shall have the powers to inspect the work or supply running account bill, final bill and other vouchers, measurement books, test reports and other documents either during progress of work or after completion of the same

and order recoveries from the contractor for recorded reasons even though the contractor might have been paid earlier. These recoveries are enforceable against the contractor from any amount due to him, from performance security or withheld amounts or any amounts due to the contractor or may become due to him from the department in any work or supply.

67. **JURISDICTION OF COURT**

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

68. **RESERVATION OF RIGHT**

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

VIII – FORM OF AGREEMENT
TAMILNADU WATER SUPPLY AND DRAINAGE BOARD

Forwarding Slip to The Lump sum Agreement No.

1. Name of Work :

   Estimate Amount :
   Sanctioned in Original Estimate No. :
   Revised Estimate No. :

2. Name of Contractor and Address :

3. Original or Supplemental :

4. If Supplemental, Original Agreement No. :

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

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

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

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

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

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

TENDERER SUPERINTENDING ENGINEER/TWAD,

II. Additional Information

A. Original Agreement

1. Original Agreement amount of tender excess and percentage over the estimate rate. :
2. If confessional rate of EMD & SD have been allowed ref. to sanction thereof :

B. Supplemental Agreement

1. Whether the approval of the competent authority has been obtained for the rates as required as per B.P.Ms.No.198 dated 5.5.1998 :
2. If entrusted without tenders whether sanction is necessary with reference to total value of work covered by the supplemental agreement so far accepted. :

TENDERER SUPERINTENDING ENGINEER/TWAD,

TAMILNADU WATER SUPPLY AND DRAINAGE BOARD

Form of Agreement (Lump sum)

Articles of Agreement made this----------

--

Day of ----------

---

between Thiru----------

---

hereinafter referred to as the contractor which expression shall where the context so admits include his heirs, executors, administrators and legal representatives of the one part and the Tamil Nadu Water Supply and Drainage Board (hereinafter called the Employer) which expression shall where the context so admits include its successors in office and assigns) of the other part. Whereas the contractor delivered to the Employer the bid which was opened on ----------

---

----------whereby the contractor offered and undertook to carryout the works specified under this contract and allied work, i.e. (name of work) ----------

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

And whereas the contractor in accordance with the terms of the said Bid has deposited in the Office of the ----------

Engineer, TWAD,----------as performance security for the due and faithful performance by the contractor of this contract, the sum of Rs. ----------

--(Rupees----------)

And whereas the contractor fully understands that on receipt of communication of acceptance of bid from the accepting authority, there emerges a valid contract between the contractor and the Employer represented by the Officer accepting the agreement and the bid documents i.e. invitation for bids, letter of application, bill of quantities and other schedules, general conditions of the contract,

technical specifications of the bid, negotiation letter, communications of acceptance of bid, shall constitute the contract for this purpose and be the foundation off rights of both the parties, as defined in clause 8.1 of ""Bid Documents "Now hereby agreed that in consideration of payment of the said sum of Rs.
(Rupees
) or such other sum as may be arrived at under the clause of the General conditions of the contract relating to payment by final measurement at unit prices, the contractor shall and well within the time specified in his bid thoroughly and efficiently and in a good workman like manner perform, provide, execute and do all the works, materials matters of things incidental to or necessary for the entire completion of the works specified under this contract and necessary works including all works shown in the drawings hereinafter referred to or described or set forth the said specifications and schedule hereto annexed and in accordance with such further drawings and instructions as the Engineer of the Board or
other Engineer duly authorised in that behalf (thereinafter) and in the annexed documents referred to as the Engineer) shall at any time in accordance with the said schedule (Bill of Quantities) and specifications provide and give together, with any alterations in the works or additions thereto, in the time and manner in such schedule (Bill of Quantities) and specifications stipulated to the entire satisfaction of the Engineer, the Employer for themselves and their successors convenient and agree with the Contractor that during the progress of the works and on the completion of contract to the satisfaction of the Engineer, the Employer shall and will from time to time on receiving the certificates in writing of the Engineer pay to the contractor according to such certificates and the terms of this contract the price or sum mentioned in such certificates as due to the contractor under the terms of this contract subject nevertheless to deductions or additions thereto or there from which may be lawfully made under terms of his contract. It is hereby mutually agreed and declared as follows.

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

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

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

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

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

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

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

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

g) Time shall be considered as essence of the contract and the contractor hereby agree to commence the work immediately on 15th day from the date of issuing of work order complete the work within 12 months and to show progress at the stipulated milestone.

In witness where of the contractor

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

In the presence of

Signature of Contractor

Name and Seal.

Signature, Name and
Designation of Witness.

Signed by on behalf of
TWAD Board.

Signed, Name and Designation of Witness

SUPERINTENDING ENGINEER/TWAD BOARD
TRICHY-PUDUKKOTTAI CIRCLE,TRICHY,

LETTER OF NEGOTIATION

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

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

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

Signature of Contractor

TENDERER SUPERINTENDING ENGINEER/TWAD,

INDEMENITY BOND

This deed of indemnity bond executed at (place) on this

Day of (month) year by and

between Thiru/ Tmt. (Name)

widow/Wife/Son/Daughter of Thiru/Tmt residing at

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

2. Whereas the contractor has submitted the bid for (description of work) at (place of work or supply) and such bid has been accepted subject to the relevant conditions to contract appended to Tamil Nadu Building Practice and other conditions issued along with bid documents.

3. And where as in pursuance of the terms of contract, that a sum equal to 21/2% of the total value of work done have been retained with the Employer for a period of two years reckoned from the date of completion of the work in order to enable the departmental officers to watch the effect of all seasons on the work and the structural stability of the work executed by the contractor.

4. And whereas it was decided to refund the said sum equal to 21/2% of the total value of the work done retained with the Employer on the expiry of two years period reckoned from the date of completion of work provided that the

contractor execute an indemnity bond for a period of three years indemnifying the Board against any loss or expenditure incurred to rectify any defect noticed due to the faulty workmanship by the contractor or substandard material used by the contractor during the period of three years.

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

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

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

In witness whereof Thiru/Tmt/Miss

Contractor has signed this deed on this day of month year.

Witness:

TENDERER SUPERINTENDING ENGINEER/TWAD,

SPECIMEN FORMAT FOR PERFORMANCE BANK-GUARANTEE

PERFORMANCE BANK GUARANTEE (UNCONDITIONAL)

To

……. (name of Employer)

……..(address of Employer)

WHEREAS ……..(name and address of Contractor) (hereinafter called " the Contractor :") has undertaken, in pursuance of contract No. …… dated: ……..to execute……..(name of contract and brief description of works)(hereinafter called " the Contract")

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligations in accordance with the Contract:

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

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

NOT THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Contractor, upto a total of ……(amount of Guarantee)…… ……(amount in words), such sum being payable in the types and proportions of currencies in which the Contract Price is payable, and we undertake to pay you unconditionally and irrevocably upon your first written demand and without cavil or argument, any sum or sums within the limits of ……(amount of guarantee) 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 dept from the contractor before presenting us with the demand.

TENDERER SUPERINTENDING ENGINEER/TWAD,

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 thereunder 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.

The Bank Guarantee is encashable at …….branch of ……..Bank in ……Town in Tamil Nadu Only.

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

SIGNATURE AND SEAL OF THE GUARANTOR.

Name of Bank……..

Address…….

Date……

Bill of Quantities

(to be furnished separately as Price Bid)

General

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

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

Item for which no rate or price has been entered in 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

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

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

- The total amount and excess / Less quoted in the " Abstract of BOQ" will only be taken as the final value for comparison and the finalisation of the tender.
- If there is any variation in the Percentage quoted in words and figures, the lesser of the two will only be taken in to consideration.
- The percentage quoted in the bid shall be up to two decimal only.
- If the tenderer failed to scour out the word either of " excess or less" the word less alone will be taken in to consideration.
- If two or more tenderers / Firms have quoted the same percentage excess or less over the departmental rate in the abstract of BOQ then the successful tenderer will be decided by LOT SYSTEM provided they satisfy all other requirements in the presence of tenderers of their authorised representatives who chose to be present during the tender opening.

Change in the Quantities

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

NAME OF WORK:

Replacement of existing 140mm dia PVC pipes with 150mm DI S/S K7 pipes from Kolakudipatty BS to Appananallur in the CWSS to Kolakudi in Thottiyam union of Trichy district under MNP fund for Budget for the year 2019-2020 (REACH II) including trial run for 6 months and free maintenance for 6 months (period of completion 6 Months)

SI. No.	Description of Item of Work.	Quantity.	Specification	Unit.	Rate		Amount
					In Figures	In Words	
1	2	3	4	5	6	7	8
	FURNISHED SEPARATLY						

TECHNICAL SPECIFICATION

TECHNICAL BID DOCUMENT

TECHNICAL SPECIFICATIONS.

Index

I. Materials

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

1.Cement and Steel

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

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

1.3 The steel bars shall comply with the requirements set forth in the IS 432 Part I, IS 1139, IS 1786 as the case may be with the latest revision thereof and the test as described for ultimate tensile strength, bond test and elongation tests. Steel and steel product with relevant BIS certification with standard mark licenses should only be used particularly High Strength Deformed bars (TMT) for concrete reinforcement. 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 bed. Each band containing the bars shall bear the ISI Certification mark.

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

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

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

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

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

2. Aggregates

2.1 Sand for use in masonry and plaster works shall confirm to relevant specification in TNBP (specification No. 7) and I.S.2116/ 1985, I.S. 1542/ 1977.

2.2 The coarse and fine aggregates for concrete shall confirm to I.S.383/ 1970

and as specified in the relevant clauses of I.S.456/ 1978. Other aggregates free from deleterious materials shall be used at the concurrence and approval of the Engineer after sufficient tests have been carried out at the contractor's cost.

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

3. Water required for Construction

3.1 The water used in the construction shall be of potable quality and shall be tested at the contractor's cost. The contractor has to make his own arrangements at his cost for water required for construction, testing, filling, etc., either from local bodies or from elsewhere, by paying the charges directly and arranging tanker etc., as per necessity. No claim for extra payment on account of non availability of water nearby or extra lead for bringing water shall be entertained. All required piping arrangements and pumping if required for water shall be made by the contractor at his cost. Water for mortar, mixing and curing of concrete shall be free from harmful matter or other substances that may be deleterious to concrete or steel and taken from a source approved by the Engineer. Ground water for mixing and curing shall confirm to the provisions in the class 4.3 of IS 456/ 1978.

4. Admixtures

Only where a beneficial effect is produced shall any admixture be used and that too after test has been carried out to convince the Engineer

that no harmful effect will be produced by the use of such admixture and after approval by the Engineer. The admixture shall confirm to IS 9103/ 1972.

5. Form Work and Centring

5.1 Steel/ wooden form centring shall be used. If wooden form work is used, it shall consist of planks not less than 40mm thick and strong props. This shall be provided complying with clause 10 of IS 456/ 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.

6. Separator (Cover Block)

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

7. Pipes, Specials and Valves

7.1 General

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

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

7.2 C.I. pipes

7.2.1 CI pipes shall be procured from the reputed manufacturer and the pipe shall conform to IS 1536/1976 or IS 1537/1976. The pipes shall bear ISI mark. The test certificate furnished by the manufacturer should be produced

7.3 AC pressure pipes

7.3.1 AC pressure pipes procured by the contractor shall strictly conform to IS 1592/1989 and as amended from time to time and the pipes should bear ISI marking. The CID joints should conform to ISS 8794/1988 and as amended from time to time. The AC couplers together with rubber rings for jointing the pipes should properly suit the AC pipes and withstand the same test pressure as the AC pipes. The test certificate issued by the manufacturer should be produced. The pipes shall be subjected to third party inspection also and the test certificate showing the inspection agency should also be produced.

7.3.2 The Engineer shall have the right to test pipes for the quality wherever felt necessary. All charges incurred in testing the pipes shall be borne by the contractor.

7.4 PVC Pipes

7.4.1 The unplasticized 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.

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

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

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

7.4.5 In addition to third party inspection, wherever felt necessary, the Engineer shall have the power to test the PVC pipes for its quality such as specific gravity, impact strength at 0^0C, internal hydraulic pressure test, diameter, thickness etc. in TWAD Board laboratory.

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

7.4.7 The Engineer in charge, shall verify, in addition to the test certificate, whether the pipes are as per BIS, by visual examination, diameter, weight, wall thickness flexibility, colour etc.

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

7.4.9 GI pipes

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

7.5 CI D/F pipes

7.5.1 The CI/D/F pipes procured for use in the work should conform to the relevant BIS specification and suitable for use in the work.

7.6 Valves

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

7.7 CI/PVC/GI/MS Specials and Fittings

7.7.1 The specials and fittings should be in conformity of the relevant BIS specification

7.8 Testing of Pipes

7.8.1 The manufacturer test certificate/third party inspection certificate should be produced by the contractor for the pipes used in the work. The engineer shall have the right to test the pipes, wherever felt necessary for its quality. All testing charges should be borne by the contractor.

7.8.2 **Testing of materials to be used in works, for the quality of finished items shall generally be done by the contractor at his own cost in the laboratory approved by the Employer by providing requisite materials, transport of test specimen and other assistance required thereof.**

7.9 M.S. pipes

7.9.1 MS pipes shall be procured from the reputed manufacturer and the pipe shall conform to IS 3589/2001 or IS 1537/1976. The pipes shall bear ISI mark. The test certificate furnished by the manufacturer should be produced

II. CIVIL WORKS

I. General

1.1 Tamilnadu Building practice (TNBP) shall be strictly followed for carrying out different items of the work for which no standard specifications are available and no alternate specification have been given under the description of works.

1.2 Where any provision of the TNBP is repugnant to or at variance with any provision under BIS or description of work, technical specification and conditions of contract, the provisions, of the latter shall be deemed to supersede the provision of the TNBP.

2. Earth work

2.1 Specification

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

2.2 Conveyance

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

2.3 Stacking

Where the location of the work is such and does not permit the deposition of excavated earth while digging trenches for laying pipes, the excavated earth should be conveyed to a convenient place and deposited there temporarily, as directed by the Engineer-in charge. Such deposited soil shall be re-conveyed 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.

2.4 Disposal of Surplus Earth

The excavated soil which is surplus to that required for refilling and after allowing for settlement will have to be removed, spread and sectioned at places shown on the site during execution for purpose of widening or levelling the road. Sectioning is to be done as detailed in TNBP. It is to be understood that no extra payment, will be made for this

and the unit rate for trench work of excavation and refilling shall include the cost of removal of surplus earth to disposal site approved by the Engineer-in-charge, its spreading and sectioning at the bidder's expense.

2.5 Shoring, strutting and Bailing at water

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

3. Concrete

3.1 Specification

Concrete for use in the works shall generally comply with TNBP (specification No.30) and the relevant BIS. The concrete mix shall be 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 change.

For M30 design mix with graded aggregate the mix proportion with water cement ratio may be got approved from competent authority before the commencement of concrete work.

3.2 Mixing of Concrete

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

colour. The mixing of concrete shall be done in accordance with clause 8 and 9 of IS 456-2000.

3.3 Transporting , Placing and Compacting Concrete

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

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

3.3.3 The mix should not be dropped from such a height as it may cause segregation and air entertainment. When the mix is placed in position, no further water shall be added to provided easier workability.

3.3.4 No concrete mix shall be used for the work if it has been left for a period exceeding its initial setting time before being deposited and vibrated into its final position in the member.

3.3.5 While one concrete is being placed in position it shall be immediately spreaded and ramped sufficiently and suitable to attain dense and complete filling of all spaces between and around the reinforcement and in to the corners of form work for ensuring a solid mass entirely free from voids.

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

3.4 Curing

3.4.1 Curing shall be done to avoid excess shrinkage or harmful effort to the members generally complying with clause 12.5 of IS 456-2000

3.4.2 The method adopted shall be effective and any special method used must be approved by the Engineer and be subject to complete supervision.

3.4.3 Any deficiency in concreting such as cracking, excessive honeycombing, exposure of reinforcement or other fault which entail replacement of the defective part by fresh concrete and whatsoever remedy reasonable required without hampering the structural safely and architectural concept, all at the cost of contractor.

3.5 Removal of Form Work

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 striping time shall not be less than that indicated in clause 10.3 of IS 456-2000.

3.6 Testing of Concrete

3.6.1 During the course of construction works, preparation of test specimens, curing and casting of concrete shall be done in accordance with IS 1199 and IS 516 to ascertain the strength requirements and acceptance criteria indicated in IS 456-2000. The contractor shall provide all apparatus, labour and arrange to test the cubes at his own cost at the test laboratory decided by the Employer.

3.6.2 In addition to the above tests, any other test which may if desired by the Engineer in charge be carried out from time to time as per relevant specifications at the cost of contractor. In case the concrete does not meet the strength required, all corrective measures shall be taken at once at the contractor's cost.

3.6.3 The inspection and testing of structures shall be done in accordance with clause 16 of IS 456-2000.

4. Masonry

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

5. Plastering

5.1 Plastering would be 12 mm, 20mm and 25mm thick cement plaster either plain or water proof as may be specified.

5.2 The plastering items shall be executed in thickness and cement mortar of proportion as detailed in respective item in the BOQ. Similarly the plastering shall be either ordinary or water proof as specified in respective item in the BOQ.

5.3 In case of water proof plaster standard and approved water proofing compound shall be mixed in cement mortar in required percentage as directed and then the plaster is applied.

5.4 The finishing shall be either smooth or rough as may be directed by the Engineer unless otherwise specifically mentioned in the BOQ.

5.5 NEERU finish wherever directed by the Engineer shall be done at no extra cost.

5.6 Curing and watering shall be done as directed and plaster shall be in alignment and level. Any substandard work is liable to be rejected and shall have to be re-done at contractors cost. Sand to be used shall be of approved quality only. Cost of all scaffolding shall be included in the rates quoted in the BOQ.

6 Flooring

40mm thick cement concrete 1:2:4 shall be provided for flooring. The size of metal shall not be more than 12mm and it shall be properly graded. A thin coat of very fine plaster shall be provided on top to give a smooth finish. The marking of false grooves to surfaces as directed includes the cost of labour.

7. Doors and Windows

7.1 Sizes shown on drawings are clear openings in masonry and not the shutter's size. These sizes shown on drawings are, therefore, inclusive of required frame sizes and doors, windows, etc., and shall be manufactured, accordingly. If sizes bigger than shown in drawings are manufactured, as instructed specifically in writing they shall be measured and paid for accordingly.

7.2 The work shall be executed as per the size of frame thickness of shutter type viz. Plan planked, glazed, etc., and fixture, etc., as described in tender item. Iron bars for windows and ventilators are to be provided if specifically mentioned in the tender item at Contractor's cost. Specifications in TNBP shall be applicable.

7.3 The design of shutters and quality of wood shall be got approved form the Engineer-in-charge before manufacture. The CW/TW to be used for woodwork shall be uniform in substance straight, free from large deed knots, flows flanks. The work shall be done as per specification of TNBP latest edition. The joints shall be perfect.

7.4 Part of wood embedded in masonry shall be painted with the tar. The frames of doors, windows, ventilators, etc., shall have proper hold-fasts embedded in masonry

7.5 Whenever iron bar is to be provided as per tender item the rate thereof is included in tender item. The painting shall be done as prescribed in tender item. No painting, however, shall be permitted till the woodwork is approved by the Engineer-in-charge.

7.6 Any substandard work not confirming to the specifications are liable to be outright rejected and

7.7 Executive Engineer's decision in such cases shall be final and binding on the Contractor

7.8 The mode of measurement shall be on area units as mentioned in B0Q.

8. Painting

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

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

III. SOURCE CREATION

1. Borewells

1.1 Borewells are drilled for tapping the water from the deeper acquifer.

1.2 In hard rock areas, 150mm DTH Rigs shall be used for drilling of borewells for power pump schemes. The location of borewell and depth of borewell are to be decided based on the geophysical survey by the Employer.

1.3 In sedimentary areas, Rotary rigs shall be used for drilling tubewells. The pilot well has to be drilled to the depth recommended through geophysical survey by the Employer. For the location of screen pipe, electrical logging has to be done. After erection of the casing pipes in the tube well, proper packing has to be done as per IS 4097/1967.

1.4 For shallow depth tubewells, conventional calyx drills and hand bore sets may be deployed, if so directed by the Engineer in charge.

1.5 In certain parts of the State, where the depth of drilling extends to 60m and above and some areas where the boulder bed formation is encountered, ODEX drilling rigs (simultaneous casing and drilling) are to be deployed.

2. Open well

2.1 These types of wells may be proposed when the required quantity can be drawn from shallow depth and tapping deeper acquifer is not possible due to poor quantity and quality of water. The location of the open well has to be done with respect to geophysical survey. Subsequent to the geophysical survey, trial bores have to be drilled for confirming the data of survey. The diameter of the wells is to be decided based on the designed requirement.

2.2 The contractor must produce the spring details during the excavation of the open well. Wherever separate rate is provided in the B0Q for

baling out water, necessary log books are to be maintained. Wherever necessary, weep holes or pipes are to be provided in the steining of the well.

2.3 Well rejuvenation technique may be adopted wherever necessary.

3. Infiltration Well

3.1 Infiltration wells must be constructed in the location shown by the Employer. Before starting the works confirmatory bores must be drilled in the periphery of the wells to ascertain the soil strata.

3.2 Clearance from bottom of curb to the hard strata should be D/2 subject to a minimum of 0.6m. ('D' refers to diameter of the well).

3.3 Clearance from top of porous concrete/perforated bricks to the bed level should not be less than 3.0m.

3.4 Pilasters should be provided from top of curb to the cover slab.

3.5 Holding down rods of size not less than 20mm dia should be placed at 1m interval.

3.6 Binding Rings of 15cm thick should be provided at 1.5m intervals.

3.7 Plastering the portions above porous concrete at 1.5m intervals.

3.8 Vent pipe of suitable size with anchoring arrangements shall be provided from cover slab upto 0.30m above M.W.L.

3.9 Two numbers of heavy type Inspection covers of size 75cm x 60cm shall be provided with locking arrangements.

3.10 Bottom curb should be taken below the scour depth.

3.11 Top cover slab should be minimum 1M above bed level.

3.12 Size of curb should be minimum of 0.60m including cutting edge.

3.13 Bottom portion of well should be filled with coarse sand for 0.60m depth (top of curb to bottom of curb).

General

In all above source creations, after completion of source, yield tests are to be conducted and safe yield has to be arrived at. Number of wells shall be decided depending upon the yield.

4. Collector well

4.1 **General Specification**

4.1.1 Confirmatory borings have to be put down along the proposed alignment of radial arms and at collector well point and detailed sieve analysis of the sample of soil is to be made at the proposed site before taking up the work by the contractor.

4.1.2 The location of collector well, radial arms should be suitably checked based on results of confirmatory borings and sieve analysis of soil samples of ensure the potentially of acquire by the contractor himself.

4.1.3 Detailed sieve analysis of the sample of soil is to be made before taking up the work. The contractor should submit a detailed report to the department and get the clearance from the Executive Engineer for proceeding with the work further.

4.1.4 Reduced levels of various components of collector well cum pump house should be maintained very carefully at every point.

4.1.5 True vertically of collector well and true horizontal position of radial arms should be ensured during execution. The tolerance limit of vertically of well sinking as per BIS is allowable.

4.1.6 "Design Mix" should be verified by the contractor at his own cost by conducting laboratory tests using the actual materials at site. The extra charges will not be paid by the Employer.

4.1.7 Cube test should be conducted for every work during execution in the nearby laboratory and the results shall be communicated to Engineer in charge then the there. The unit rates quoted in the price bid includes these types of tests also.

4.1.8 The results of tests conducted as above should be furnished to the Engineer concerned before carrying out the work and clearance to be obtained then and there before proceeding with the above items of work.

4.1.9 Plugging the bottom of collector well should be done effectively with special tools and plants to ensure water tightness.

4.1.10 The contractor should conduct necessary pumping tests to prove that the radial arms are driven on to correct alignment, levels and without any gap or damage to radial pipes and to prove that

required quantity of water could be abstracted during summer. The required pumps, tools and plants etc. should be used by the contractor himself. No separate charges will be paid to the contractor on this account.

4.2 Radial Arms

4.2.1 Suitable length of radial arm of dia as per specifications to be driven in different directions so as to give the minimum guaranteed yield of ..... MLD of water throughout the year. The quantity furnished in the schedule is only approximate. If the well yields the required quantity of ..... MLD with radial arms of less than ..... metres, the payment should be restricted to the actual length driven at the rate per metre as quoted by the contractor. The slot in the radial arms should be of required size based on the sieve analysis of the soil samples obtained at site. The depth up to which the well should be sunk based on the confirmatory borings and the length for which the arms are to be provided so as to get the required yield shall be the sole responsibility of the contractor. The Employer has the option to instruct the contractor to drive any extra length of radial arms over and above the length provided in the Bid Document.

4.2.2 Each radial arms should be provided with bullet head for driving. No extra rate will be paid to the contractor for the bullet head as the rate to be quoted in the B0Q shall be inclusive of the above items. If due to site condition, the number of arms are to be increased than those provided in the agreement, it should be done at the agreement, it should be done at the agreement rate both for driving radial arms and providing bullet head. Further the contractor should supply, deliver and fix necessary extra number of .....mm dia tail piece and ..... mm dia sluice valve as per BIS with operating gear head arrangements due to increase in number of radial arms at the agreement rate.

4.2.3 Fabricated MS slotted pipe should not be used for radial arms.

4.3 Baling out Water

4.3.1 The rates for well sinking and driving of radial arms will be inclusive of charges for baling and pumping out of water, scooping out of earth etc. complete and no extra payment for such contingencies will be made separately.

4.4 Tools and Plants

4.4.1 All the tools and plants required for the work including all pipes and timbers for shoring and strutting. Pumpsets for de-watering, compressor driving equipments for under water works etc. shall be provided by the contractor at his own cost. The rates quoted for the relevant items shall be inclusive of charges for such tools and plants and appurtenances required for the proper execution of the work.

4.5 Guarantee for Structural Stability

4.5.1 The water tightness of the collector well should be ensured when the collector well is empty.

4.5.2 The period of guarantee required by the contract shall be two years from the date of commissioning of the scheme. If any defects are noticed within the guarantee period, the defects should be rectified by the contractor at his own cost and the guarantee period will again be extended to two years from the date of completion of the rectification of defects by the contractor. During this period the structure shall neither develop any defect which shall endanger its stability nor shall show signs of leakage or seepage or infiltration through the sides or from the bottom of the collector well.

4.6 Guarantee for the Yield

4.6.1 The contractor should give a guarantee for the required yield of ..... MLD of water in all seasons of the year for a period of two years reckoned from the

date of commissioning of the collector well. The contractor has to indemnify the Employer towards guarantee for the yield of ..... MLD of water in all seasons through out the year.

Yield Tests

4.6.2 The contractor is responsible for the required yield of ..... MLD. The yield test will be conducted by him in the presence of the Engineer not below the rank of an Assistant Executive Engineer during summer and the results of the same shall be furnished to the Engineer in charge. The yield test will be conducted as many times required by the Engineer in charge even for part length of radial arms by operation of valves. The required pumpsets, tools and plants etc. should be made available by the contractor at his cost for conducting yield tests and no extra charges will be paid to the contractor.

4.7 Diversion of surface flow and isolating the site of work

4.7.1 The contractor himself has to arrange for necessary diversion of surface flow for isolating the site of work for construction of collector well cum pumphouse and other allied works. The bund for diversion should be well formed in such a manner that there may not be any breach during the progress of work and the same should also be maintained in good condition till the work is completed.

4.7.2 The contractor will be personally responsible for any damages caused to the work due to any breach in the diversion formed during the progress of work.

4.7.3 The employer will not take any cognizance of any damage to the materials or the equipment required for the work and kept in the river bed or in the bank due to any cause whatsoever it may be. The contractor should take necessary precaution against floods, theft or any loss or damage occasioned by or arising out of act of God and in particular unprecedented floods etc. The contractor shall arrange for risk insurance at his cost for the above cause.

4.9 Earthwork Excavation

4.9.1 The levels in the drawings are only approximate for the guidance of the contractor in general. From the date of execution, the bed level and the sub soil water level as noted will be reckoned. Thus the payment will be regulated according to the sub soil water level observed.

4.9.2 In regard to the width of the excavation of work above or below water level, sketch will be furnished to the contractor and payment will be restricted as per section shown in plans irrespective of the facts that the contractor excavates the same with more side slopes for his own convenience.

4.9.3 **The contractor has to fix up and maintain necessary sight rails and ranging rods etc. as required by departmental officers for checking the various levels.**

4. 10. Excavation for Foundation

4.10.1 Unless otherwise specified open well excavation shall be resorted upto water levels as directed by the Engineer.

4.10.2 All precautionary measures for the safety of labourers while excavation shall be made as per the relevant BIS for safety code for earth work.

4.10.3 The quantities furnished in the BOQ are only approximate. Any omission or excess in quantities may arise during execution according to the site condition. Any alteration of work or any additional work during execution has to be done by the contractor. If no rate in the BOQ is applicable or derivable for the additional works, the rate will be arrived at as per rules and regulations governing for the working out of rates for supplemental item of work and will be paid to the contractor.

4.11 Well Sinking

4.11.1 Unless otherwise specified open well excavation shall be carried upto water level before the well curb is laid.

4.11.2 Sinking of well shall be carried out as per the relevant specification of TNBP and as directed by Employer.

4.11.3 The contractor shall arrange his own method sinking unless otherwise specified or ordered by Engineer i.e. by manual labourer drivers or by dredgers and loading the top of the staining to assist sinking, adopting, suitable combination to sink the well to the required depth.

4.11.4 No de-watering of the wells must be done during sinking without obtaining prior permission of the Engineer and any damages which may result to the well by such de-watering shall be made good at the contractor's expenses.

4.11.5 The well must be sunk perfectly vertical and in the exact position of the site selected. If it is necessary to sink a well deeper than the specified depth in order to set right any tilt or error of position such sinking must be done at the contractor's expenses.

4.11.6 Well shall not be left partially sunk during the periods of release of water. The rectification of damages to the partially sunk wells due to any cause shall be done by the contractor to the satisfaction of the Engineer in charge of the works at the contractors cost.

4.12 R.C.C. Well Curb

4.12.1 The well curb must be cast as per drawings and as per departmental specification.

4.13 R.C.C. Well Staining

4.13.1 Well staining should be of required thickness and with required reinforcements. No patent water proof materials shall be mixed in the concrete or mortar and applied to the work as a matter of course by the contractor as they are liable to give deceptive results on the water tightness of the structure. The structure should be stable, sound and water tight to facilitate construction work. Under full working head of water it shall not develop any defects which shall endanger its stability. The contractor shall make his own arrangements at his costs for the testing of works and carrying out such rectification as may be ordered to be done if necessary.

IV. PIPE LAYING WORKS

1. **General**

1.1 The earthwork for the pipe laying work shall generally confirm to the details given below.

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

1.2 Wherever necessary, sand cushioning for the bed shall be given as per IS Standards and as directed by the Engineer in charge. The pipe should be laid true to the alignment line and grade wherever necessary, appropriate bends should be used. The pipes laid must be jointed properly and carefully by using approved type of jointing materials.

1.3 After the pipes are laid and jointed, the pipelines are to be subjected to hydraulic pressure test as detailed in the relevant BIS specification for various types as indicated below.

A.C. pressure pipes .. Clause 2 of IS 6530/ 1972
Cast in iron pipes .. Clause 6 of IS 3114/ 1985
PSC. pipes .. Clause 2 of IS 783/ 1985
PVC pipes .. Clause 2 of IS 7634/ 1975
DI Pipes .. IS 8329/2000
GI pipes .. IS1239/ Part I -1990
MS pipes .. IS 3589/2001
MS specials .. IS 7323

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

1.4 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 upto 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.

1.5 In case of pipe trenches, the Engineer may reduce the width of trench wherever a hard strata is met with, if he feels adequate and just sufficient to lay the pipe line in order to reduce the hard rock quantity. In such case the contractor will be paid as per the actual measurement.

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

1.7 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.

1.8 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 the bends and appropriate places.

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

2. Laying Cast Iron pipes

2.1 The laying and jointing of case iron pipes shall be carried out as follows :

Before laying the pipes, the contractor shall carefully brush them to remove any soil, stones or other materials which may be therein. An even and regular bed having been prepared and joint pit excavated to form a process under the socket of each pipe of no greater depth and width than to enable the pipe jointing to be properly done. Each pipe shall then be carefully lowered and placed singly in the trench and shall rest in the solid ground for a distance of not less than two thirds of its entire length. In places where the soil is not hard, cement concrete bed blocks or timber piles have to be provided under the pipes if directed by the Engineer in charge.

2.2 Pipes not Truly Laid

Any pipe or pipes laid, which on inspection are found to diverge from the true lines and levels shall be removed and re-laid to the true lines and levels and the old jointing properly cleared off the pipes and fresh joints made by the contractor at his expense. Any pipes damaged in removal shall be replaced by the contractor at his cost.

2.3 Cutting of C.I. Pipes

Where necessary and as ordered by the Engineer in charge, the Contractor shall cut the pipes and fix and joint common collars for jointing spigot ends. The cut ends of the pipe shall be made truly at right angles with the axis of the pipe.

2.4 Covering up Open Ends

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

2.5 Jointing of C.I. Pipes

The trench must be kept quite dry during jointing unless in any particular case the Engineer permits laying of the pipe in wet conditions. Plain spigot and socket pipes shall be joined as follows.

a) Lead Joints

Generally lead joints shall be used for all sizes. In the case of 100mm pipes, cement joints may be used if specified in which case for every ten cement joints, one lead joint shall be used. Provision of lead joints shall also be made at street crossings, at closing joints and for all specials and as determined by the Engineer depending upon the site condition.

The spigot of the pipe must be forced well home into its socket and must be centred, so that the joint may be of even thickness all round. As many laps of white hemp spun yarn as may be needed to leave the space required for the lead shall be driven to the bottom of the socket without being forced through the joint into the pipe but carefully driven home with a caulking tool. The proper depth of each joint shall be tested before running the lead by passing completely round it a wooden gauge, notched out to the correct depth of lead, the notch being held close against the face of the socket. The joints shall then be run with molten lead in sufficient quantity so that after being caulked solid, the lead may project 3mm beyond the face of the socket against the outside of the spigot but must be flush with the outside edge of the socket.

For pouring lead in the joints, a ring of hemp rope covered with clay shall be wrapped around the pipe at the end of the socket leaving an opening at the top of the socket into which the lead can be poured. The hemp rope shall be supported by clay packing so as to withstand the operation of lead pouring.

The lead used shall be carefully skimmed of all scale, when melted in a cast iron pot or patent melting machine. Sufficient lead shall then be taken by a ladle and run hot into the joint, and the joint filled at one running. The joint shall then be caulked when cool by a suitable caulking tool and a 2kg hammer and the joint left neat and smooth.

The weight of lead and hemp which shall be used in each joint shall be in conformity with the table given below or as specified by the Engineer.

Quantity of lead and spun yarn for different sizes of pipes

Nominal size of pipe in mm	Lead/ joint In Kg	Depth of Lead joint in mm	Spun Yarn per Joint in Kg
80	**1.8**	**45**	**0.10**
100	**2.2**	**45**	**0.18**
125	**2.6**	**45**	**0.20**
150	**3.4**	**50**	**0.20**
200	**5.0**	**50**	**0.30**
250	**6.1**	**50**	**0.35**
300	**7.2**	**55**	**0.48**
350	**8.4**	**55**	**0.60**
400	**9.5**	**55**	**0.75**
450	**14.0**	**55**	**0.95**
500	**15.0**	**60**	**1.00**
600	**19.0**	**60**	**1.20**
700	**22.0**	**60**	**1.35**
750	**25.0**	**60**	**1.45**
800	**31.5**	**65**	**1.53**
900	**35.0**	**65**	**1.88**
1000	**41.0**	**65**	**2.05**
1100	**46.0**	**65**	**2.40**
1200	**50.0**	**70**	**2.60**
1500	**66.5**	**75**	**2.80**
8 Inches	**4.54**	**2.00 Inches**	**0.29**
9 "	**5.10**	**2.00"**	**0.31**
10 "	**5.67**	**2.00 "**	**0.34**
12 "	**6.58**	**2.00 "**	**0.48**
14 "	**9.30**	**2.50 "**	**0.63**
15 "	**9.98**	**2.50 "**	**0.68**
16 "	**10.66**	**2.50 "**	**0.74**
18 "	**14.06**	**2.50 "**	**0.95**

Nominal size of pipe in mm	Lead/ joint In Kg	Depth of Lead joint in mm	Spun Yarn per Joint in Kg
20 "	**16.33**	**2.50 "**	**1.04**
21 "	**17.92**	**2.50 "**	**1.08**
24 "	**20.41**	**2.50 "**	**1.21**
27 "	**23.13**	**2.50 "**	**1.33**
30 "	**25.86**	**2.50 "**	**1.46**
33 "	**28.35**	**2.50 "**	**1.65**
36 "	**31.58**	**2.50 "**	**2.40**

Note

The quantities of lead and spun yarn given in the table are provisional and variation of 20 percent is permissible.

b) Flanged Joints

Flanged joint should be made by painting the facing of the flange with white lead freely and bolting up evenly on all sides. A thin fibre of lead wool may be very useful in making the joints water tight where facing of the pipes is not true.

When packing must be used, it should be of rubber insertion of approved thickness. The packing should be of the full diameter of the flange with proper pipe hole and bolt holes cut out evenly on both the inner and outer edges. Where the flange is not fully faced, the packing may be of the diameter of the packing strip only. Proper placing of the packing should be checked before another pipe is joined on.

c) Cement Joints

The cement for the joints shall confirm to IS 269/ 1996 specification for ordinary, rapid hardening and low heat portland cement.

Cement and water taken in proportion 8 : 1 by weight shall be thoroughly mixed. The mixture shall be such that when it is tightly compressed by hand into a ball and the ball is broken into two pieces the break shall be clean. If the hand becomes water stained, it has to be considered that the water is excessive. If there is evidence of crumbling in the break, water added is less than required. The cement mixture shall ring with metallic sound while caulked.

Cement which has been wet for more than one hour or which had undergone initial set shall not be used for jointing.

Making the joints

When new pipes are laid close ahead of a newly made cement joint, the disturbance caused during the forcing home of the pipe ends into the sockets during the adjustment of the pipe to proper alignment may damage the new joint. To avoid this damage, jointing shall be done only when there are atleast six pipes laid to the final grade and alignment ahead of the joint to be made. Starting at the bottom of the joint the joint space shall be filled with wetted cement and caulked. The remaining joint space shall than be refilled with cement and caulked until the joint is practically flush with the face of the socket. The mixture shall be thoroughly compacted to make a water tight joint.

No water shall be allowed to touch the joint until the initial set had taken place. Immediately after initial set has taken place, the joint shall be covered with wet burlap, or other approved wet materials to ensure complete hydration of the cement. No water shall be allowed into the pipe until the elapse of 12 hours after the last joint in the line is made. Filling the pipe with water without pressure after this interval will be beneficial to curing of the joint.

d) Rubber Ring Joints

In the case of rubber ring joints or push on joints, the groove and the socket shall be thoroughly cleaned before inserting the rubber gasket. While inserting the gasket it shall be made sure that it faces the proper direction and that it is correctly seated in the groove. After cleaning dirt or foreign materials from the plain end, lubricant shall be applied in accordance with the pipe manufacturer's recommendations.

The contractor shall make sure that the plain end is beveled as square as sharp edges may damage or dislodge the gasket and cause a leak. When the pipe is cut at site, the plain end shall be beveled with a heavy file or grinder to remove all sharp edges.

The plain end of the pipe shall be pushed into the socket of the pipe and while pushing, the pipe shall be kept straight. If any deflections are to be made in the alignment, it may be made after the joint is assembled. A timber header shall be used between the pipe and crow bar or jack to avoid damage to the pipe while the plain end of the pipe is pushed into the socket either with a crow bar or jack, or level pullet.

2.6 Fixing Sluice Valve

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

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

The valve shall be supported in the valve chamber so that no stress or strain occurs in the flange or other joints of the valve.

The valve shall be carefully protected from slime or dust by a suitable mat or gunny covering and the pit itself shall be cleared of all unwanted material.

2.7 Fixing Scour Valve

Scour valves shall be fixed at places shown in the drawings or as directed by the Engineer, and the scour connections from the main shall be carried out completely as per drawings.

2.8 Fixing Air Valve

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

2.9 Interconnection Work

The interconnection work between the existing main and proposed main to be laid under this contract shall proceed from the new main to the existing main. Before actually proceeding with the interconnection work, the contractor shall make ready necessary tools and plants required for the work at site, such as pumpsets, shoring materials etc., He shall also keep ready at site necessary pipes, specials, valves if any required for the work. The contractor shall keep necessary skilled workmen of sufficient strength at site and once the work is commenced, the entire interconnection 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 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.

2.10 Works to be left water tight

The contractor shall construct the pipes chambers and all other works so that they shall be water tight. Should any leakage appear, it shall be made good by him at his expense by removing and reconstructing the portions of the work so affected or by other method which will render the work thoroughly water tight to the satisfaction of the Engineer.

2.11 Cleaning of Mains

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

2.12 Masonry Chambers

Chambers for sluice vales, 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 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 20mm thick and the outside with cement mortar 12mm thick. The chamber shall be topped with pre-cast R.C.C. Slabs 1:2:4 or cast iron surface box of valve cover as ordered by the Engineer. The surface box or valve cover shall be fixed on the top of the R.C.C. slab by a layer of cement mortar and sides of the surface box or valve cover covered over with cement concrete. Where pipes pass through walls of chambers relieving arches shall be turned neatly over the upper half of the pipes or R.C.C. lintels shall be provided to avoid load of the walls transmitted to the pipes. Cast Iron steps shall be built in each chamber as the work proceeds one being inserted to every 4

courses of brick work, horizontal distance centre to centre of each row being 30 cms. The contractor shall include in his rate for brick work cost for fixing steps, frame, cover etc., for completing all chambers in accordance with the drawings and with the above specifications.

2.13 Testing of Main –Hydrostatic Test

After laying and jointing the pipes and specials, the pipe lines shall be tested for hydrostatic pressure in such length as may be specified by the engineer. The test pressure shall be equal to 50% or such other higher percent as may be specified in excess of the pressure the pipe will have to withstand subsequently subject to a minimum test pressure of 7 kg/sq.cm in the case of lead joints. However in the case of cement joints, the joints may be tested to a minimum test pressure 3.5 kg/sq.cm.

If cement joints show seepage or slight leakage, such joints shall be cut out and replaced as directed by the Engineer and the test repeated. The Contractor shall make his own arrangements to procure, necessary equipments, apparatus etc,. required for testing and shall provide necessary labour for filling with water the length of pipes to be tested, fixing all apparatus and for carrying on the testing operations until the length of pipes, specials and connections are finally passed by the Engineer. The length to be tested shall be provided with two blank flanges fastened on in the usual manner by collar bands and bolts to the end pipes or if the length to be tested shall have a sluice value at each end, such blank flanges may dispensed with. The length of pipes to be tested shall first be filled in with water from a higher section of pipes already laid or with clean water shall be arranged at the contractor's expense with the approval of the Engineer. Before the actual testing pressure is applied any air which has lodged in the length of pipes to be tested shall be got rid of, by screwing on at the highest part of the length of pipes or temporary air valve, or, by opening a temporary stop-cock or by other mean as the Engineer may direct.

The test pressure shall then be applied to the length of pipes under test by a hand or powered hydraulic test pump. The connection of the test pump to the length of pipes shall either be at the union connection provided at a blank flange or shall be at a temporary stop sock or fountain connections as the Engineer may in the circumstances direct. The actual test shall be made by pumping water into the length of pipes under test, until the test pressure as specified above has been reached on the pressure gauge.

The test pressure shall be maintained for one hour or for such other period of time as may set by the Engineer and each joint will be inspected. While the pressure is on, the pipes should be struck smartly with a 2 kg hammer. When a flange joint is found to be leaking, care shall be taken that while tightening up the flanges, the neighbouring joints are not affected .If the length of pipe line under test is found to be satisfactory and no leaks or sweatness are found at the pipe joints or at the joints of specials and connections then this length of pipe line will be passed by the Engineer.

But should any pipe, joint, special or connection be found to sweat or leak, the contractor shall make good at his cost such defective joint and the length of pipe line shall be re-tested by the Engineer until all pipes, joints, specials and connection are found to be satisfactory.

If any pipe or special leaks or bursts, the damaged portion shall be removed and new pipes or specials shall be laid and jointed at the contractor's cost.

2.14 Restoring Road Surface

The surface of the road or ground shall be finished off to the proper level with the same kind of material as the surface consisted of before the excavation commenced except in the case of superior roads and tarred roads in which case the surfaces should be finished off with water bound macadam surface. Should any settlement occur after refilling is completed and 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.

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

3.1. Laying and Jointing of PVC Pipes

a) PVC Pipes

The PVC pressures pipes for water supply and distribution shall conform to IS 4985/ 1988.

b) Laying of PVC Pipes (IS 7634/ 1975)

The trench bottom should be carefully examined and should be free from hard objects, such as flints, rock projections or tree roots etc. The bedding for the pipes should be

brought to an even finish providing uniform support for the pipes over their length and pipes laid directly on the trench bottom. In other case the trench should be cut correspondingly deeper and the pipes laid on a prepared under bedding which may be drawn from the excavated material if suitable. As a rule trenching should not be carried out too far ahead of pipe laying. The trench should be kept as narrow as practicable but must allow adequate room for jointing pipes and placing and compacting the back fill. Mains should be laid with a cover of not less than 1m measured from the top of the pipes to the surface of the ground. Mains which might be brought under roadways by future widening schemes should be so laid that the eventual cover will not be less than 1m.

c) Jointing of PVC Pipes

The jointing of PVC pipes are done either by using Solvent Cement Joint or rubber ring joint.

The solvent cement used for jointing should be of the quality as specified in IS 14182/ 1994. The spigot and socket ends of the pipes should be cleaned and roughened with emery paper. If the ends are grossly contaminated, they should be cleaned with Acetone or Methyl Alcohol. The solvent cement should be thickly applied on the spigot end and thinly in the socket. For larger sizes the first coat should be allowed to dry and a

second coat applied. The spigot is then pushed into the socket and the excess cement wiped off at once with piece of cloth or rag. The joint should not be disturbed for atleast 5 minutes. The pipe should not be subjected to working pressure for 24 hours after jointing.

i) Rubber Ring Joint

The pipes for rubber ring joints are supplied with both ends chamfered. A mark should be made at a distance from the pipe end equal to half the length of the coupler. The inner side of the coupler ring and the chamfered end of the pipe should be clean and dry. The 'O' ring is then slipped into the coupler. The ring and the chamfered end of the pipe are lubricated with a lubricant. The coupler and the pipe should be carefully aligned and should be truly coaxial. The coupler is then pushed home into the pipe or the pipe is pushed into the coupler to make the joint.

4. Disinfection of Mains

Upon completion of a newly laid main or when repairs to an existing pipe are made, the main shall be disinfected as directed by the Engineer.

The mains shall be flushed prior to dis-infection 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 atleast 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 disinfection fails to produce satisfactory samples, dis-infection shall be repeated until satisfactory samples have been obtained. When the samples are satisfactory, the main shall be placed in service.

5) Laying and jointing of Ductile iron pipes.

a) Ductile iron pipes

The Ductile Iron pressure pipes shall conform to the I.S. 8329 /2000 & specials as per IS 9523/2000.

b) Laying Ductile Iron Pipes as per IS 12288/1987

The pipe should be lowered into the trench with tackle suitable for the weight of pipes. For smaller sizes up to 250mm nominal bore, the pipe may be lowered by the use of ropes but for heavier pipes either a well designed set of shear legs or mobile crane should be used. When lifting gear is used the positioning of the slink to ensure a proper balance, should be checked when the pipe is just clear of the ground. If sheathed pipes are being laid, suitable wide slings are scissor dogs should be used.

All construction debris should be cleared from the inside of the pipe either before or just after a joint is made. This is done by passing a pull through in the pipe, or by hand, depending on the size of the pipe. When laying is not in progress a temporary end closer should be securely fitted to the open end of the pipe line. This may make the pipe buoyant in the event of the trench becoming flooded, in which case the pipe should be held down either by partial refilling of the trench or by temporary strutting. All persons should vacate any section of trench into which the pipe is being lowered.

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

c) Jointing of Ductile Iron Pipes:
Two main types of joints are used with Ductile Iron pipes and fittings.
i)Socket and spigot flexible joints.

1. **Push on joints**
2. **Mechanical joints**

ii)Rigid flanged joints.

iii)Flexible joints:

The spigot and socket flexible joint should be designed to permit angular deflection in direction and axial movement to compensate for ground movement and thermal expansion and contraction. They incorporate gasket of electrometric materials and the joints may be of the simple push-on-type or the type where the seal is effected by the compression of a rubber gasket between a seating on the inside of the socket and the external surface of spigot. Joints of the latter type are referred to as mechanical joints. Both push-in and mechanical joints are flexible joints. Flexible joints require to be externally anchored at all changes in direction such as at bends, etc., and at blank end to resist the thrust created by internal pressure and to prevent the withdrawal of spigots.

Flanged joints:
Flanged joints are made on pipes having machined flange at each end of pipe. The seal is usually effected by means of a flat rubber gasket compressed between two flanges by means of bolts which also serve to connect the pipe rigidly. Gaskets of other materials, both metallic and non metallic are used for special applications.

Jointing procedure:
Procedure for jointing will vary according to the type of joint being used. Basic requirements for all types are:

a) Cleanliness of all parts
b) Correct location of components
c) Centralization of spigot within socket and
d) Strict compliance with manufacturer"s jointing instructions.

The inside of sockets and the outside of spigots should be cleaned and wire brushed for a distance of 150 to 225 mm. Glands and gaskets should be wiped clean and inspected for damage. When lifting gear is used to place the pipe in the trench, it should also be used to assist in centralizing the spigot in the socket.

Where the pipeline is likely to be subjected to movement due to subsidence or temperature variations, the use of flexible joints is recommended. A gap should be left between the end of the spigot andthe back of the socket to accommodate such movement.

V. WATER RETAINING STRUCTURES
(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 C.I. 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. **Lettering 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.**
10. Testing for water tightness

10.1 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.

10.2 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.

10.3 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.

10.4 In case of unsatisfactory test results, the contractor shall ascertain the cause, make all necessary repairs and repeat the procedure in the preceding clauses until the test has been passed satisfactory at no extra cost to the employer.

10.5In addition to the withheld amount, 40% of the amount of each bill of the contract shall be deducted and will be retained till the date of receipt of certificate of water tightness from the Executive Engineer, TWAD Board. The whole of the above sum together with any recovery from the payments already made to the contractor as may be assessed by the Executive shall be forfeited to the TWAD Board if the RCC reservoir develops structural defects or leaks. The above recovery shall be exclusive of the amount deposited towards security deposit. The fact of carrying out water tightness test should be recorded in 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.100.00 towards water tightness and structural stability of the reservoir/ water retaining structure. The period of guarantee required by the contract shall be two years from the date of completion and commissioning (with filling of water 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 confirmity with the standard

specification as per IS 3370 (Part-I) 1965 as amended from time to time and the other specifications as mentioned in the bid document.

11. C.I. Pipe Connections

11.1The vertical pipe connections shall be hoisted and fixed true to plumb without any deviation from the vertically as directed by the Engineer-in-charge.

11.2The jointing of pipes shall conform to the requirement and all required jointing materials shall be arranged by the contractor at his cost.

12. Scour

12.1Scour and overflow arrangements should be connected and let to a common pit from where it will lead to the nearest open drain.

13. Maintenance

13.1During the maintenance period, the contractor should clean the elevated service reservoir and sump at the intervals as directed by the Engineer.

VI. LAYING AND JOINTING OF PIPES

5.1 General

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

5.2.Earth work excavation

5.2.1 General

Before commencing the work and also during the progress of the work, the contract shall give notice to the concerned authorities viz., the Panchayats, the Municipalities, the Railways, the Electricity Board, the Telegraph Department, the Traffic Department attached to the Police and other Departments or Companies, as may be required to the effect that the work is being taken up in a particular locality and that necessary diversion of traffic may be arranged for. The contractor shall co-operate with the department concerned and provide for necessary barricading of roads, protection to existing underground cables, etc. met with during the excavation of trenches. The contractor shall also provide at his own expense watch and light during

the day and the night and put required notice towards such as "Caution" "Road Closed for Traffic" etc. He should also provide and maintain at his own expense the necessary supports for underground cables, etc. to afford the best protection to them in consultation with the authorities in charge of the properties and to their best satisfaction.

5.2.2 Trench excavation

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

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

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

Wherever earthern 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.

5.3 HARD ROCK

"Rock requiring blasting" shall exclude all rock such as soft rock, disintegrated rock, small boulders, all of which can be removed either with pick axe or craw bards and shall apply to rocks of different kinds when cannot be removed by any of these means. In case of difference of opinion, the Engineer's decision as to which rock shall be considered as "rock requiring blasting" shall be final.

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

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

5.4 Lowering pipes and jointing of pipes and specials

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

5.4.2 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.

5.4.3 Baling 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.

5.5 Special Fittings

5.5.1 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.

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

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

5.6 Testing pipes on position

5.6.1 The finished 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 litres per kilo metre per hour per centimetre diameter of the pipe shall be permissible.

5.6.2 Joint Testing

When testing the finished pipe line hydraulically after filling the 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 valve. The excess water coming from the relief valve shall be returned to the calibrated container. The rate of loss of water from the container shall be determined at regular intervals The pipe line is satisfactory provided the successive measurements show a diminishing quantity.

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

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

a) 1 ½ times the maximum sustained operating pressure;
b) 1 ½ 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.

5.7 Back Filling Trenches

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

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

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

5.8 River crossings

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

Railway Crossings

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

5.9 Road Crossings

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

5.10 Distance Indicators

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

5.11 Drawings

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

VII. Pumpsets and Accessories

I General

1. **All the materials used shall conform to the relevant BIS and should be delivered at site of work. The contractor is responsible for safe custody of machinery and other equipments under this contract till handing over to the employer.**
2. **The rates should include all the minor items of civil works, if any required for installation complete**
3. **All necessary civil works for creation of all equipments and accessories offered by the contractor under this contract should be done by the contractor.**
4. **Test certificates for machinery and equipments should produced along with supply**
5. **The bidder should enclose the performance curve duly indicating the duty point for the size of the impeller selected (family curve should not be furnished) the performance curve should furnish complete range of operation and the curve should be authenticated by the manufacturer or his authorised dealer. In the event of non compliance the offer shall be summarily rejected**
6. **The contractor shall make necessary arrangements to get supply of electricity from TNEB for operating the machinery and equipments. Necessary vouchers in original for the payment made to the EB shall be produced to the employer by the contractor which shall be reimbursed by the employer.**
7. **Before supply of machinery, equipments and other accessories prior approval of the Engineer should be obtained giving the name of makes and other details required.**
8. **Obtaining approval or electrical layout diagram for the installation of all the equipments (transformers, generators, pumpsets and other accessorice) and obtaining safety certificate on completion of work from Chief Electrical Inspector to Government of Tamil Nadu should be arranged and got approved by the contractor at his cost.**

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

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

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

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

12. The submersible pumps centrifugal pumps, turbine pumps submersible motors, motors for turbine and centrifugal pumpset transformer, generators, Panel Boards to be supplied by the firm will be inspected by the Inspecting Agency fixed by the Employer at the manufacturers premises and test certificate will be issued. The contractor should make necessary arrangements for the inspecting staff at his own cost for testing the above pumpsets.

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

13) If the complete plant or any portion there of is found to be deffective the Engineer shall give the contractor a notice in writing to verify such defects. If the contractor fails to rectify the defects within the specified period the Engineer will rectify the defects at the contractor's risk and cost.

2(a) TURBINE PUMP

The pump shall be of manufacturer's latest standard design to give maximum efficiency when operated under the most exacting conditions at medium speed 1000/1500 RPM, conforming to IS 1710-1972 as amended upto date. The equipment shall conform to the following specifications:

i) IMPELLER

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

ii) IMPELLER SHAFT

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

iii) LINESHAFT

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

iv) BEARINGS

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

v) COLUMN PIPES:

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

vi) NAME PLATE

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

vii) PERFORMANCE CURVES

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

The performance curve must contain the following:

a. Discharge (full range) Vs. Total head in Meters.
b. Discharge (full range) Vs. Pump efficiency in Percentage.
c. Discharge (full range) Vs. Overall efficiency percentage (Pump to Motor)
d. Discharge (full range) Vs. BHP absorbed in KW.
e. Discharge (full range) Vs. Power input in KW.

2(b) MOTOR

i) TYPE OF MOTORS

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

ii) OUTPUT OF MOTORS

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

iii) BEARINGS

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

iv) OVERLOAD

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

v) TEMPERATURE RISE

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

vi) EARTH TERMINALS

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

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

The HP of motor offered shall have a margin of 10% above the BHP absorbed by

the pumpset at duty point and also above the maximum HP absorbed by the pump offered.

vii) STARTING

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

viii) CAPACITOR

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

1. **Induction motor (Squirrel cage)**
2. **Name of manufacturer**
3. **Manufacturers number and frame reference**
4. **Type of enclosure**
5. **B.H.P**
6. **Rated output in K.W.**
7. **Rated Voltage and winding connections.**
8. **Number of phases.**
9. **Frequency in HZ**
10. **Current approximate in amperes at rated output.**
11. **Speed in revolutions per minute at rated output.**

3(a) CENTRIFUGAL PUMPS

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

The casing should be free from blow holes, cracks and other imperfections conforming to relevant standard. Bearing housing shall be of such design to exclude entry of water bearing may be of oil lubricated of grease lubricated type. The shaft design should ensure the deflection not exceeding. 1 mm per meter length. The flexible tyre type rubber coupling is recommended for coupling pump and motor of horizontal mounting.

Painting may be done as per relevant Bureau of Indian Standard specifications.

i) CASING

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

ii) IMPELLERS

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

iii) IMPELLER SHAFT

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

iv) STUFFING BOX

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

v) BEARINGS

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

vi) ACCESSORIES

Each pump shall be provided with the following accessories.

i) Lifting Hook
ii) Priming funnel
i) Approved type of lubrication system
ii) Drip water pipes
iii) Pressure gauge as specified
iv) Compound gauge as specified

v) NAME PLATE

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

Make **Index No.**
Litres per minute **Total Head in metres**
No. of stages **Diameter of delivery branch**
Revolution per minute
Diameter of suction branch

vi) BASE PLATE

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

vii) COUPLING

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

viii) CHARACTERISTICS CURVES

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

3(b) MOTOR

i) TYPE OF MOTORS

The Motors (suitable for centrifugal pump) shall be AC squirrel cage induction motor with drip proof screen protected continuous rating suitable for operation in the range of 360/440 volts 3 phase 50 cycles at the speed of 1500 RPM.

ii) OUTPUT OF MOTORS

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

iii) BEARINGS

The motors shall be provided with ball end or rollers S.S. bearings of ample size readily available from stocks in India. The bearings shall be accurately fitted and provided with moisture and dust proof bushes. The contractor shall state the name of the manufactrers and the bearing No.

iv) OVERLOAD

The motors shall be capable of with standing the overload specified in the relevant condition of I.S.

v) TEMPERATURE RISE

The temperature rise in the windings shall not exceed over an ambient temperature after a full load continuous run of 12 hours. The temperature

rise shall not reach a value where there is risk of injury to any insulated materials of adjacent part irrespective of that has been mentioned above.

vi) EARTH TERMINALS

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

VII) TECHNICAL DATA

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

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

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

VIII) STARTING

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

IX) CAPACITOR

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

a) Induction motor (Squirrel cage)

b) **Name of manufacturer**

c) **Manufacturers number and frame reference**

d) **Type of enclosure**

e) **B.H.P.**

f) **Rated output in K.W.**

g) **Rated Voltage and winding connections**

h) **Number of phases**

i) **Frequency in HZ**

j) **Current approximate in amperes at rated output**

***k)* Speed in revolutions per minute at rated output.**

4(a) SUBMERSIBLE PUMP

The pump shall be of latest standard designed to give maximum efficiency when operated under most exacting condition at speed 1500/ 3000 rpm. The equipment shall confirm to the following specifications as per IS 8030 – 1996.

i) PUMP BOWL

The pump bowl shall be manufactured to offer resistance to corrosion. The bowls may be equipped with replaceable bearing.

The bowl assembly shall bear a name plate giving the following information.

a. Name of the manufacturer or trade mark
b. Serial Number of the pumpset
c. Pump type
d. Number of stages
e. Total head
f. Capacity
g. Speed

ii) IMPELLERS

The impellers shall be open or closed or semi closed type. They shall be turned and accurately finished and balanced on their own pump shaft for maximum lifting capacity without over loading the prime mover irrespective of water level fluctuations. The impeller may be of the enclosed or semi enclosed type and shall be properly balanced. Dynamic balancing is recommended. Enclosed impellers may be equipped with sealing rings on their hubs.

iii) PUMP SHAFT

The pump shaft shall be stainless steel of ample size and stiffness to transmit maximum power without strain or vibration. The pump shaft shall be guided by bearings provided below and above the impeller shaft assembly. The shaft without protecting sleeves shall have a surface finish of 0.75 micron.

iv) BEARING SLEEVE

The bearing sleeve shall be of leaded bronze

v) DISCHARGE CASING

The discharge casing shall be manufactured to offer resistance to corrosion

vi) SUCTION CASING

The suction casing shall be manufactured to offer resistance to corrosion

The opening in the suction case of the entrance shall be of proper size and shape to reduce loss. The suction case shall be fitted with a strainer made of corrosion resistant materials. Suitable guard shall be provided just above the suction case bearing to prevent the entry of foreign matter into the suction case.

vii) COUPLING

A suitable coupling arrangements shall be provided in case of directly coupled pumpsets.

viii) NON RETURN VALVE

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

9. CHARACTERISTIC CURVES

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

3 (b) SUBMERSIBLE MOTORS

i) TYPE

The submersible motor shall be wet type, squirrel cage induction motor suitable for operation on 360/440 volts, 3 phase 50 Cycles AC supply and capable of developing the required HP at a speed 1500/3000 RPM. The motor windings and the bearing bushes of the rotar shaft shall be lubricated by pure water or oil, filled in the motor before erecting the pumpsets. The motor shall confirm to IS 9283 – 1979

The motor shall be connected by means of cable glands rubber seals etc., from inside of borewell to arrest the entry of sand and other foreign matter.

The motor shall be provided with a breathing attachment like bellows diaphragm etc., to compensate the Volumetric variation due to changes in the temperature. The motor shall be made of corrosion resisting materials or suitably treated materials to resist corrosion under normal condition.

ii) BEARINGS

The thrust bearing shall be of adequate size to withstand the weight of all rotating parts as well as the imposed hydraulic thrust. These shall be lubricated suitable.

The thrust bearing housing shall be provided with a drain plug to empty the oil pure water filled into thrust bearing housing rotor.

iii) Motor

The rotor shaft shall be provided with shaft protective sleeves having a surface finish of 0.75 micron.

iv) EARTHING ARRANGEMENT

The earthing of motor shall comply with IS : 3043 – 1966 Code of practice for earthing provision shall be made for double earth copper connection. Two separate lead should be taken to two separate earth pits located outside the pumphouse.

v) TEMPERATURE RISE

The insulation should be perfect so as to limit the temperature rise in windins.

vi) OUTPUT

The motor shall be capable of developing the Mechanical output for the required conditions and shall have continuous normal rating to suit the maximum load when operated at the pump speed.

vii) TECHNICAL DATA

The motor HP shall be such that to safely take the load when the total head is reduced by the rise of water level.

The H.P. of the motor offered shall have a Margin above the H.P. absorbed by the pumpset at duty point and also above the maximum BHP absorbed by the pump set offered.

viii) OVERLOAD CAPACITY

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

ix) STARTING

The motor shall give full load torque when taking 1 to 1.5 times full load current. The motor shall have a name plate giving the following information.

a. Induction motor
b. Name of manufacturer
c. Manufacturers number & frame reference
d. Type of enclosure
e. B.H.P
f. Rated voltage and winding connections
g. Rated output in K.W.
h. Number of phases
i. Frequency in HZ
j. Current approximate in amperes at rates output
k. Speed in revolutions per minute at rates output

5 (a) TRANSFORMERS AND ACCESSORIES

i) SCOPE

This specification covers the power transformers with fittings and accessories to be used in the electrical system. The transformer shall conform to BIS No. 1180/1964

ii) STANDARDS

The equipment and accessories covered by this specification shall be designed, manufactured and tested in accordance with the latest relevant standards and codes of practice published by the Bureau of Indian standard amended upto date.

All electrical equipment shall also conform to the latest Indian Electricity

rules in regard to safety/earthing and other essential provisions specified therein for installation and operation of electrical plants.

iii) DESIGN BASIS

All equipment shall be capable of operating at the required capacity in ambient air temperature of 45ºC maximum and 40º C average over 24 hours. The derating of all equipments shall be done on an ambient temperature of 45ºC The equipment and apparatus to be installed outdoor/ indoor as per latest BIS.

All equipment and accessories shall be designed to withstand the operating conditions in the plant and the atmospheric conditions at site.

iv) SYSTEMS VOLTAGES

Electric power for the transformer accessories will be available at 415, 3 phase, 4 wire, 50 Hz.

Special care shall be taken to make the enclosed equipment proof against entry of rats, lizards, and other creeping vermin which may create electrical short circuit inside the live equipment

All ventilating and forced draft opening shall have suitable screen protection. Where screens are provided on top of the equipments, means shall be provided to protect them from falling object.

All equipments shall be complete with approved safety services whereover a potential hazard to personnel exists and with provisions for safe access of personnel to an around equipment for operational and maintenance functions, designs shall include all reasonable precautions provisions for the safety of operating and maintenance personnel.

v) GENERAL DESIGN FEATURES

All transformers shall be of the latest design, as called for in the technical specification, unless otherwise specified, all transformers shall be suitable for outdoor installation.

Each transformer shall be suitable for operation at full rated power on all tapping without exceeding the applicable temperature rise.

The transformers shall be designed to be capable of with standing without injury, the thermal and mechanical effects of short circuit between phases or between phase and earth at the terminals of any winding with full voltage applied across the other winding for periods given in relevant standards.

The transformers shall be designed to suppress harmonic content especially the third and fifth so as to eliminate distortion in the wave form and consequent additional insulation stress noise on communication system and undesirable circulation currents.

The transformers shall operate with minimum noise and vibration, the cores, banks/ protective housing and other structural parts shall be properly constructed and windings properly braced so that the mechanical vibration are kept to the minimum thus reducing the noise. The core coil assembly shall also be fixed in such a manner that no shifting or deformation occur during shipment or installation.

Each transformer shall be designed for minimum no – load losses within the limit.

The design of each transformer shall be such that, the risk of accidental short circuits due to birds or vermin are obviated. All

outdoor apparatus, including bushing insulators and fittings shall be so designed that they do not collect water at any point.

All electrical connections and contacts shall be of ample section for carrying the rated current without excessive heating.

All mechanisms shall be of stainless steel, brass, gunmetal or other suitable materials to prevent, sticking due to rust or corrosion, all valves shall be of gunmetal

If any temporary fitting is made in the tank protective housing of a transformer for transporting purpose, these shall be identified as well instructions, and illustrated drawings shall be furnished to facilitate their removal at site before commissioning.

vi) CORE

The frame work, clamping arrangement and general structure of the cores of each transformer shall be of robust construction and shall be capable of with standing any shock to which they may be subjected during transport installation and service. The assembled core shall be securely clamped on the limbs and the yoke, to build up a rigid structure. The clamping pressure shall be uniform over the whole of the core and so adjusted to minimise noise and vibration in the core when the transformer is in operation. The frame work and the core bolts shall be efficiently insulated from the core so as to reduce the eddy currents to a minimum.

The magnetic circuit shall be built of high quality low loss, non ageing, cold rolled, preferably grain oriented, silicon steel laminations having excellent magnetic properties and being specifically suitable as core materials, Laminations shall be insulated from each other with materials having high inter alienation. Insulation resistance and rust inhibiting property and also capable of withstanding pressure, machanical vibration and action of heat and all in case of oil immersed transformers.

The limbs and the yokes of the core shall have similar sections to minimise heat and noise arising from transformer flux. The joints in the laminated magnetic circuit shall be inter leaved. Necessary

cooling ducts shall be provided for heat drssipation from the core so that the anticipated maximum hot spot temperature in the core shall not be injurious to any material used in the core assembly.

The core clamping frame shall be provided with lifting eyes having ample strength to lift the complete core and winding assembly.

The core assembly of oil immersed type transformers shall be electrically connected to the transformers tank for effective earthing.

vii) WINDING

The coils used for transformer winding shall be circular in shape and made of paper insulated continuous and smooth, tinned or enamelled electrolytic copper conductors of high conductivity and 99.9% purity. The windings shall be duly sectionalised. Similar coils shall be connected by accessible joints Brazed or welded and finished smooth. No core discharge shall result on the winding open resulting the transformer for induced voltage test as specified in applicable standard. The insulation materials for all immersed type transformers shall be of class `A' type.

viii) TANK FOR IMMERSED TYPE TRANSFORMER

The transformer tank shall be made of good commercial grade low carbon steel plate of adequate thickness, shaped in such a way that minimum of welding is required. All seams shall be electrically welded for absolute oil tightness. Tank walls shall be reinforced by adequate stiffener to ensure mechanical rigidity permitting hoisting of complete transformer unit filled with oil and also to damp transformer noise. The tank shall be sufficiently strong to withstand shocks likely to be encountered during transport of the transformer without any deformation or weakening of joints. Guides shall be welded on the inner side of tank to facilitate tanking and untanking of the transformer core and coil assembly.

Tank cover shall be bolted into the flanged rim of the tank with a suitable wooden proof hot oil resistance resilient gasket in between for complete oil tightness. If the gasket is compressible, metallic

steps shall be provided to prevent over compression. The bottled tank cover shall be provided with lifting eyes and shall be arranged that it can be removed and the core inspected without removal of the radiators. All requisite access and inspection holes shall be provided with bolted, oil tight market scaled cover plates. Bushing currents, covers of access holes and other devices shall be designed as to prevent only leakage of water into oil from the tank. Surfaces of the transformer tank or other parts of the transformer of auxiliary equipment which are in contact with oil shall not be galvanised.

The transformer tank shall be provided with lifting locking and pulling lugs etc. as may be necessary for lifting and healage of the complete oil filled unit. The tank shall be mounted as a suitable under carriage to meet the requirement of the technical specification.

After fabrication, each tank with its conservator and radiator/ cooler fitted with their respective valves and filled with oil, shall be pressure tested for a minimum period of 24 hours to withstand a pressure equal to the static head of oil up to service level plus an air pressure of one atmosphere to ensure that the valves do not leak nor any welded joint sweat.

ix) INSULATION OIL

Mineral oil shall be used for oil immersed type transformers. The oil shall conform to the relevant applicable B.I.Standard and shall be suitable in all respects for operating the transformer at the ratings and under conditions specified.

Sufficient oil shall be supplied for the first filling of transformer, the oil circulation equipments and also the chamber containing on load top changing mechanism where provided.

x) TAP CHANGER

All transformers shall have provision for tap changing for mineral oil immersed type. The tap changing mechanism should be of manually operated off load circuit type tap changing switch as called for in the technical specification.

OFF CIRCUIT TAP CHANGER

For off circuit tap changers the tap changing switch shall be mechanically coupled to the external operating handle and the operating spindle shall be carried through an oil tight gland in the tank side. A register plate clearly indicating the tapping in use shall be fixed to the external operating mechanism and provision shall be made for securing and pad locking the switch in any of the working positions and for ensuring that the contacts are fully engaged before the transformers is energised.

xi) COOLING

The cooling system for oil immersed type transformers may be oil natural/ air natural (NAN) as called for in technical specification.

In oil immersed transformers, the Radiators/ Cooler tubes shall be commercial grade low carbon steel or approved equivalent with clean bright internal surface and shall be suitably supported to withstand mechanical shock. The radiator/ cooler shall be designed for the same pressure condition as specified for the transformer tank. The radiator/ cooler tubes for transformers shall be so arranged that every part of the cooling surface can be cleaned by hand.

xii) TERMINAL ARRANGEMENTS

The terminal arrangements for external connection shall be suitable for the type of connection as called for in the technical specification. Over head conductor connectors/ bus duct termination arrangement/ cable terminal boxes shall be suitable for the required type, size and arrangement of the overhead conductor/ bust duct/ cable. For out door transformer the bus duct termination arrangement/ cable boxes shall be weather proof design.

The type of natural terminal shall be as specified in the technical specification.

The relative orientation in space of the terminal bushings when mounted on transformers shall be such as to permit maintenance of specified clearance between the phase conductors and between any phase conductor and the earth. Bushing insulators shall be so mounted that the

jumper connection, where specified can be taken away clear of all obstacles. The orientation of the set of bushings on the LV side in relation to that on the HV side will have to be fixed as required by equipment layout at the substation where the transformer will be installed.

The terminals and terminal fittings shall be of appropriate size and construction. These shall be designed for carrying the full rated transformer current continuously without exceeding permissible temperature rise and withstanding all stresses under normal working and short circuit conditions.

The bushing insulators of the transformers shall be made of wet process, single piece glazed porcelain and shall have high mechanical strength, stable insulation and very high puncture strength. These shall remain unaffected by atmospheric conditions due to proximity to the sea, fumes, acids, dust or rapid change of temperature likely to be met with at site.

Poccelain shall not engage directly with hard metal and where necessary and approved resilient material shall be interposed between and the fittings. The fixing materials shall be of approved quality and shall not enter into chemical action with the metal parts stresses due to expansion and contraction in any part of the insulator shall not lead to the development of any defect. Connection between the bushing terminal and windings shall be flexible.

The construction of oil filled or condenser type bushing, where offered, shall be such as to allow free expansion of the control conductor. These bushing shall be provided with test taps to facilitate measurement of tangent delts by anchoring bridge.

xiii) TRANSFORMING FITTINGS

Each transformer shall be provided with all fittings and accessories specified in the applicable standard for the size and type of transformer concerned. Additional fittings shall also be provided as called for in the technical specification.

The oil temperature indicator shall be direct actuated dial type thermometer fitted with a pointer to register the highest temperature

attained. The indicator shall be provided with a set of adjustable contact for high oil temperature.

The local winding temperature indicator shall be direct actuated dial type thermometer fitted with a pointer to register the highest temperature attained. The winding temperature indicating device shall be complete with current transformer, heater element and dial type thermometer with two separate sets of contacts one for alarm and the other for circuit breaker trip. Each set of contacts shall be of specified range and to reopen when the temperature fails to present desired value.

Conservators for oil-immersed transformers shall be suitably located and shall be fitted with oil filling hold and cap, drain value, oil level indicator shut off value etc.

Oil immersed transformers shall be provided with dehydrating breather filled with silicagel or other suitable dehydrating agent. The breather shall be complete with inspection windows connecting pipe and oil seals.

Oil level indicators shall be gauge glass type or magnetic dial indicator type as called for in the technical specification. Dial indicators shall be complete with requisite set of contact for giving low oil level alarm.

The explosion vent shall be provided with suitable diaphragm which shall break at a static pressure applied for the transformer tank. It shall have an equalising pipe connection to the conservator air space.

Two earthing terminals of adequate mechanical and electrical capacity shall be provided. Separate earthing terminals shall also provided on each separate radiator/ cooler tank.

Complete set of rating and diaphragm plates as per adopted standard shall be provided for each transformer.

Lifting lugs and jacking pads as required shall be provided for the transformers.

Suitable under carriage fitted with either flanged bi-directional wheels for specified gauge of rails of flat rollers or skids as called for in the technical specification (Bill of quantities) shall be provided. The wheels and rollers shall have adequate mechanical strength and shall be so designed that the transformer will roll without undue effort after it has been immobile for a

considerable period. The edges of rollers shall be duly rounded off to permit skidding of transformers on flat surfaces.

xiv) PAINTING

All painting shall be in accordance with the latest BIS for painting.

xv) TESTS

All equipment shall be fully tested in accordance with relevant clauses of applicable standards. All components and devices shall be checked for correct operation before despatch.

5. (b) TRANSFORMER YARD

The transformer yard should have 6 pole/ 8 pole structure according to relevant I.E. rules along with lightening arrestors, insulators, air break switches D.O. switches with jumper connections duly complying with the regulations of Chief Electrical Inspector to Government. Required no. of earth pits, spreading of 40mm stones in the transformer yard as stipulated by the CEIG is to be provided.

The transformer yard earthing shall be done in accordance with relevant I.E. rules

6. GENERATOR

The generator should be brushless, self excited and self regulated with test response to load charges and coupled to diesel engine of suitable HP rating.

MECHANICAL CONSTRUCTION

It should conform to IS 2253 and 4722 and amended therein.

The rotor assembly should be dynamically balanced to ensure vibration free running.

TERMINATION

Termination box provided at the end of the Generator should have four leads brought out for three phase supply.

VOLTAGE

The Generator should be designed for 415V, 3 phase and 50 HZ.

MOTOR STARTING

The generator should have a good motor starting ability and can be drawn upto twize the full current for 10 seconds.

DIESEL ENGINE

Diesel engine should enable should have adequate power margin to take care of the starting torque. The diesel engine should have all standard fittings as per BIS.

STARTERS

The starters shall suitable for the motor offered. This should have single phasing preventor, mounted on Ammeter, suitable capacity fuses etc. with all the standard safety devices such as Np volt coil, over load releases with time lag arrangements dry running preventor suitable interlocking devices, cable entries name plates and earthing facilities etc.

These starters to be supplied should be of FOL upto a range of 5 HP, star delta starter upto the range 15 HP and auto transformer starter above range of 15 HP.

SWITCH BOARD

The switch board shall be complete with all necessary internal connections and accessories as mentioned in the BOQ and as per latest I.E. Rules and CEIG

regulations. This switch board should contain all equipments housed in cubiele, the bus bars should have ample current carrying capacity for connected load and painted with powder coated painting.

CABLES

The cables shall be supplied as mentioned in BOQ with ISI mark. Laying and jointing of cables shall be as per I.E.Rules. The cable should have current carrying capacity to withstand over load due to low voltage and voltage drop. Cable jointing should be done in such manner that there is adequate bondage strength and safety to equipments and operators.

EARTHING

Twin copper earthing of the plants and equipments shall be done as per IS 3043/1966 & I.E. rules 1996 and amended from time to time. Two separate lead should be taken to two separate earth pits located outside the pump house.

PUMP HOUSE WIRING AND LIGHTING

Pump house wiring and lighting shall be carried out, as per I.E.Rules with sufficient number of light points, lamps and other accessories (to be supplied by the Contractor) as prescribed in the BOQ and shall be of standard free of cost.

ERECTION AND TESTING

The contractor shall provide a skilled Engineer and skilled labour for the entire execution of the work and final testing of the plants at site.

All erection tools including spanners, diesets etc. shall be supplied by the contractor and the contractors representatives shall have full and uninterrupted access to the site during erection.

The Employer may depute any officer under his control to visit the works at any time during the stage of erection for inspection. The plant shall be tested by Employer. Post delivery inspection by the third party inspection agency in the presence of the firm's Engineer or any other representative to ensure performance and all testing equipments as may be reasonably required shall be provided by the contractor .Installation testing and commissioning should in accordance with relevant ISS. The pre delivery inspection certificate for the pumpsets, panel board and other equipments and TNEB. Test certificate for transformer to be obtained by the bidder.

SPARE PARTS

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

TOOLS

Standard tools for the maintenance of the equipments shall be supplied as detailed.

D/E spanners	**1 set**
Ring spanners	**1 set**
Bearing puller	**1 no.**
Grease gun	**1 no.**
Hand Gloves tested for electrical operation	**1 pair**
Ball peen hammer	**1 no.**
Screw drivers	**1 set**

Electrical tester	**1 no.**
Electric megger	**1 no.**

COMPLETION PLANS

The successful bidder shall be requested to furnish completion plans in triplicate within one month from the date of the first testing of the plants. The plan should show the entire layout of the plant executed. Two copies of plan should be supplied to the Employer and one to be framed and suspended in the Head works. The contractor shall in addition to the above furnish detailed specifications of the equipment provided to the Employer with all technical data.

MAINTENANCE MANUAL

The periodical maintenance schedules for each equipment shall be given with reference to the hours of operation. Detailed information about the spare parts (part name, identification number etc.) should be given. The copies of the manuals should be furnished within one month from the date of commissioning**.**

VIII . TESTING OF PLANT

General

The requirements for testing shall be as specified below.

Pumps, valves and pipework and general purpose machinery Off-site inspection and testing

(a) Pumps

Pumps shall be individually tested in accordance with Relevant IS Code and the tests shall be with clean water. Site conditions shall be simulated as nearby as possible

including the NPSH condition. Pumps shall be tested with their own prime movers. Where it is impracticable to include the full length of the connecting shaft, the Contractor shall state the allowances to be made for the losses incurred by its omission

and shall demonstrate the accuracy of the allowances to the satisfaction of the Engineer.

Pumps shall be tested at the guaranteed duty point and over the full working range from

the closed valve condition to 20 percent in excess of the quantity when a single pump runs alone at minimum head. The tests shall provide information for performance curves

to be drawn for head/quantity, efficiency/quantity, power absorbed/quantity and net positive suction head/quantity. Readings shall be taken at a minimum of seven points in

addition to shut-off condition. Each pump shall also be run at its duty point for at least 30 minutes.

Positive displacement pumps shall be tested in accordance with BS EN ISO 9906.

For eccentric helical rotor pumps the tests shall provide information for performance curves to be drawn for pump speed/flow, input power absorbed/flow differential pressure/flow and pump efficiency/flow.

Pump casings shall be subject to a pressure test at 1.5 times the pressure obtained with the delivery valve closed. The positive suction head when installed shall be taken into account in determining this pressure. During the test, the casing and joints shall show no signs of leakage, distortion or defect.

In addition to confirming the specified hydraulic performance of the pumpset, the test shall demonstrate that vibration is within the specified limits, the mechanical performance is satisfactory and the noise level is within the specified limit. Additionally chemical dosing pumps shall be tested in accordance with API standard 675 and the specified flow linearity, steady state accuracy and flow rate shall be demonstrated.

(b) Gate valves

Gate valves shall be tested in accordance with relevant IS Codes or equivalent whichever applies, valve seat tests shall be made under open-end conditions, the test pressure being applied to each face of the valve in turn.

(c) Butterfly valves

Butterfly valves shall be tested in accordance with IS Codes or equivalent. The seat test shall be for tight shut-off and low leakage. Valves shall be tested under maximum unbalanced water test pressure in either direction

(d) Air valves

Air valves shall be water tested for drop-tightness at all pressures from 0.2 bar in steps of 2 bar up to the specified pressure. The valve body shall be water tested at 1.5 times the specified pressure, at which pressure no damage or permanent deformation of the valve body, ball or seat shall occur. Two valves of each type and size incorporating large orifices shall be tested for exhaust of air at a differential pressure up to 1 bar in steps of 0.1 bar and for inflow of air at a differential pressure up to 0.5 bar in steps of 0.1 bar. During the tests the air flow rates shall be measured by orifice plates in accordance with BS 1042. Pressures (positive or vacuum) shall be measured by Bourdon tube gauges or by mercury-in-glass manometers. The temperature of the flowing air shall be measured in accordance with relevant parts of IS Code or equivalent. The barometric pressure shall also be measured

If the manufacturer provides results of independently witnessed air flow tests similar to those specified and these are accepted by the Engineer, the specified airflow tests shallbe deemed to be completed

(e) Pressure and flow control valves

Pressure and flow control valves shall be tested hydrostatically as follows:-

Body strength: closed-end test, valve open, test pressure 1.5 times working pressure;

Valve element strength:	open-end test, valve closed, test pressure of 1.5 times working pressure applied to each end;
Leak tightness:	open-end test, valve closed, test pressure of the working pressure applied to inlet end, no visible leakage permitted.

(f) Pipe work
Pipe work shall be tested in accordance with the appropriate IS Codes or equivalent.

(g) Castings
Castings shall be tested hydrostatically to 1.5 times the maximum working pressure for a minimum period of 1 hour.

(h) Surge vessels
Surge vessels shall be tested in accordance with the relevant IS Codes or equivalent.

Electric motors
Off-site inspection and testing
Motors shall be inspected and tested to show that they are compliant with the Specification and approved drawings.
Tests shall be in accordance with the relevant IS Codes or equivalent..
For low voltage standard production motors for general use, the tests shall be routine checks. For high voltage and low voltage motors for main drive application, the tests shall be duplicate. If the test to determine the locked rotor current of cage induction motors is carried out at reduced voltage, allowance shall be made for the effect of saturation when adjusting for rated voltage. The estimated value of locked rotor current at rated voltage shall be stated on the test certificate.
A Polarisation Index test shall be carried out for high voltage motors. The requirement for "basic" or "special" tests shall be as specified.
Individual Tests
Each motor shall be inspected prior to site testing for:-
- Absence of damage during transportation and erection;
- Absence of moisture or other contamination;
- Ventilation openings and drain holes are free of debris;
- Cable glanding and core terminations for tightness and identification;
- Free rotor rotation;
- Free movement of brush gear;
- Remote start/stop/E.stop control box wirings and arrangement;

• Starting interlocks

Unless otherwise specified the following tests shall be carried out on each motor before energising:-

• Winding insulation resistance;
• Polarisation Index for high voltage motors;
• Insulation resistance between motor and heater windings and ancillary devices;
• Calibration of winding and bearing temperature monitoring devices and the operation of alarm and trip initiating contacts;
• Continuity and resistance of winding thermistors;
• Bearing insulation integrity;
• Brush pressure.

Any other tests recommended by the manufacturer or stipulated in the the relevant IS Codes or equivalent. On the satisfactory completion of the inspection and tests listed above, motors shall be energised to check for correct direction of rotation, noise and the vibration levels are within the specified limits. The tests shall be carried out with the motor uncoupled from the driven plant.

Transformers

Off-site inspection and testing

Transformers shall be inspected and tested to show that they are fully compliant with the Specification and approved drawings and shall include the following tests as a minimum:-

• Routine tests;
• Measurement on winding resistance;
• Ratio, polarity and phase relationship;
• Impedance voltage;
• Load loss;
• No-load loss and current;
• Insulation resistance;
• Induced over voltage withstand;
• Separate source voltage withstand;
• Magnetic circuit voltage withstand
• Transformer tank oil leakage test (1 kg/cm2 for 24 hours);
• Transformer noise level measured in accordance with methods and procedures detailed in IEC 551 -Noise level shall not exceed 65dBA;
• Tap changer switching, mechanical and electrical tests according to BS4571;
• Zero sequence impedance measurement;
• Type tests;
• Impulse voltage withstand test;
• Temperature rise test;

• On load tap changer panels;
• Operational tests;
• Sequence tests.

Unless otherwise stated by the Engineer at the time of placing the order, evidence of records of satisfactory type test carried out on identical transformers to those ordered will be accepted in lieu of actual tests on transformers manufactured under this Contract for impulse voltage withstand test. Temperature rise test shall be carried out on one transformer of each size and type. The guaranteed no-load and load losses of each

transformer shall be verified at the manufacturer's works. The positive tolerances stipulated in BS 171 shall not be accepted. The Board reserves the right to reject any transformer which does not achieve its declared guaranteed values.

Individual Tests

The Site inspections and tests to be carried out are as follows:-

- Ratio, polarity and phase relationship;
- Impedance voltage;
- Insulation resistance;
- Oil and winding temperature gauges shall be calibrated and tested;
- Pressure gauges and oil level indicator relays shall be tested with pilot cables connected by mechanical operation of contacts;
- Tap changer equipment including protective devices shall be tested to ensure correct operation;
- Oil tests;

Samples of insulating oil shall be taken and subjected to dielectric strength tests. If the insulating oil fails the site test, the Contractor shall carry out the drying of oil to remove the moisture content or replace the oil and then carry out the oil tests again to comply with the relevant IS Codes or equivalent.

IX . MAINTENANCE OF PROJECT

1. It is the sole responsibility of the contractor to maintain the entire project successfully for the maintenance period of **6 months** from the successful Commissioning of the project. Under this scope

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, pumpsets 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
- Complete quality service shall be ensured by the contractor during the maintenance period.
- Necessary log books indicating the quantity of water pumped, and maintenance carried out and repairs attended with details of spares changed shall be maintained by the contractor on a day to day basis and produced to the Engineer in charge whenever called for
- Date of commencement of maintenance will be from the date of commissioning of the schemes in all respects i.e. after supply effected to all beneficiaries covered under this scheme.
- In case where the work could not be completed due to the reasons beyond the control of the contractor viz. due to delay in getting permission from Railways/ Highways etc. authorities, the partial commencement of the maintenance will be permitted for other completed works/ components from the date in which these components / works were commissioned and water supply affected to the beneficiaries and of separate maintenance period may be adopted as per agreement conditions for he component after its completion.

X. ANNEXURES

I. Pump characteristics

II. a) Turbine pumps
b) Motor for turbine

III a) Centrifugal pump
b) Motor for centrifugal pump

IV a) Submersible pump
b) Motors for submersible pump

V Transformer

VI Generator

VII Starters

(The above annexures as applicable should be filled in and duly signed and enclosed with the Tehnical Bid – Cover I)

ANNEXURE - I

PUMP CHARACTERISTICS

Sl. No.	Description Technical	Remarks	Details
a.	**Capacity in LPM (discharge)**		
b.	**Total head in metres**		
c.	**Net positive suction head required**		
d.	**HP absorbed by the Pump**		
	i) at duty point		
	ii) at max BHP point given in the range of curve furnished		
e.	**HP of the motor offered**		

Note :

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

ANNEXURE II (a)

TURBINE PUMPS

1. Name of Manufacturer

2. Model

3. IS reference

4. Type

A. Pump Details

1. Nature of Lubrication :

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

3. Stages :

4. Bowl outer dia in mm :

5. Discharge in LPM :

6. Total head in metres :

7. Speed in RPM :

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

9. Maximum power input required for entire range of operation :

10. Pump efficiency at duty point in % :

11. Shut off head in metre :

12. Minimum submergence required :

B. Column Assembly

1. Dia in mm :

2. Length in metre :

3. Type of joint (flanged or serewed) :

C. Size

4. a. i) Oil tube if necessary dia .....mm

ii) Material

b. i) Line shaft dia ..... Mm

ii) Material

1. Discharge head

Surface/ Underground

2. Delivery size in mm

3. Impeller

i) Material

ii) Type

4. Balancing of Impeller Dynamic/Static

Floor space required ..... Sq.m.

5. Weight of Pump heaviest part bowl assembly -

Weight of complete pump

6. Type of sealing rings

7. Type of impeller shaft sleeves

8. Type of bearing, make and reference number

9. Are the bearing external/internal

10. Materials of bearing

11. Whether the performance curve is attached

12. Does the characteristics curve conforms to

Indian standard Specifications

13. What is the nature of drive

14. Type of coupling

15. Weight of the Motor

16. Does the pump and its accessories conform to IS

ANNEXURE – II (b)

Motor for Turbine Pump

1. Rate output HP :

2. Make :

3. Description type :

4. System voltage :

5. current in Amps at rated output :

6. Current Rating at full load :

7. Class of insulation :

8. Permissible Temperature rise over 45 Degree Ambiant temperature :

9. Efficiency at 100% Load
75% Load
50% Load

10. Power factor ½ Load
¾ Load
Full Load

11. Type of Enclosure

12. B.I.S. Reference :

13. Type of rotor :

14. Type of starting :

15. Rotor current

a) Max Starting

b) Normal Full Load

16. Overload capacity

25 %

50 %

100%

17. Operating torque

18. Starting current

19. No. of poles

20. Bearing Make & Number

21. Type of coupling

22. Whether motor conform to
B.I.S. Specifications

23. Weight of Motor

ANNEXURE – III (a)

Centrifugal Pumps

1.	**Type & Make**	**:**
2.	**B.I.S reference**	**:**
3.	**Stages**	**:**
4.	**Suction diameter in mm**	**:**
5.	**Delivery diameter in mm**	**:**
6.	**Materials**	**:**
	i) Casing	**:**
	ii) Bearing	**:**
	iii) Impeller	**:**
	iv) Base plate	**:**
7.	**Bearing No.**	**:**
8.	**Speed in RPM**	**:**
9.	**Method of Lubrication**	**:**
10.	**Balancing of Rotating parts**	**:**
11.	**Gland Rope size**	**:**
12.	**NPSHR in metre**	**:**
13.	**SHUT off head in metre**	**:**
14.	**Type of coupling**	**:**
15.	**Materials of coupling**	**:**
16.	**Weight of (i) the pump**	
	(ii) Heaviest part of the pump	**:**
17.	**Space required in Sq. M**	**:**

18. The clearance required/between two strainers, bottom floor and strainer :

19. Type of impeller
i) Type of sealing rings
ii) Bearing make & number :

20. Are the bearing internal or external :

21. Are the characteristics of pumps attached :

22. Does the characteristics conform to B.I.S.

23. Nature of drive :

24. Length of pumpset :

25. Accessories conform to B.I.S. :

26. Whether performance chart enclosed

Sl. No.	Description	Head in Metres			Discharge in LPM	Speed in RPM	Efficiency %	BHP
		Suction	Delivery	Total				
1.	**At any point**							
2.	**At LWL condition**							
3.	**At MWL condition**							
4.	**At shut off head**							

TENDERER SUPERINTENDING ENGINEER/TWAD,

28. Are the following accessories Provided

a. Priming funnel and union

b. Air Release cocks and drain cocks

c. Drip water pipes

d. Compound gauge to suction and deliver branch

e. Are the gauges graduated in metre head of water, if so, give range.

f. What arrangement is adopted for preventing air being a drawn into the pumps.

ANNEXURE – III (b)

Motors for Centrifugal Pumps

1. Name of the manufacturer :

2. Type of Motor :

3. Output brake horse power :

4. Number of phases :

5. Cycles :

6. Voltage :

7. Speed at full load :

8. Rating :

9. Class & insulation :

10. Stator current
(Normal full load Phase) :

11. Current

a.	**Normal full load**	**Amps**	**Per phase**
b.	**Maximum starting**	**Amps**	**Per phase**

12.	**Efficiency**	**Load**	**Tolerance**
		Full	**%**
		¾	**%**
		½	**%**

Note :

Manufacturer's Certificate should be enclosed

13. Overload capacity

a. 25%

b. 50%

c. 100%

TENDERER SUPERINTENDING ENGINEER/TWAD,

14.	**Power factor**	**Load**	**Tolerance**
		Full	**%**
		¾	**%**
		½	**%**

15. Temperature rise

		Stator	**Rotor**
a.	**With 12 Hrs. of full speed run with 45° C ambient temperature at the place**	**°C**	**°C**

16. Starting torque :

a. In percent of full load torque

b. Starting currenting percent of

Normal full load current system **Phase**

17. Details of motor

a. Number of poles

b. Type of enclosure

c. Type of Motor

18. Bearing manufacturer

19. Type and size (Driving end)

20. Type and size of bearing at non-driving end

21. Size of coupling and its type

22. Does the motor conform to BIS

23. Specification reference

24. Weight of motor

25. Degree of protection of motor.

ANNEXURE – IV (a)

Submersible Pumps

01. Name of Manufacturer :

02. Type of pump and Model :

03. Number of stages :

04. Material of strainer :

05. Delivery Branch dia. (in mm) :

06. Total discharge in LPM :

07. Materials of casing :

08. Type of impeller :

09. Materials of impeller :

10. Material of impeller shaft :

11. Type of bearings :

12. Are the bearings external or internal :

13. Material of bearings :

14. Maker's name and code number of bearings :

15. Whether moving parts are balanced:

16. If so, type of balancing :

17. BHP of the pump :

18. Efficiency of the pump :

19. Weight of the pump :

20. Diameter of the pump :

21. Pump speed :

22.	**Are the characteristics curves of the pumps attached**	**:**
23.	**Total Head**	**:**
24.	**Does the pump conform to BIS Specification**	**:**
25.	**Specification reference**	**:**
26.	**What is the nature of drive**	**:**
27.	**Type of coupling**	**:**
28.	**Weight of the heaviest part of the pump**	**:**
29.	**Weight of the pump complete**	**:**

ANNEXURE – IV (b)

Motor (for Submersible Pumpsets)

01. Name of Manufacturer :

02. Type of Motor :

03. Brake Horse Power of the Motor :

04. Number of phases :

05. Cycles :

06. System Voltage :

07. Frequency :

08. Speed at full load :

09. Full load current :

a. Normal full load ..... Amps

b. Maximum starting ..... Amps

10. Efficiency	**Load**	**Percent**	**Tolerance as per BIS**
	Full		
	¾		
	½		

11. Over load capacity

a. 25%

b. 50%

c. 100%

12. Power factor Load Percent as per

Full

¾

½

13. HP of the Motor :

14. Number of poles :

15. Type of enclosure :

16. Type of Rotor :

17. Bearing manufacturer :

18. Type, number and size of bearing (driving end) :

19. Size of coupling and its type :

20. Does the Motor conform to BIS Specification :

21. If so state the No. :

22. Weight of Motor :

23. Total weight of pump and Motor :

24. Diameter of the Pumpset :

25. Overall efficiency of the pumpset :

ANNEXURE – V

TRANSFORMERS

1. KVA of the transformer

2. H.T voltage

3. L.T. Voltage

4. Name of the manufacturer :

5. Connection's at

i) H.T. side

ii) L.T. side :

6. Type of cooling

7. Type of mounting – Indoor/outdoor

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ANNEXURE – VI

GENERATOR

1. **KVA rating**
2. **Voltage**
3. **Speed**
4. **Name of the manufacturer**
5. **Type of starting**
6. **Type of cooling**

   Diesel Engine
7. **HP of Engine**
8. **Speed**
9. **Name of the manufacturer**
10. **Type of cooling**
11. **Mountings attached**
    - **i) Radiator**
    - **ii) Diesel tank**
    - **iii) Bare frame**
    - **iv) Exhaust piping**

ANNEXURE – VII

STARTERS

1. Name of Manufacturer

2. Type of Starter

3. Type of Cooling

4. Over load relay

5. No Volt Coil

6. No. of starters permitted in one hour

XI . REFERENCE TO SPECIFICATIONS/ CODE OF PRACTICE

DESCRIPTION	BIS NO.
Ordinary Portland Cement (33 Grade)	**269 – 1976**
43 Grade Ordinary Portland Cement	**8112 – 1989**
Pozzolona Portland Cement	**1489 – 1991**
Hydrophobic Portland Cement	**8043 – 1978**
Rapid Hardening portland Cement	**8041 – 1990**
Low Heat Portland Cement	**12600 – 1989**
Standard sand for testing of cement	**650 – 1966**
Methods of Test for Pozzolonic Materials	**1727 – 1967**
Methods of sampling and test for water & waste water (Physical & chemical)	**3025 – 1984(Part 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 for hydraulic cement	**4032 – 1985**
Aggregates coarse & Fine from Natural resources For concrete.	**383 – 1970&4082/1977**
Sand for Masonry Mortar	**2116 – 1965&1542/1977**
Methods of tests for aggregates for concrete	**2386 - 1963(Part 1 to 8)**
Part I – Particle size and shape	**2386 – 1963(Part – I)**
Part II – Estimation of deleterious Materials & Organic impurities	**2386 – 1963(part – II)**
Part III – Soundness	**2386 – 1963(part – III)**
Methods for sampling of aggregates for concrete	**2430 – 1986**
Specifications for test sieves Part – I – Wire cloth test Sieves	**460 – 1978 (Part – I)**

DESCRIPTION	BIS NO.
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**
High Tensile Steel for PSC Pipes	**1784 – 1986(Part 1)**
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 plasticity	**2854 – 1964**
Glossary of terms relating to cement concrete	**6461 – 1972(Part 1 to 12)**
Methods of test for strength of concrete	**516 – 1959**
Methods of sampling and analysis of concrete	**1990 – 1959**
Methods of testing bond in reinforced concrete Pull out test	**2770 – 1967**
Methods of test for permeability of cement Mortar and concrete	**3085 – 1965**
Methods of test for splitting tensile strength of concrete cylinders	**5816 – 1970**
Methods of tests for determining setting time of concrete by penetration resistance	**8142 – 1976**
Code of practice for construction of **Pile foundations (concrete piles)**	**2911 (Part I)**

DESCRIPTION	BIS NO.
Driven cast-in-situ concrete piles **Bored cast –in-situ piles** **Driven pre-cast concrete piles** **Bored pre-cast concrete piles**	**Sec – 1 – 1979** **Sec – 2 – 1979** **Sec – 3 – 1979** **Sec – 4 – 1984**
Code of practice for construction of raft foundation	**2950 – 1981**
Design Aids for reinforced concrete	**SP 16 – 1980**
Explanatory Hand Book on codes for earthwork Engineering	**SP 22 – 1982**
Explanatory Hand Book on IS Code 456 – 1976	**SP 24 – 1983**
Hand Book on causes and prevention of cracks In buildings	**SP 25 – 1984**
Hand Book on concrete reinforcement & detailing	**SP 34 – 1987**
Brick Masonry	**2212 – 1962**
Construction of Stone Masonry	**1957 – 1967**
Asbestos cement pressure pipes	**1592 – 1989**
Concrete pipes with and without reinforcement	**458 – 1988**
P.S.C. Pipes (including fittings)	**784 – 1978**
Methods of tests for concrete pipes	**458 – 1988&3597 – 1985**
Materials for M.S. Specials	**226 – 1976 &2062 – 1980**
Specifications for M.S. Specials for P.S.C. Pipes	
Specifications for Steel cylinders reinforced Concrete pipes	**1916 – 1989**
Methods of tests of concrete pipes	**3597 – 1985**
Specials for steel cylinders reinforced concrete pipes	**3597- 1985**
Cast iron specials for asbestos cement pressure pipes for water, gas & sewage	**5531 – 1988**
Methods of test for asbestos cement products	**5913 – 1989**
Dimensional requirement for rubber sealing rings	**10292 – 1988**

DESCRIPTION	BIS NO.
For CID joints in asbestos cement pipes	
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**
D.I. Fittings for pipes for water, gas & seweage	**9523 – 1980**
Dimensional requirements of rubber gaskets for Mechanical joings and push on joints for the use with C.I.D.I.Pipes.	**5382/1985**
C.I. Specials for Mechanical and push on flexible joints for pressure pipe lines for water, gas & sewage	**13382 – 1992**
Horizontally cast iron double flanged pipes for water, Gas and sewage	**7181 – 1986**
Cast iron fittings for pressure pipes for water, gas And sewage	**1538 – 1976(part 1 to 24)**
Cast iron detachable joints for use with Asbestos Cement pressure pipes	**8794 – 1988**
Rubber rings for jointing C.I. Pipes, R.C.C. Pipes & AC. Pipes	**5382 – 1969**
Rubber rings for jointing P.S.C. pipes	**5382 – 1985**
Rubber rings for jointing AC pipes with AC couplings	**10292 – 1985**
Pig Lead (caulking lead)	**782 – 1978**
Hemp yarn	**6587 – 1966**
Rubber Insertion to be used in jointing CIDF pipes	**638 – 1979**
Bolts & Nuts to be used in jointing CIDF pipes	**1363 – 1967**
Unplasticized PVC pipes for potable water supplies	**4985 – 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**

DESCRIPTION	BIS NO.
	(part 1 to13)
Methods of test for unplasticized PVC pipes for potable water supplies	**12235 – 1986 (Part 1 to 11)**
Sluice valves for water works purposes	**14846/2000**
Surface boxes for sluice valves	**3950 – 1979**
Manhole covers for sluice valves	**1726 – 1974**
Laying of Asbestos Cement Pressures Pipes	**6530 – 1972**
Laying of Concrete pipes	**783 – 1985**
Laying of Cast – Iron Pipes	**3114 – 1985**
Laying of PSC pipes	**126 of APSS & 783 – 1985**
Laying of DI Pipes	**12288 – 1987**
Laying and jointing of unplasticized PVC pipes	**7634 – 1975 (Part 3)**
Batch type concrete mixer	**1791 – 1968**
Sheep foot roller	**4616 – 1968**
Safety code for excavation works	**3764 – 1966**
Safety code for scaffolds and ladders **part – I Scaffolds** **Part II – Ladders**	**3696 – 1966 (Part I)** **3696 – 1966 (Part – II)**
Safety code for piling and other deep foundations	**5121 – 1969**
Safety code for working with construction machinery	**7293 – 1974**
Tamil Nadu Building Practice	**Volume – I** **Volume – II**
Government of India Manual on Water Supply and Treatment	**May 1999(Revised)**
Gravel for packing	**4091 – 1967**
Hard drawn Steel Wire	**1785 – 1983 (Part I and II)**

DESCRIPTION	BIS NO.
Structural Steel	**226 – 1975**
Hard rolled mils steel for concrete	**1139 – 1966**
Hard drawn Steel Wire	**1566 – 1982**
American Society for Testing of Materials	
British Standard	**2494 – 1955Part I**
Welding Electrodes	**814 – 1970**
Steel Sheets	**225 – 1975**
Guniting	**7322 – 1994**
Welded Joints	**3589 – 19667&** **2041 – 62**
Tensile Test	**223 – 1950**
Mechanical and Electrical Works	
Turbine Pump	**1710 – 1972**
Submersible Pump	**8030 – 1976**
Submersible Motor	**9283 – 1979**
Earthing	**3043 – 1966**
Transformer	**1180 – 1964**
Generator	**2253 –** **4722**