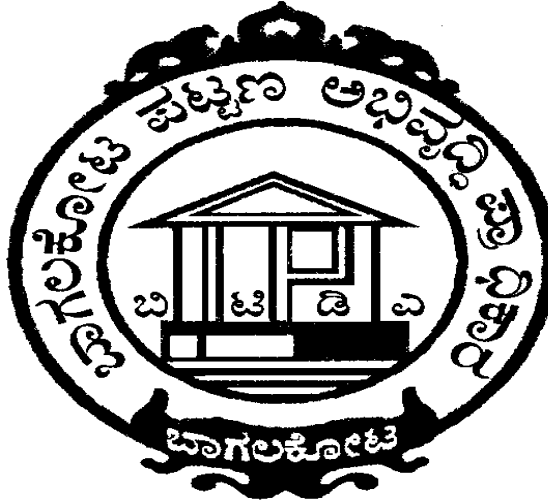




**BAGALAKOTE TOWN DEVELOPMENT AUTHORITY,
BAGALAKOTE**

TENDER DOCUMENT



JANUARY - 2023

PACKAGE-1

Name of the Work: Design and Construction along with Operation & Maintenance for a Period of 05 Years for (1) Layout development and Infrastructure works consisting of Roads, Water Distribution, Ground Service Reservoirs, Sewer Network, Storm Water Drains, Power Supply System (HESCOM), ICT infrastructure system works, Chain link fencing for Parks / open areas, Tree plantation for Sector B, C & D and (2) Primary drains outside Unit-3 area, along with Sewage Pumping Stations (SPS) (including pumping machineries & pumping mains for all sectors) for Bagalakote Navanagar - Unit 3 Area under Lumpsum Turnkey Contract.

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KRISHNA BHAGYA JALA NIGAM LIMITED
(A Government of Karnataka Undertaking)
Bagalakote Town Development Authority, Bagalakote
Telephone: 08354-295372, E-mail: btdadn1@gmail.com

TENDER FACE SHEET

(TO BE FILLED AT THE TIME OF ISSUE OF TENDER DOCUMENT)

1. Name of Work : Design and Construction along with Operation & Maintenance for a Period of 05 Years for (1) Layout development and Infrastructure works consisting of Roads, Water Distribution, Ground Service Reservoirs, Sewer Network, Storm Water Drains , Power Supply System (HESCOM), ICT infrastructure system works, Chain link fencing for Parks / open areas, Tree plantation for Sector B, C & D and (2) Primary drains outside Unit-3 area, along with Sewage Pumping Stations (SPS) (including pumping machineries & pumping mains for all sectors) for Bagalakote Navanagar - Unit 3 Area- under Lumpsum Turnkey Contract. Package-1
2. Tender reference : Indent Number _____
3. Whether the contractor has been enrolled as Class-I Contractor with KPWD for civil works and Class-I Contractor enrolled with Karnataka Electrical Inspectorate for electrical works :
4. Category of Contractor : Class I
5. Date of issue of tender document to the contractor : As per details published in e-portal
6. Pre-Tender meeting : As per details published in e-portal.
7. Last date & time of receipt of Tender Document in the eportal : As per details published in e-portal
8. Date of opening of Tender (Technical Tender) : As per details published in e-portal
9. Address for communication : Office of the Executive Engineer,
Division No. 1, BTDA, Bagalakote
Telephone: 08354-295372,
E-mail: btdadn1@gmail.com

Accounts Superintendent

**Executive Engineer,
Division No. 1, BTDA,
Bagalakote.**

ABBREVIATIONS ADOPTED IN THE TENDER
DOCUMENTS AND THEIR EXPANSION

Sl. No.	Abbreviation	Expansion
1	BIFR	Bureau of Industrial and Financial Reconstruction
2	BTDA	Bagalakote Town Development Authority
3	C.C.	Cement Concrete
4	C.M	Cement Mortar
5	Cm	Centimeter
6	D.D	Demand Draft
7	E.M.D.	Earnest Money Deposit
8	GFC	Good For Construction
9	GST	Goods and Service Tax
10	KBJNL	Krishna Bhagya Jala Nigam Limited
11	Kg	Kilogram
12	Kg/cm ²	Kilogram per square centimeter
13	KM	Kilometre
14	KPWD	Karnataka Public Works Department
15	KWH	Kilo watt Hour
16	L	Liters
17	M	Meter
18	m ² or Sqm	Square meter
19	m ³ or Cum	Cubic metre
20	mm	milli metre
21	N.S.C.	National Savings Certificate
22	NIGAM	Krishna Bhagya Jala Nigam Limited
23	No.	Number
24	O & M	Operation and Maintenance
25	R.C.C.	Reinforced Cement Concrete
26	Rmt	Running Meter
27	ROW	Right of Way
28	SFMS	Structured Financial Messaging System
29	T	Metric Tonnes
30	U.C.R	Uncoursed Rubble Masonry
31	UDI	Unique Document Identification

TO BE FILLED AT THE TIME OF OPENING THE TENDERS

1. Whether the contractor has :
remitted the required E.M.D.
or not, and how?
2. No. and date and amount through e proc/
SFMS Bank Guarantee of Scheduled
Commercial Bank
3. Name of Bank :
4. Validity Period :
5. Whether the contractor fulfills all :
the conditions of EMD
6. Whether the tender fulfills all the :
conditions of Tender Notice and
conditions of contract etc.
7. Whether counter conditions if any :
are put by the contractor
8. Recommendations of the :
Engineer-in- Charge / Executive
Engineer for processing
of the tender

Opened by me on this day.....at.....

Place:

Date:

**Executive Engineer,
Division No. 1, BTDA,
Bagalakote.**

SECTION - 1

INVITATION FOR TENDER

BAGALAKOTE TOWN DEVELOPMENT AUTHORITY, BAGALAKOTE.

No. EE/DIV-1/BTDA/Tender-No.

Office of the Executive Engineer,
BTDA, Division No. 1, Bagalakote.

Date:

SECTION- 1: INVITATION FOR TENDER

DATE:

IFT NO:

(Through e- Procurement only)

1. On behalf of Managing Director, KBJNL, Bangalore, the Executive Engineer, BTDA, Division No-2, Bagalakote invites tender on 'Lump-sum Turn Key' basis from Registered Contractors enrolled as Registered Class-I KPWD Contractor for civil works and enrolled with Karnataka Electrical Inspectorate as Class-I Electrical Contractor for electrical works, who fulfills the stipulated qualification conditions for the work of **"Design and Construction along with Operation & Maintenance for a Period of 05 Years for (1) Layout development and Infrastructure works consisting of Roads, Water Distribution, Ground Service Reservoirs, Sewer Network, Storm Water Drains, Power Supply System (HESCOM), ICT infrastructure system works, Chain link fencing for Parks / open areas, Tree plantation for Sector B, C & D and (2) Primary drains outside Unit-3 area, along with Sewage Pumping Stations (SPS) (including pumping machineries & pumping mains for all sectors) for Bagalakote Navanagar - Unit 3 Area- Package-1,** as detailed in the table below.

The Tenderers are required to submit their offer in two tender document system i.e., technical Tender and financial Tender. The Tenderers are advised to note the minimum qualification criteria specified in clause 3 of the instructions to tenderers to qualify for award of contract.

2. Deleted
3. Tenders must be accompanied by Earnest Money deposit specified for the work in the table below. Earnest Money deposit will have to be in any one of the forms as specified in the tender document and shall have to be valid for 45 days beyond the validity of tender.
4. Deleted
5. A pre tender meeting will be held on **as per details published in e-portal** at the office **as per details published in e-portal**.to clarify the issues if any, and to answer questions on any matter that may be raised at that stage as stated in clause 8.2 of "Instruction to tenders" of the tender document.
6. Othe details can be seen in the tender documents.

7. The Tenderers are required to upload two tender document system, first document containing Technical Tender should contain the documents as mentioned in para 1.1. The second document shall contain the financial Tender. The Document - 1 (Technical Tender) will be opened first. There after Document - 2 (Financial Tender) of those Tenderers who have paid the requisite EMD & fulfill the conditions contained in para 3.2 (technical qualification) will be opened. This facility is available through e-procurement portal.

www.eproc.karnataka.gov.in

Table showing the details of work put to tender is as below;

Sl. No.	Name of Work	Amount put to Tender (Rs. in Crore) without GST	GST on Amount put to Tender (Rs. in Crore)	Amount put to Tender including GST (Rs. in Crore)	E.M.D. (Rs. in Crore) for Amount put to Tender including GST	Cost of Blank Tender forms & tender processing fee	Period of Completion of Work	Class of Contractor
1	2	3			4	5	6	7
1	Design and Construction along with Operation & Maintenance for a Period of 05 Years for (1) Layout development and Infrastructure works consisting of Roads, Water Distribution, Ground Service Reservoirs, Sewer Network, Storm Water Drains , Power Supply System (HESCOM), ICT infrastructure system works, Chain link fencing for Parks / open areas, Tree plantation for Sector B, C & D and (2) Primary drains outside Unit-3 area, along with Sewage Pumping Stations (SPS) (including pumping machineries & pumping mains for all sectors) for Bagalakote Navanagar - Unit 3 Area- under Lumpsum Turnkey Contract. Package-1	560.59	100.91	661.49	6.62 (EMD of Rs Ten Lakhs shall be paid through E-Proc and the balance shall be through SFMS Bank Guarantee of Scheduled Commercial Bank and scanned copy of the same shall be uploaded in the e-proc)	As displayed in e-portal	30 Months (Including monsoon)	Registered Class-I KPWD Contractor for civil works and Karnataka Electrical Inspectorate Class-I Electrical Contractor for electrical works

- I. Interested applicants may access and download the complete proposal document from Government of Karnataka e-procurement portal <https://eproc.karnataka.gov.in> and also submit the Tenders online on the same portal.
- II. Tender Security (EMD) shall be paid as mentioned in the document
- III. Pre-Tender meeting date / Last date for submission / date & time, place of opening of the Technical Tenders to be referred in the e-portal.
- IV. A copy of the valid **Karnataka PWD Class-1 Civil Contractor Registration Certificate / License and Class-I Electrical Contractor (Karnataka Electrical Inspectorate) Registration Certificate / License.**
- V. Copy of Valid **Employees Provident Fund Registration Certificate.**
- VI. Copy of Valid **GST Registration Certificate.**
- VII. The intending Tenderer/firm/company should furnish list of Manpower, machinery available with them for taking up the work.
- VIII. The details in support of qualification criteria.
- IX. Technical details containing document with preliminary designs, working methodology in support of their Tender as per the Tender document.

Please note henceforth, any changes in calendar of events will be uploaded on e-portal website only and will not be published in Newspapers.

Sd/-

Executive Engineer,
BTDA, Division – No. 1
Bagalakote

SECTION - 2

INSTRUCTIONS TO TENDERERS (ITT)

SECTION 2: INSTRUCTIONS TO TENDERERS

TABLE OF CLAUSES

A.	General	16	Deadline for Submission of Tender
1.	Scope of the tender	17	Late Tender
2.	Eligible Tenderers	18	Modification and Withdrawal of tenders
3.	Qualification of tenderer	E.	Tender Opening and Evaluation
4.	One tender per tenderer	19	Opening of First cover of all Tenders and evaluation to determine qualified tenders
5.	Cost of Tender	20	Opening of Second cover Tenders of qualified tenders and evaluation
6.	Site Visit	21	Process to be Confidential
B.	Tender Documents	22	Clarification of Tenders
7.	Content of Tender Documents	23	Examination of Tender and Determination of Responsiveness
8.	Clarification of Tender Documents	24	Correction of Errors
9.	Amendment of Tender Documents	25	Evaluation and Comparison of Tenders
C	Preparation of Tenders	F.	Award of Contract
10.	Documents Comprising the Tender	26	Award Criteria
11.	Tender Prices	27	Employer's Right to Accept any Tender and to Reject any or all Tenders
12.	Tender Validity	28	Notification of Award & Signing of Agreement
13.	Earnest Money deposit	29	Security deposit
14.	Format and Signing of Tender	30	Advance Payment and Security
D.	Submission of Tender	31	Corrupt or Fraudulent Practices
15.	Sealing and Marking of Tenders		

A. GENERAL

1. Scope of Tender

- 1.1. The Bagalakote Town Development authority (BTDA), Bagalakote, (referred to as employer in these documents) invites Tenders for the construction and installation of works (as defined in these documents and referred to as “the works”) detailed in Information for Tenders (IFT). The tenderers having requisite qualification may submit tender for the works given in IFT.

2. Eligible Tenderers

- 2.1. Tenderers shall not be under a declaration of ineligibility for corrupt and fraudulent practices issued by Government of Karnataka

2.2. Tenders from Joint ventures are not acceptable.

3. Qualification of the tenderer

- 3.1. All Tenderers shall provide the requested information accurately and in sufficient detail in Section 3: Qualification information

- 3.2. **QUALIFICATION CRITERIA:** To qualify for award of this contract, each Tenderer in its/his name should have in the last five years period i.e., 2017-18 to 2021-22.

- a) Achieved a minimum financial turnover of not less than **Rs. 529.20 crore (including GST)** in at least 2 financial years in the last 5 years from 2017-18 to 2021-22. The turnover prior to FY 2021-22 will be updated to the 2021-22 Price level by giving weightage of 10% each year. Audited Profit and Loss account statement certified by a practicing Chartered Account bearing the UDI number along with copy of Income Tax returns filed for the years indicated above should be furnished. Chartered Accountant's certificate without UDI (Unique Document Identification) number will not be considered.

b) **Similar work:**

1. The tenderer shall have successfully/ satisfactorily completed (not less than 90% of contract value) similar nature of works costing not less than **Rs. 331.00 Crore** including 18% GST during last 5 years from 2017-18 to 2021-22.
2. **Similar work means:** Formation of Layout involving Construction of Roads, Road side drains, storm water drains, Water supply, UGD, etc., (The Government of India and other State Governments and their undertakings credentials will be considered for qualification).
3. In any one-year, Minimum project area **203 Acre** covering all infrastructure services during the last five financial years from 2017-18 to 2021-22.

c) **Executed**

1. Minimum quantity as mentioned below in any one financial year, during the last five financial years from 2017-18 to 2021-22. Certificate should be obtained from an officer not below the rank of Executive Engineer of the concerned Division and countersigned by the Superintending Engineer of

the concerned Circle or equivalent in case of other government undertaking with in India.

Sl. No.	Qualifying criteria	Requirements
1	Roads works – Asphalted / Concrete- ROW ranging from 9m to 30m	Should have executed Minimum 23Km (considering Two lane carriage way) For Roads with greater carriageway width (i.e., 4/6 lane) shall be considered with a multiplication factor of 1.5 in one financial year
2	Water supply pipeline works with HDPE / DI / MS / PVC pipe materials of pipe diameter varying from 90mm to 1000mm	Should have executed minimum length of 27Km in one financial year
3	Wastewater collection system with HDPE /SWG/ DI/ DWC/ RCC / PVC pipe materials of pipe diameter varying from 90mm to 1000mm	Should have executed minimum length of 18Km in one financial year
4	RCC drains	Should have executed minimum length of 29Km in one financial year
5	Electrical system	Should have executed minimum of UG cable length of 113Km of size 95 Sqmm and above in one financial year by their name or their identified sub contractor.

- d) The Tenderer or his identified sub-contractor should possess valid electrical license and should have executed similar Electrical works costing **Rs. 46.00 Cr** (inclusive of GST) in any one year. Tie-MoU on Rs.100 stamp indicating terms and conditions both main contractor and sub-contractor shall be enclosed. The sub contractor can have Tie-up agreement with only One Tenderer in the tenders of the same work. Multiple Tie-ups is not permitted with in the same work.
- e) The Tenderer or his identified sub-contractor should possess valid license and should have executed similar water supply/ Sanitary Engineering costing **Rs. 40.00 Cr** (inclusive of GST) in any one year. Tie-MoU on Rs.100 stamp indicating terms and conditions both main contractor and sub-contractor shall be enclosed.

Note:

1. Work done certificate to be uploaded should have following information:

1	Date of Agreement	Date:
2	Agreement period	-----Months
3	Contract/Agreement Value	Rs.-----Lakhs.
4	Amount of work executed	Rs.-----Lakhs.

5	% of Fin. Progress w.r.t contract value.	-----%
6	Date of completion of work.	Date:-----
7	Copies of Last RA Bill/ Final RA Bill shall be uploaded in e-proc in support of work done certificate.	

2. The work done certificate should be obtained duly signed from an officer not below the rank of the Executive Engineer of the concerned Division and counter signed by the Superintending Engineer of the concerned circle or equivalent in case of other Government / Government undertaking within India. The cost will be updated to the present value by giving a weightage of 10% for each year, if the work is completed prior to FY 2021-22.

3.3. Each tenderer should further demonstrate

- a) availability by owning atleast 50% of the required / specified critical equipment for this work.

The remaining 50% can be deployed on lease/ hire basis for all works provided, relevant documents (commitment agreements etc.) for availability for this work are furnished

Items of plant and equipment to be deployed by the Contractor

Sl. No.	Type of Equipment	Capacity	Min nos. Required to be mobilized	Minimum equipments to be	
				Owned	Hired
1	Excavators	1.25 m ³	4	2	2
2	Mobile Cranes	40 tonnes Capacity	1	1	0
3	Dozer	D 60	2	1	1
	a) Vibratory Roller / Soil compactor	Minimum static	2	1	1
	b) Smooth wheeled Roller / Tandem roller for compaction of edges	weight 10 T Minimum static weight 8 T.	2	1	1
4	Paver Finisher with electronic sensors for automatic level control	Capacity of paving minimum 5m Width	1	1	0
5	Bitumen sprayer		1	1	0
6	Concrete batching Plant	60 Cum per hour	2	1	1
7	Asphalt batching Plant	100 TPH	1	1	0
8	Water truck with sprayer with 5 HP capacity	1	4	2	2
9	Trucks/ Tipper	10 T Capacity	10	5	5
10	Transit Mixer	6 cu.m capacity	4	2	2
11	Concrete Pump	20 cu.m Capacity	2	1	1
12	Motor Grader		2	1	1

Sl. No.	Type of Equipment	Capacity	Min nos. Required to be mobilized	Minimum equipments to be	
				Owned	Hired
13	Pneumatic Roller		1	1	0
14	Pug Mill	Minimum 120 TPH	2	1	1

Notes:

1. Applicants shall indicate the make, year of manufacture, capacity and working conditions of above equipments. Before commencement of works, all equipments and accessories, latest calibration certificate has to be submitted and got approved from the BTDA.

The Employer shall have the right to verify all the men and machinery details/ documents submitted by the tenderer at any point of time during technical evaluation of the tender document.

2. It is mandatory for the contractor to Set-up the Field Laboratory (with all testing equipments as per NABL standards) and following shall be required during work execution as desired by Engineer-In-Charge:
 - a. Minor plants and equipments and accessories.
 - b. Field laboratory, testing equipments and survey equipments.
 - c. Tests at regular frequency for materials / finished work before and after completion of works shall be conducted as per relevant Codes & Standards.

- b) Each Tenderer should furnish liquid assets and or/ availability of credit facilities of not less than **Rs. 79.50 Crore. (Credit lines/ letter of credit/ certificates from banks for meeting the fund requirement etc).**

Note: The Tenderer should furnish the details regarding qualification information in the prescribed format appended with Tender document (i.e., Qualification information furnished by the Tenderer other than prescribed format is treated as non-responsive).

- 3.4. To qualify for a package of contracts made up of this and other contracts for which tenders are invited in this IFT, the Tenderer must demonstrate having experience and resources to meet the aggregate of the qualifying criteria for the individual contracts.
- 3.5. Sub-contractors' experience and resources shall not be taken into account in determining the Tenderer's compliance with the qualifying criteria except to the extent stated in 3.2 (d) and (e) above
- 3.6. Tenderers who meet the above specified minimum qualification criteria, will only be qualified and if their available tender capacity is more than the total tender value (**Rs. 661.49 crores, including GST**).

The available tender Capacity will be calculated as under:

Assessed available tender Capacity = (A x N x 1.5 - B), where

A = Maximum value of Civil engineering works Executed in any one year during the last 5 years (updated to 2022-23 price level) taking into account the completed as well as works in progress.

N = Number of Years i.e., 5 years prescribed for completion of the works for which tenders are invited.

B = Value, at 2022-23 price level of existing commitments and on-going works to be completed during the next 5 years.

NOTE: The statements showing the value of existing commitments and ongoing works as well as the stipulated period of completion remaining for each of the work listed should be certified by Statutory Auditors of the Company or by the proprietor of the company through an affidavit.

- 3.7.** Even though the Tenderers meet the above criteria, they are subject to be disqualified if they have:
- made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements; and/or
 - record of poor performance such as abandoning the works, not properly completing the contract, inordinate delays in completion, litigation history, or financial failures etc.; and/or
 - Participated in the previous tender in BTDA / KBJNL and had quoted unreasonably high tender prices and could not furnish rational justification.
 - If the Tenderer have participated in more than one work, the available tender capacity will be assessed, and work will be awarded as per his available Tender capacity.
- 3.8.** All Tenderers shall provide Forms of Tender and a preliminary description of the proposed work method and schedule, as necessary.
- 3.9.** All Tenderers shall include the following updated information and documents with their Tenders in technical stage.
- I) Evidence of adequacy of working capital for this contract (access to line (s) of credit and availability of other financial resources) ;
 - II) Authority to seek references from the Tenderer's bankers;
 - III) Information regarding any litigation, current or during the last ten years, in which the tenderer is involved, the parties concerned, and disputed amount.
 - IV) The proposed methodology and program of construction, backed with equipment planning and deployment, duly supported with broad calculations and quality control procedures proposed to be adopted, justifying their capability of execution and completion of work as per technical specifications within the stipulated period of completion as per Milestones.

TENDER IS OPEN TO ONLY TO TENDERERS HAVING REQUISITE QUALIFICATION

If the tender is made by a firm in partnership, it should be signed by all the partners of the firm, giving their full names and current addresses, or by a partner holding the power of attorney of the firm to sign the application. In such cases, a notarized certified copy of the power of attorney shall accompany the application. A certified copy of the partnership deed, current addresses of all the partners of the firm shall also accompany the tender.

If the Tender is made by a limited company or a corporation, it shall be signed by a duly authorized person holding power of attorney for signing the tender in which case, a certified copy of power of attorney shall accompany the tender.

4. One Tender per Tenderer

- 4.1.** Each tenderer shall submit only one tender for one package. A tenderer who submits or participates in more than one Tender(other than as a sub -contractor or in case of alternatives that have been permitted or requested) will cause all the proposal with the Tenderer's participation to be disqualified.

5. Cost of Tender

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

6. Site Visit

- 6.1.** The intending Tenderers are advised to visit the site of work at their own cost, make themselves familiar with local situation about the availability of construction material, work men, land required for construction activities. The Tenderer should also acquaint himself of the access to the site of work before attending the pre-Tender meeting and submitting their tenders. The intending Tenderer shall submit the proof of site visit with their self attested site appraisal letter in this regard.

B. TENDER DOCUMENTS

7. Content of Tender Documents

- 7.1.** The set of Tender documents comprises the documents listed in the table below and addendum issued in accordance with Item No. 9 of ITT:

INVITATION FOR TENDERS

Section	1	Instruction to Tenderers (ITT)
	2	Forms of Tender and Letter of Acceptance
	3	Conditions of Contract
	4	General conditions of contract
	5	Schedule C, D, E, F & G
	6	Contract Data
	7	Detailed Technical Specifications
	8	Additional Conditions for Civil works
	9	Schedule A and B
	10	Forms of securities
	11	Tender Capacity
	12	Data sheets
	13	Annexures and other related documents.
	14	Drawings

- 7.2.** Deleted

8. Clarification of Tender Documents

- 8.1.** A prospective Tenderer requiring any clarification of the Tender documents may notify the Employer in writing or by e-mail at the Employer's postal / e-mail address indicated in the Invitation for Tenders. The Employer will respond to any request for clarification,

which he has received before the pre Tender meeting as notified in e-procurement portal. Copies of the Employer's response will be uploaded in the E- Proc portal, including a description of the enquiry but without identifying its source as per the calendar of events listed in the Tender Notification.

8.2. PRE-TENDER MEETING

- 8.2.1. The Tenderer or his official representative is invited to attend a pre-Tender meeting which will take place at the office of the Chief Engineer, BTDA, Bagalakote at time and date as notified in e-procurement portal, chaired by Chief Engineer, BTDA.
- 8.2.2. The purpose of the meeting will be to clarify issues already communicated / raised during the meeting to answer questions on any matter pertaining to the works.
- 8.2.3. The Tenderer is requested to submit any questions in writing or through E-mail. It may not be practicable at the pre Tender meeting to answer all questions, but questions and responses will be transmitted in accordance with the following sub-clause.
- 8.2.4. Minutes of the meeting including the text of the questions raised (without identifying the source of enquiry) and the responses given will be uploaded in the e-portal. Any modification of the Tender documents listed in Item No. 7.1 of ITT, which may become necessary as a result of the pre-Tender meeting shall be made by the Employer exclusively through the issue of an Addendum pursuant to Item No. 9 of ITT.
- 8.2.5. Non-attendance at the pre-Tender meeting will not be a cause for disqualification of a Tenderer.

9. Amendment of Tender Documents

- 9.1. Before the deadline for submission of Tenders, the Employer may modify the Tender documents by issuing addendum in the e-procurement portal only.
- 9.2. Any addendum thus issued shall be part of the Tender documents and will be uploaded in the e-portal.
- 9.3. To give prospective Tenderers reasonable time in which to take an addendum into account in preparing their tenders, the Employer shall extend as necessary the deadline for submission of tenders, in accordance with Sub-Clause 16.2 below

C. PREPARATION OF TENDERS

10. Documents comprising the Tender

- 10.1. The tender shall be submitted in Two (2) parts viz., Technical Tender and Financial Tender.

The contents of each of these two Tenders shall be as described in the subsequent clauses. For all further references, these envelopes will be referred to briefly as:

- 10.1.1. **First Part** - Technical Tender.

Technical Tender shall contain the following in the sequence indicated below.

- i. Covering letter
- ii. Checklist
- iii. The Tender Security
- iv. Letter of Tender

- v. Letter of Credit received from the Bank
- vi. Qualification, information crearia, particulars
- vii. Available Technical staff
- viii. Declaration by the Tenderer that his Tender is without any technical and financial Tender deviations in the format enclosed with the Tender.
- ix. Certified notarized Power of Attorney authorizing a representative or representatives of the Firm to sign the Tender and all subsequent communication.
- x. Full technical description of the items and services proposed by the Tenderer for the fool proof performance of the entire Pipe Distribution for water supply and sewage Network system to be enclosed.
- xi. PERT Charts for execution of works.
- xii. Details of drawings and documents proposed by the Tenderer.
- xiii. Confirmation of technical specification and terms and conditions.
- xiv. Confirmation of commercial terms and conditions. **There shall be no reference to the price.**
- xv. Any other technical details.

10.1.2. Second Part - Financial Tender.

- i. Covering letter
- ii. Tenderer should quote his Lumpsum price in the Tender documents through e-proc
- iii. Apart from the above documents, Tenderers shall not enclose any other document that influences the Lumpsum Price.

10.2. Deleted

10.3. Document-1: Technical Tender shall **not contain the following;**

- i. Schedule of Prices of the Tender Document constituting the Lump-Sum Tender Price
- ii. Any indication either direct or indirect or implicit or explicit or implied regarding the Tender Price or its breakup details or any other related price indication etc. shall be the cause for outright disqualification of the entire Tender.

10.4. All documents relating to the Tender shall be in English language and all correspondence related to the Tender submission shall be in English only.

11. Tender Prices

11.1. The Contract shall be Turn Key Contract based on Tenderer's own Investigation and Design for the Whole of the Works as described in Sub Clause 1.1 above

- 11.2.** The Tenderer shall fill in the Turn Key Price (both in Figures and in Words) for the whole of the work as well as Part I & Part II separately as per the Financial Tender form as in Section 9: Financial Tender of the tender documents
- 11.3.** All duties, taxes, excluding GST and other levies payable by the contractor under the contract, or for any other cause, shall be included in the rates, prices and the total tender price submitted by the tenderer
- 11.4.** The rates and prices quoted by the tenderer shall be subject to adjustment during the performance of the contract in accordance with the provisions of the conditions of contract.
- 11.5.** **The Price quoted by the Tenderer shall be for the Whole Works including maintenance period of 5 years, which includes 2 years defect liability Period as noted in the Schedule, Specifications and elsewhere in this Document and shall hold good till the Completion of Work. It shall be excluding GST and inclusive of all Taxes, Duties, Cess and Levies including, Municipal Taxes, Local Taxes, Octroi, ESI, Worker's Welfare, all Royalties, Patent Rights, other Incidental Charges, etc. The Rate shall also include the Cost of all Labours, Materials, Plant, Machinery, Equipments, Carriage, statutory clearances and other Inputs involved in the Execution and Completion of the Work in all respects to the agreed specifications and standards with quality workmanship**

12. Tender Validity

- 12.1.** Tenders shall remain valid for a period not less than One Hundred and Thirty Five Days after the deadline date for Tender submission specified in Item No. 16 of ITT. The Employer shall reject a Tender valid for a shorter period considering it as non-responsive.
- 12.2.** In exceptional circumstances, prior to expiry of original time limit, the Employer may request the Tenderers to extend the period of validity for a specified additional period. The request and the Tenderer's response shall be made in writing or by specified e-mail. A Tenderer may refuse the request without forfeiting his Tender security. A Tenderer agreeing to the request will not be required or permitted to modify his Tender but will be required to extend the validity of his Tender security for a period of the extension, and in compliance with Item No. 13 of ITT in all respects.

13. Earnest money deposit (Tender Security)

- 13.1.** The Tenderer shall furnish, as part of his Tender, a Tender security amount (shall be referred in tender notification) as specified in the General conditions of contract and tender notifications.
- 13.2.** Fixed validity issued as earnest money deposit for the tender shall be valid for 45 days **beyond** the validity of the tender.

This security shall be in favour of the Executive Engineer- Division No. 1, BTDA, Bagalakote and in the form of e-cash for Rs. Ten Lakhs and the balance in the form of SFMS Bank Guarantee of Scheduled Commercial Bank issued by the Nationalised / Public Sector / Scheduled Banks. The scanned copy of the Bank Guarantee of EMD shall be submitted along with the tender. The original copy of the Bank Guarantee shall be submitted after the due date of the submission of the Tender. Failure of

submission of Original BG before the stipulated date and time shall be treated as non-responsive.

13.3. Any Tender not accompanied by an acceptable Tender Security and not secured as indicated in Item No. 13.1 and 13.2 of ITT above shall be rejected by the Employer as non-responsive.

13.4. The Tender Security of unsuccessful Tenderers will be returned as promptly as possible upon award of contract, but in any event not later than 30 days of the end of the Tender validity period specified in Item No. 12.1 of ITT. No interest shall be paid by the employer on the Tender security.

13.5. The Earnest Money Deposit of the successful Tenderer will be discharged when the Tenderer has signed the agreement and furnished the required security deposit in the form of SMFS Bank Guarantee issued by a Nationalized / Public Sector / Scheduled Banks.

13.6. The EMD may be forfeited

- (a) if the Tenderer withdraws the Tender after Tender opening during the period of Tender validity.
- (b) if the Tenderer does not accept the correction of the Tender Price pursuant to Clause 24 or
- (c) in the case of a successful Tenderer, if the Tenderer fails within the specified time limit to
 - (i) sign the Agreement or
 - (ii) furnish the required Performance Security

14. Format and Signing of Tender

Tenderer shall submit the duly signed Tenders electronically before the submission date and time published in e-procurement portal.

The Electronic Tender System for the Construction of Work comprises of two Stages (i) Technical Tender and (ii) Financial Tender. The Tenderers are required to submit the Tender Documents in two stages electronically.

14.1. Deleted

14.2. Deleted

14.3. The Tender shall contain no Alterations or Additions, except those to comply with instructions issued by the Employer that are duly incorporated.

14.4. Signing of Tender is deemed as signed in e – Procurement System.

D. SUBMISSION OF TENDERS

15. Sealing and Marking of Tenders

15.1. Deleted

15.2. Deleted

15.3. Deleted

15.4. Deleted

15.5. The tender shall be submitted in Two (2) parts viz., Technical Tender and Financial Tender.

15.6. No Physical Documents shall be considered. However, all the participating Tenderers shall produce all the Original Documents for Verification whenever asked by the Employer.

Tenderer shall submit the Tenders electronically before the submission date and time published in e-procurement portal.

15.7. The contents of each of these two Tenders shall be as described in the subsequent clauses. For all further references, these documents will be referred to briefly as:

- Technical Tender.
- Financial Tender.

15.8. Technical Tender shall contain the following in the sequence indicated below.

- i. Covering letter
- ii. Checklist
- iii. The Tender Security
- iv. Letter of Tender
- v. Letter of Credit received from the Bank
- vi. Qualification, information crearia, particulars
- vii. Available Technical staff
- viii. Declaration by the Tenderer that, his Tender is without any technical and financial Tender deviations in the format enclosed with the Tender.
- ix. Certified notarized Power of Attorney authorizing a representative or representatives of the Firm to sign the Tender and all subsequent communication.
- x. PERT Charts for execution of works.
- xi. Details of drawings and documents proposed by the Tenderer.
- xii. Confirmation of technical specification and terms and conditions.
- xiii. Confirmation of commercial terms and conditions. **There shall be no reference to the price.**
- xiv. Any other technical details.

15.9. Document-1: Technical Tender shall not contain the following;

- i. Schedule of Prices of the Tender Document constituting the Lump-Sum Tender Price
- ii. Any indication either direct or indirect or implicit or explicit or implied regarding the Tender Price or its breakup details or any other related price indication etc. shall be the cause for outright disqualification of the entire Tender.

15.10. Document-2: Financial Tender document should contain the following:

- i. Covering letter
- ii. Tenderer should quote his Lumpsum price in the Tender documents through e-proc
- iii. Apart from the above documents, Tenderers shall not enclose any other document that influences the Lumpsum Price.

16. Deadline for Submission of Tenders

16.1. Deleted

16.2. The Employer may extend the deadline for submission of Tenders by issuing an amendment in accordance with Item No. 9 of ITT, in which case all rights and obligations of the Employer and the Tenderers previously subject to the original deadline will then be subject to the new deadline.

16.3. Tenders must be uploaded before the deadline fixed as indicated in e-procurement portal.

16.4. The uploaded hard copy in original shall be produced at the technical opening of the Tender as stated in the e-portal for verification. & "Copy of all the e-portal uploaded documents shall be submitted in hard copy (Notarized) at the time of opening of the technical Tender".

17. Late Tenders

17.1. Deleted

17.2. The E-Tender supporting system does not permit late submission after date and time of submission. The Employer shall not be responsible for any reasons for the causes for which the Tenderer is unable to access the portal.

18. Modification and Withdrawal of Tenderes:

Tender has all the time to modify and correct or upload any relevant document in the portal before submission on e-portal.

Tender Can be withdrawn only before Tender submission date and time, as published in the e-procurement portal.

18.1. Deleted

18.2. Deleted

18.3. No Tender may be modified after the deadline for submission of Tenders.

18.4. Withdrawal or modification of a Tender between the deadline for submission of Tenders and the expiration of the original period of Tender validity specified in Clause 12.1 above or as extended pursuant to Clause 12.2 may result in the forfeiture of the earnest money deposit pursuant to Clause 13.

18.5. Deleted

E. TENDER OPENING AND EVALUATION

19. Opening of First document (Technical Tender) of all Tenders and evaluation to determine qualified Tenderers

The Employer will open online the First document of all the Tenders received through e-procurement portal, in the presence of the Tenderers or their authorized representatives who choose to attend at 11.30 hours on the date and the place specified in the e-procurement portal. In the event of the specified date of Tender opening being declared a holiday for the Employer, the Tenders will be opened at the appointed time and location on the next working day.

19.1 Deleted

19.2 Deleted

19.3 The Tenderers' Names, the Presence or Absence of Earnest Money Deposit (Amount, Format and Validity), the Submission of Qualification Information and such

other Information as the Employer may consider Appropriate will be announced by the Employer at the Opening date.

19.4 The Employer shall prepare minutes of the Tender opening, including the information disclosed to those present.

19.5 Deleted

19.6 The Employer will evaluate and determine whether each tender (a) meets the eligibility criteria defined in ITT Clause 2; (b) is accompanied by the required earnest money deposit as per stipulations in ITT Clause and (c) meets the minimum qualification criteria stipulated in ITT Clause 3. The Employer will draw out a list of qualified Tenderers.

20. Opening of Second document of qualified Tenderers and evaluation:

20.1 The Employer will inform all the Qualified Tenderers the time, date and venue fixed for the opening of the Second Cover containing the priced Tenders. The Employer will open online the Second Covers of Qualified Tenderers at the appointed time and date (as indicated in the e-Procurement Portal) in the presence of the Tenders or their representatives who choose to attend. In the event of the specified date of Second Cover opening being declared a holiday for the Employer, the Second Covers will be opened at the appointed time and location on the next working day.

20.2 Deleted

20.3 The Tenderers' names, the Tender prices, the total amount of each Tender, any discounts, Tender modifications and withdrawals, and such other details as the Employer may consider appropriate, will be announced by the Employer at the opening.

20.4 The Employer shall prepare minutes of the Second Cover Tender opening, including the information disclosed to those present in accordance with Sub-Clause 20.3.

21. Process to be Confidential

21.1. Information relating to the examination, clarification, evaluation and comparison of Tenders and recommendations for the award of contract shall not be disclosed to Tenderers or any other persons not officially concerned with such process until the award to the successful Tenderer has been announced. Any effort by a Tenderer to influence the Employer's processing of Tenders or award decisions may result in the rejection of his Tender.

22. Clarification of Tender

22.1. To assist in the examination, evaluation, and comparison of Tenders, the Employer may, at his discretion, ask any Tenderer for clarification of his Tender, including breakdowns of unit rates. The request for clarification and the response shall be in writing or by e-mail, but no change in the price or substance of the Tender 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 Tenders in accordance with Clause 24.

22.2. Subject to sub-clause 22.1, No Tenderer shall contact the Employer on any matter relating to its Tender from the time of the Tender opening to the time the contract is awarded. If the Tenderer wishes to bring additional information to the notice of the Employer, it should do so in writing.

22.3. Any effort by the Tenderer to influence the Employer in the Employer's Tender evaluation, Tender comparison or contract award decisions may result in the rejection of the Tenderers' Tender.

23. Examination of Tenders and Determination of Responsiveness

- 23.1.** Prior to the detailed evaluation of Tenders, the Employer will determine whether each Tender; (a) has digitally signed; and; (b) is substantially responsive to the requirements of the Tender documents.
- 23.2.** A substantially responsive Tender is one which conforms to all the terms, conditions, and specifications of the Tender 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 as determined by the Employer.
 - (b) which limits in any substantial way, inconsistent with the Tender documents, the Employer's rights or the Tenderer's obligations under the Contract as determined by the Employer; or
 - (c) whose rectification would affect unfairly the competitive position of other Tenderers presenting substantially responsive Tenders.
- 23.3.** If a Tender is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the nonconforming deviation or reservation.

24. Correction of Errors

24.1. Deleted

24.2. Deleted

24.3. The Tenderer can do Modifications before submitting their Tenders online only.

25. Evaluation and Comparison of Tenders

- 25.1.** The Employer will evaluate and compare only the Tenders determined to be substantially responsive in accordance with Clause 23.
- 25.2.** Deleted.
- 25.3.** The Employer reserves the right to accept or reject any variation and deviation. Variations, and deviations and other factors which are in excess of the requirements of the Tender documents or otherwise result in unsolicited benefits for the Employer shall not be taken into account in Tender Evaluation.
- 25.4.** Deleted.
- 25.5.** If the tender of the successful tenderer is seriously unbalanced in relation to the Employer's estimate of the cost of the work to be performed under the contract, the Employer may require the Tenderer 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 and/or the rate/cost as in the Feasibility Report. After evaluation of the price analyses, the Employer may require that the amount of the performance security set forth in Clause 29 be increased at the expense of the successful Tenderer to a level sufficient to protect the Employer against financial loss in event of default of the successful Tenderer under the contract.

F. AWARD OF CONTRACT

26. Award Criteria

26.1. Subject to Clause 27, the Employer will award the Contract to the Tenderer whose Tender has been determined to be substantially responsive to the Tender documents and who has offered the lowest evaluated Tender Price provided that such Tenderer has been determined to be (a) eligible in accordance with the provisions of Clause 2, of ITT and (b) qualified in accordance with the provisions of Clause 3 of ITT.

27. Employer's Right to Accept any Tender and to Reject any or all Tenders

27.1. Notwithstanding clause. No. 26, the Employer reserves the right to accept or reject any Tender, and to cancel the Tender process and reject all Tenders, at any time prior to the award of Contract, without thereby incurring any liability to the affected Tenderer or Tenderers or any obligation to inform the affected Tenderer or Tenderers of the grounds for the Employer's action.

28. Notification of Award & Signing of Agreement

28.1. The Tenderer whose Tender has been accepted will be notified of the award by the Employer prior to expiration of the Tender validity period by, e-mail or e-procurement portal or through letter. This letter (hereinafter and in the *Conditions of Contract* called the "Letter of Acceptance") will state the sum that the Employer will pay the Contractor in consideration of the execution, completion, and maintenance of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Contract called the "Contract Price").

28.2. The notification of award will constitute the formation of the Contract, subject only to the furnishing of Security deposit in accordance with the provisions of Clause 29.

28.3. The Agreement will incorporate all agreements between the Employer and the successful Tenderer. It will be kept ready for signature of the successful Tenderer in the office of Employer within 30 days following the notification of award along with the Letter of Acceptance. Within 20 days of receipt, the successful Tenderer will sign the Agreement and deliver it to the Employer failing which action as stated in 13.6 (c) of ITT will be taken.

28.4. Upon furnishing by the successful Tenderer of the Performance Security, the Employer will promptly notify the other Tenderers that their Tenders have been unsuccessful.

29. Performance Security (Security Deposit)

29.1. Within 20 days of receipt of the Letter of Acceptance, the successful Tenderer shall deliver to the Employer a Security deposit in any of the forms given below for an amount equivalent to **3%** of the Contract price plus additional security for unbalanced tenders in accordance with Clause 25.5 of ITT and Clause 44 of the Conditions of Contract.

29.2. If the security deposit is provided by the successful Tenderer in the form of a SFMS Bank Guarantee, it shall be issued by a nationalized/scheduled bank.

29.3. Deleted.

29.4. Failure of the successful Tenderer to comply with the requirements of Sub-Clause 29.1 shall constitute sufficient grounds for cancellation of the award and forfeiture of the Earnest money deposit.

29.5. The Security Deposit lodged/paid by a Contractor shall be refunded after 30 days of completion of Defect Liability Period (DLP) to an extent of 66.67% of the performance security, balance amount will be released 30 days after the completion of O&M period.

30. Advance Payment and Security

30.1. Employer will provide an advance payment on the contract price as stipulated in the conditions of contract, subject to the maximum amount as stated in the contract data.

31. Corrupt or Fraudulent Practices

31.1. The Employer requires that Tenderers observe the highest standard of ethics during the evaluation and execution of such contracts. In pursuance of this policy, the Employer:

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

- (i) "Corrupt practice" means the offering giving, receiving or soliciting of anything of value to influence the action of a public official in the evaluation process or in contract execution.

And

- (ii) "Fraudulent practice" means a misrepresentation of facts in order to influence an evaluation process or the execution of a contract to the detriment of the Employer and includes collusive practice among Tenderers (prior to or after Tender submission) designed to establish Tender prices at artificial non-competitive levels and to deprive the Employer of the benefits of free and open competition.
- (a) Will reject a proposal for award if it determines that the Tenderer recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question.
 - (b) Will declare a firm ineligible, either indefinitely or for a stated period of time, to be awarded a contract if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for or in executing a contract.

31.2. Furthermore, Tenderers shall be aware of the provision stated in sub-clause 50.2 of the Conditions of Contract.

SECTION - 3

QUALIFICATION INFORMATION

SECTION 3 : QUALIFICATION INFORMATION

The information to be filled in by the Tenderer hereunder will be used for purposes of computing Tender capacity as provided for in Clause 3 of the Instructions to Tenderers. This information will not be incorporated in the Contract.

1.1 Constitution or legal status of Tenderer [Attach copy]

Place of Registration

Principal place of business:

(Attach Copy)

1.2 Total value of similar works executed and payments received in the last five years *(in Rs. Lakhs)¹

2017 - 18	_____
2018 - 19	_____
2019- 20	_____
2020 - 21	_____
2021 - 22	_____

[Attach certificate from chartered Accountant]

*Annual Turnover certificate obtained from the Chartered Accountant shall mandatorily contain UDIN of the Chartered Accountant.

1.3 Work performed as Prime Contractor (in the same name) on works of similar nature during the seven years.

Project Name	Name of Employer	Description of Work	Contract Number	Value of contract Rs. Lakhs	Date of issue of work	Specified period of completion order	Actual date of completion	Remarks explaining reasons for delay in completion of work
1	2	3	4	5	6	7	8	9

1.4 Quantities of work executed as prime contractor (in the same name) during the last five years:

Year	Name of Work	Name of Employer	Quantity of work performed ²	Remarks (Indicate contract reference)
2017-18				
2018-19				
2019-20				
2020-21				
2021-22				

1.5 Information on works for which Tenders have been submitted and works which are yet to be completed as on the date of this Tender.

¹ Attach Certificate from Chartered Accountant with UDIN No

² Items of Work for which Data is requested should tally with that specified in ITT Clause 3

(A) Existing commitments and on-going works:

Description of work	Place & State	Contract No. & Date	Name and Address of the Employer	Value of Contract (Rs. Lakhs)	Stipulated period of Completion	Value of Works ³ remaining to be completed	Anticipated Date of Completion
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

(B) Works for which Tenders already submitted:

Description of work	Place & State	Name and Address of the Employer	Estimated Value of Works (Rs. Lakhs)	Stipulated period of Completion	Date Decision is Expected	When if any
(1)	(2)	(3)	(4)	(5)	(6)	(7)

- 1.6. The following items of equipment are considered essential for successfully carrying out the works. The Tenderer should furnish all the information listed below.

Item of Equipment	Requirement ²			Owned and Available		Remarks
	No.	Capacity	Owned	Number/Capacity	Age/Condition	
(1)	(2)	(3)	(4)	(5)	(6)	(7)

- 1.7 Reports on the financial standing of the tenderer, such as profit and loss statements and auditor's reports for the last five years;
- 1.8 Qualification and experience of the key technical and management personnel in permanent employment with the tenderer and those that are proposed to be deployed on this contract, if awarded.
- 1.9. Name, address, and telephone numbers of the Tenderers' bankers who may provide references if contacted by the Employer.
- 1.10 Evidence of access to financial resources to meet the qualification requirement specified in ITT Clause 3.3 (c): Cash in hand, Letter of Credit etc. List them below and attach certificate from the Banker in the suggested format as under:

The Tenderer shall submit the Employers Certificate issued not less than the rank of Executive Engineer to evidence the experience details furnished in table 1.3 & 1.4 above.

² The item of equipment, required number and capacity should match with those specified in ITT Clause 3.3 (a)

BANKER'S CERTIFICATE
(To be issued in the Letter head of Bank Branch)
Reference No..... Place:

Date

To

(Name and Address of Beneficiary)

This is to certify that M/s. having his / their registered /administrative office atis a customer of our bank and is / are engaged in(nature of activity). If the said customer is allotted / awarded "**Design and Construction along with Operation & Maintenance for a Period of 05 Years for (1) Layout development and Infrastructure works consisting of Roads, Water Distribution, Ground Service Reservoirs, Sewer Network, Storm Water Drains , Power Supply System (HESCOM), ICT infrastructure system works, Chain link fencing for Parks / open areas, Tree plantation for Sector B, C & D and (2) Primary drains outside Unit-3 area, along with Sewage Pumping Stations (SPS) (including pumping machineries & is pumping mains for all sectors) for Bagalakote Navanagar - Unit 3 Area-**", we may extend credit facilities upto Rs.lakhs to meet his / their working capital requirements towards the execution of the said work order as per the loan policy of the Bank.

This certificate is valid upto three months from the date of issue, that is upto DD/MM/YYYY

Yours faithfully,

Sd/-

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

1.11 Proposals for subcontracting components of works amounting to more than 20% of the contract price.

Item of work	Value of Sub-Contract	Identified Sub-Contractor (Name and Address)	Experience of Similar Work ³
(1)	(2)	(3)	(4)
- "Not Applicable as sub-contracting is not permitted in this contract" -			

1.12 Information on litigations in which the Tenderer is involved:

Other Party (ies)	Employer	Details of Dispute	Amount Involved	Remarks showing present status
(1)	(2)	(3)	(4)	(5)

³ Attach certificates from the respective Employers.

- 1.13 The proposed methodology and program of construction, backed with equipment planning and deployment, duly supported with broad calculations and quality control procedures proposed to be adopted, justifying their capability of execution and completion of the work as per technical specifications within the stipulated period of completion as per milestones

SECTION - 4

FORMS OF TENDER – LETTER OF ACCEPTANCE, NOTICE TO PROCEED WITH THE WORK AND AGREEMENT FORM

**SECTION 4: FORMS OF LETTER, FORM OF TENDER, LETTER OF ACCEPTANCE,
NOTICE TO PROCEED WITH THE WORK AND AGREEMENT FORM**

FORM OF TENDER

Description of Work: "Design and Construction along with Operation & Maintenance for a Period of 05 Years for (1) Layout development and Infrastructure works consisting of Roads, Water Distribution, Ground Service Reservoirs, Sewer Network, Storm Water Drains , Power Supply System (HESCOM), ICT infrastructure system works, Chain link fencing for Parks / open areas, Tree plantation for Sector B, C & D and (2) Primary drains outside Unit-3 area, along with Sewage Pumping Stations (SPS) (including pumping machineries & pumping mains for all sectors) for Bagalakote Navanagar - Unit 3 Area- under Lumpsum Turnkey Contract.

To:

Address : **Executive Engineer,
BTDA, Division No. 1,
Bagalakote**

GENTLEMEN:

We offer to execute the Works described above in accordance with the conditions of Contract accompanying this Tender for the Contract price stated in the Financial Tender.

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

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

We confirm that this Tender complies with the Tender Validity and Tender Security required by the Tender documents.

We attach herewith our current income tax, PAN card and GST registration certificates.

Yours faithfully,

Authorized Signatory:

Name & Title of Signatory

Signature: _____

Name of Tenderer: _____

Address: _____

LETTER OF ACCEPTANCE:

(FORMAT)

(Letterhead paper of the Employer)

_____ [Date]

To,____

[Name and address of the contractor]

Dear Sirs,

This is to notify you that your Tender dated _____ for execution of the "Design and Construction along with Operation & Maintenance for a Period of 05 Years for (1) Layout development and Infrastructure works consisting of Roads, Water Distribution, Ground Service Reservoirs, Sewer Network, Storm Water Drains , Power Supply System (HESCOM), ICT infrastructure system works, Chain link fencing for Parks / open areas, Tree plantation for Sector B, C & D and (2) Primary drains outside Unit-3 area, along with Sewage Pumping Stations (SPS) (including pumping machineries & pumping mains for all sectors) for Bagalakote Navanagar - Unit 3 Area- under Lumpsum Turnkey Contract

_____ for the Contact Price of Rupees
_____()

[Amount in words and figures], as corrected and modified in accordance with the Instructions of Tenderers is hereby accepted.

You are hereby required to furnish performance Security, in the form detailed in Para 25.5 of ITT plus additional security for unbalanced tender in terms of clause 29.1 of ITT for an amount of Rs. _____ within 20 days of the receipt of this letter of acceptance valid up to 30 days from the date of expiry of Defects Liability Period and maintenance period i.e. up to _____ and sign the contract; failing which action as stated in Para 29.4 of instructions of Tenderers will be taken.

Yours faithfully,

Authorized Signatory

Name and Title of Signature

Name of Agency

ISSUE OF NOTICE TO PROCEED WITH THE WORK
(LETTERHEAD OF THE EMPLOYER)
(FORMAT)

_____ (Date)

To,

_____ (Name and address of the contractor)

Dear Sirs,

Pursuant to your furnishing the requisite security deposit as stipulated in ITT Clause 29.1 and signing of the contract for the construction of “Design and Construction along with Operation & Maintenance for a Period of 05 Years for (1) Layout development and Infrastructure works consisting of Roads, Water Distribution, Ground Service Reservoirs, Sewer Network, Storm Water Drains , Power Supply System (HESCOM), ICT infrastructure system works, Chain link fencing for Parks / open areas, Tree plantation for Sector B, C & D and (2) Primary drains outside Unit-3 area, along with Sewage Pumping Stations (SPS) (including pumping machineries & pumping mains for all sectors) for Bagalakote Navanagar - Unit 3 Area- - under Lumpsum Turnkey Contract “_____@ a Tender Price of Rs._____. You are hereby instructed to proceed with the execution of the said works in accordance with the contract documents.

Please note that the period of contract will be reckoned from this date.

Yours faithfully,

(Signature, name and date of
Signatory authorized to sign
On behalf of Employer)

AGREEMENT FORM

AGREEMENT

This agreement, made the _____ day of _____ 20 between

[Name and address of Employer] (Hereinafter called "the Employer") and

[Name and address of contractor] (Hereinafter called "the Contractor" of the other part)

Whereas the Employer is desirous that the Contractor execute ""Design and Construction along with Operation & Maintenance for a Period of 05 Years for (1) Layout development and Infrastructure works consisting of Roads, Water Distribution, Ground Service Reservoirs, Sewer Network, Storm Water Drains , Power Supply System (HESCOM), ICT infrastructure system works, Chain link fencing for Parks / open areas, Tree plantation for Sector B, C & D and (2) Primary drains outside Unit-3 area, along with Sewage Pumping Stations (SPS) (including pumping machineries & pumping mains for all sectors) for Bagalakote Navanagar - Unit 3 Area-under Turn Key

[Name and identification number of Contract] (Hereinafter called "the Works") and the Employer has accepted the tender by the Contractor for the execution and successful commissioning of entire system and completion of such Works and the remedying of any defects therein, at a cost of Rs.....

NOW THIS AGREEMENT WITNESSED as follows:

1. In this Agreement, words and expression shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to, and they shall be deemed to form and be read and construed as part of this Agreement.
2. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned. The contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein in all aspects with the provisions of the Contract.
3. The Employer hereby covenants to pay the Contractor in consideration of the execution and successful commissioning of entire system, completion of the works and the remedying the defects wherein the Contract Prices or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed in the contract.
4. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz:
 - a) Letter of Acceptance;
 - b) Notice of proceed with the work;
 - c) Contractor's tender;
 - d) Contract Data
 - e) Conditions of Contract (General and Special);
 - f) Specifications;
 - g) Drawings;
 - h) Bill of Quantities
 - i) Financial Tender
 - j) Minutes of meeting of pre Tender meeting.

- k) Any other document listed in the Contract Data as forming part of the Contract.

In witness whereof the practices there to have caused this Agreement to be executed the day and year first before written,

The Common Seal of

Was hereunto affixed in the presence of;

Signed, Sealed and Delivered by the said

in the presence of;

Binding Signature of Employer

Binding Signature of Contractor

SECTION - 5

CONDITIONS OF CONTRACT

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SECTION 5: CONDITIONS OF CONTRACT

CONDITIONS OF CONTRACT

A. GENERAL

1. DEFINITIONS:

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

Bill of Quantities means the priced Bill of Quantities indicated by the Tenderer supporting the quoted Lump sum price and forming part of the Tender.

Compensation Events are those defined in clause 38 hereunder

The Completion Date is the date of successful commissioning of entire system and completion of the works as certified by the Engineer in accordance with Sub Clause 46.1.

The Contract is the contract between the Employer and the Contractor to execute, complete and maintain the Works. It consists of the documents listed in Clause 2.2 below.

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

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

The **Contractor** is a person or corporate body who's Tender to carry out the Works has been accepted by the Employer.

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

Competent authority means Executive Engineer, Superintending Engineer / Chief Engineer BTDA / Managing Director KBJNL as the context may require.

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

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

The **Defects Liability Period** is the period named in the Contract Data and calculated from the date of completion after successful commissioning of entire system.

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

The **Engineer / Engineer In Charge / Executive Engineer** is the person named in the Contract Data who is responsible for supervising the Contract, administering the Contract, certifying payment due to the Contractor, issuing and valuing variations to the Contract, awarding Extensions of Time.

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

Events of Default by Contractor: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of this Contract.

Financial Tender means the priced and completed financial Tender forming part of the Tender

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

The **Intended Completion Date** is the date on which it is intended to successfully commission the entire system before the Contractor completes all the works assigned as per the scope of work. The Intended Completion Date is specified in the Contract Data. The Intended Completion Date may be revised only by the Engineer by issuing an Extension of Time.

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

The Maintenance Period is the period named in the Contract Data and calculated from the date of satisfactorily Completion of all works.

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

Proof Checking and Project Management Consultant means the authorized representative of the Client (BTDA) for this project.

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

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

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

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

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

Turnkey Contract includes detailed survey & Investigations, planning, analysis, design, drawings, getting the same proof checked, procurement, execution etc., and completion of the contract in all respects to the agreed specifications and standards including all the necessary tasks during defect liability period and during the maintenance period. The quoted amount is inclusive of all the above to complete the assignment in all respects as in this contract.

A **Variation** is an instruction given by the Engineer, to vary the scope of work.

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

2. INTERPRETATION

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

2.2 The documents forming the Contract shall be interpreted in the following order of priority:

1. Pre Tender meeting documents
2. Agreement
3. Letter of Acceptance, notice to proceed with the works
4. Contractor's Tender
5. Contract Data
6. Conditions of Contract
7. Specifications
8. Drawings
9. Bill of Quantities
10. Any other document listed in the Contract Data as forming part of the Contract.

2.3 Successful operation and maintenance means the successful Tenderer shall maintain the works of all infrastructure developed by him as per the conditions laid in the O&M clause of this document.

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

3. LAW GOVERNING CONTRACT

3.1 The Law governing the contract is the laws of India supplanted by the Karnataka local acts.

3.2 The G.O. issued by Government of Karnataka vide dated 25.08.2020 and 29.03.2021 with regard to restrictions on Public Procurement from Tenderers of certain countries is applicable.

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

3.4 All Tenderers shall provide Forms of Tender and a statement to the effect that the Tenderer is not associated, nor has been associated in the past, directly or indirectly, with KBJNL / BTDA, for this package. A firm that has been engaged by the employer to provide consulting services for the preparation of supervision of the works, and any of its affiliates shall not be eligible to Tender.

3.5 Government –owned enterprises in India may only participate if they are legally and financially autonomous and operate under commercial law.

3.6 Tenderers shall not be under a declaration of ineligibility for corrupt and fraudulent practices in accordance with Item No. 31 of ITT.

3.7 Tenderer for the works should enclose performance certificate from the concerned Executive Engineer for having satisfactorily executed the works undertaken by him. The tender received without performance certificate or with unsatisfactory performance shall be liable for rejection.

3.8 The Tenderer shall quote the prices entirely in Indian Rupees.

3.9 The project is proposed under turnkey basis. In the circumstances any savings due to the approved change in the parameters (including legal aspects) of the project should be transferred to the department.

4. EMPLOYER'S DECISIONS

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

5. DELEGATION

5.1 The Employer may delegate any of his duties and responsibilities to authorised representatives after notifying the Contractor and may cancel any delegation after notifying the Contractor.

6. COMMUNICATIONS

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

7. SUBCONTRACTING-

7.1 Deleted.

8. OTHER CONTRACTORS

8.1 The Contractor shall cooperate and share the Site with other contractors, public authorities, utilities, and the Employer

8.2 The Contractor shall as referred to in the Contract Data, also provide facilities and services for them as described in the Schedule. The employer may modify the schedule of other contractors and shall notify the contractor of any such modification.

9. PERSONNEL

9.1 Contractor shall employ the technical/ non technical personnel of _____ (of number and qualifications) as may be stipulated by the employer from time to time during the execution of work. The technical staff so employed shall be available at site as may be stipulated by the employer.

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

9.3 Non- employment of Project Manager and other Key Personnel shall be liable for fine as specified in Contract Data.

10. EMPLOYER'S AND CONTRACTOR'S RISKS

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

11. EMPLOYER'S RISKS

11.1 The Employer is responsible for the excepted risks which

- a. in so far as they directly affect the execution of the Works in the Employer's country, the risks of war, hostilities, invasion, act of foreign enemies, rebellion, revolution, insurrection or military or usurped power, civil war, riot, commotion or disorder (unless restricted to the Contractor's employees), and contamination from any nuclear fuel or nuclear waste or radioactive toxic explosive, or
- b. a cause due solely to the design of the Works, other than the Contractor's design, or
- c. any operation of the force of nature (in so far as it occurs on the site) which an experienced contractor:

- i. could not have reasonably foreseen or
- ii. could reasonably have foreseen, but against which he could not reasonably have taken at least one of the following measures;
 - A. prevent loss or damage to physical property from occurring by taking appropriate measures or
 - B. insure against such losses or damage

12. CONTRACTOR'S RISKS

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

13. INSURANCE

13.1 The Contractor shall prior to commencing the works, effect and thereafter maintain insurances, in the joint names of the Employer and the Contractor, (cover from the first working day after the Start Date to the end of Defects Liability Period), in the amounts stated in the Contract Data:

- (a) for loss of or damage to the Works, Plants and Materials and the Contractor's equipment;
- (b) for liability of both Parties for loss, damage, death and injury to third parties or their property arising out of the Contractor's performance of the Contract including the Contractor's liability for damage to the Employer's property other than the Works and
- (c) for liability of both Parties and of any Employer's representative for death and injury to the Contractor's personnel except to the extent that liability arises from the negligence of the Employer, any Employer's representative or their Employees.

13.2 Policies and certificates for insurance shall be delivered by the Contractor to the Employer for his approval before the Start Date. All such insurance shall provide for compensation to be payable to rectify the loss or damage incurred. All payments received from insurers relating to loss or damage shall be held jointly by the Parties and used for the repair of the loss or damage or as compensation for loss or damage that is not to be repaired.

13.3 If the Contractor fails to effect or keep in force any of the insurances referred to in the previous sub-clauses or fails to provide satisfactory evidence, policies or receipts, the Employer may without prejudice to any other right or remedy, effect insurance for the cover relevant to such default and pay the premiums due and recover the same as a deduction from any other monies due to the Contractor. If no payments is due, the payment of the premiums shall be a debt due.

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

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

14. SITE INVESTIGATION REPORTS

14.1 Deleted

14.2 The Contractor, in preparing the tender, shall solely rely on his own site investigation and reports. Data as referred to in the Contract data, supplemented by any information available to the Tenderer in the tender document and the report are only for the purpose of reference and no claim whatsoever and or correspondence from the contractor in this

regard will be entertained. This task is incidental and no payment will be made towards the same.

15. QUERIES ABOUT THE CONTRACT DATA

15.1 The Employer will clarify queries on the Contract Data based on the written queries (if any) raised by the prospective Tenderers in the pre-tender meeting.

16. CONTRACTOR TO CONSTRUCT THE WORKS

16.1 Deleted

16.2 The Contractor shall construct and install the Works in accordance with the Specification and Drawings duly proof checked and approved by the consultant appointed by BTDA. The Contractor shall construct the temporary works as per the specifications approved by the employer at his risk and cost.

16.3 The basic centerlines, reference points and benchmarks will be fixed by Employer at site within four weeks of the Start Date.

16.4 The Contractor shall establish at his cost, at suitable points, additional reference lines, benchmarks as may be necessary. The Contractor shall remain responsible for the sufficiency and accuracy of all his benchmarks and reference lines. He shall take precautions to see that the lines, points and benchmarks fixed by Employer are not disturbed by his work and shall make good any such damages.

17. THE WORKS TO BE COMPLETED BY THE INTENDED COMPLETION DATE

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

18. Approval by the Employer:

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

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

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

18.4 Deleted

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

18.6 For all the requirements as in Clause 18.1 to Clause 18.5 as above, BTDA will designate Proof checking & Project management consultant.

18.7 The Contractor shall obtain approval of experts in the related fields (if required and desired by BTDA) to the design of the Permanent and temporary Works where required at his own cost and is considered as incidental to main work and no extra payments will be made in this regard.

19. SAFETY

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

20. DISCOVERIES

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

21. POSSESSION OF THE SITE

21.1 The employer shall give possession of all parts of the site to the contractor. If possession of a part is not given by the date stated in the contract date, the Employer is deemed to have delayed the start of the relevant activities and this will be Compensation Event.

22. ACCESS TO THIS SITE

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

22.2 The Contractor will have to make his own Arrangements for Water, Electricity, Place for Storage of Construction Materials, Casting Yards, Labour Camps, etc. required for Construction and shall use his own Plant and Machinery, which may be required for the Speedy Execution of the Work

22.3 The Quoted amount shall also be inclusive of Providing Skilled Personnel for Traffic Diversion as per the Requirements of the site and Traffic Police

22.4 Contractor shall provide office facilities (temporary structures) with adequate furniture for the BTDA officers and Project Management Consultants appointed by BTDA at the site office of each of the project site. Contractor's quote shall be inclusive of all such expenses.

23. INSTRUCTIONS

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

24. PROCEDURE FOR RESOLUTION OF DISPUTES:

24.1 **Deleted**

24.2 **Deleted**

24.3 **Deleted**

24.4 Resolution of Disputes –(Refer clause 4 of special conditions of contract)

If any dispute or difference of any kind whatsoever were to arise between the Executive Engineer and the contractor regarding the following matters namely,

24.4.1 The meaning of the specifications, designs drawings and instructions herein before mentioned :

24.4.2 The quality of workmanship or materials used on the work and

24.4.3 Any other question, claim, right, matter, thing what so ever, in any way arising out of relating to the contract, designs, drawings, specifications, estimates, instructions, or orders, or those conditions or failure to execute the same whether arising during the progress of work, or after the completion, termination or abandonment thereof, the dispute shall, in the first place, be referred to the Chief Engineer, who has jurisdiction over the work specified in the contract. The Chief Engineer, shall, within a period of sixty days from the date of being requested by the contractor to do so, give written notice of his decision to the Contractor. If the contractor is aggrieved by the decision

of the Chief Engineer, or if the Chief Engineer fails to give written notice of his decision within the above said period of sixty days, the Contractor may appeal to the Managing Director, KBJNL, within 60 days from the receipt of written notice of Chief Engineers decision or from the expiry of first named period 60 days.

- 24.4.4 The Technical Director in the Managing Director's Office shall place the decision of the Chief Engineer and the appeal of the contractor before a Committee comprising of the Chairman of the Technical Sub Committee as Chairman, a member of either the Estimate Review Committee or the Technical Sub Committee of the Nigam and the Managing Director for examination of the appeal and the Chief Engineer's decision and to recommend to the Managing Director for a decision on the appeal.
- 24.4.5 Subject to the Managing Director's decision on appeal and subject to other form of settlement hereafter provided, the Chief Engineers decision in respect of every dispute or difference so referred shall be final and binding on the contractor. The said decision shall forthwith be given effect to and the contractor shall proceed with the execution of the work with all due diligence.
- 24.5 Remedy when the Managing Directors decision on appeal is not acceptable to contractor.
- 24.5.1 In case the decision of the Managing Director is not acceptable to the contractor, he may approach the Jurisdictional Law Courts for settlement of disputes after giving due written notice in this regard to the Managing Director within a period of ninety days from the date of receipt of the written notice of the decision of the Managing Director.
- 24.5.2 Time limit for notice to approach Law Court by contractor (a) If the Managing Director has given written notice to the contractor of his decision on his appeal and no written notice to approach the Law court has been communicated to him by the Contractor within a period of 90 days from receipt of such notice, the said decision shall be final and binding upon the Contractor. (b) If the Managing Director fails to give notice of his decision within a period of 90 days from the receipt of the Contractor's appeal, the Contractor may within 90 days after the expiry of the above named 90 days approach the Jurisdictional Law Courts after giving due notice to the Managing Director.
- 24.5.3 Whether the claim is referred to the Chief Engineer, or the Managing Director or to Law Courts, as the case may be, the Contractor shall proceed to execute and complete the works with all due diligence pending settlement of the said dispute of difference.
- 24.5.4 Obligations of the Contractor and the Executive Engineer shall remain unaltered during consideration of the dispute.
- 24.5.5 The reference of any dispute to the Chief Engineer or Managing Director or the Law Courts may proceed notwithstanding that the works shall then be or be alleged to be complete, provided always that the obligation of the Contractor and the Executive Engineer shall not be altered by reason of the said dispute or difference being referred to the Chief Engineer or the Managing Director or Law Courts during the progress of the works.
- 24.5.6 It is clearly understood and agreed upon by both the parties that no part of the above clause 24 shall be construed to be an Arbitration Clause under the Arbitration and Conciliation Act 1996 or any other Act. In the event of any dispute of difference arising between the parties to this contract; upon exhausting the remedies available under clause 24, the only final remedy available shall be to approach the

Jurisdictional Civil Court agreed to under provisions of this contract by filing a suit in accordance with Law.

B. TIME CONTROL

25. PROGRAM

- 25.1 Within the time stated in the Contract Data, the Contractor shall submit to the Employer for approval a Program showing the general methods, arrangements order, and timing for all the major activities in the Works.
- 25.2 The Engineer's approval of the program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Engineer again at any time. A revised Program is to show the effect of variations.
- 25.3 An update of the Program shall be a program showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work including any changes to the sequence of activities.
- 25.4 The Contractor shall submit to the Engineer, for approval, an updated program at intervals no longer than the period stated in the Contract Data. If the Contractor does not submit an updated Program within this period, the Engineer may withhold the amount stated in the Contract Data from the next payment certificate.
- 25.5 On receipt of instructions from the Employer, the Contractor shall submit the work program (specifically in respect of a portion of the work and/or for a specified period) within 7 days of such demand.

25.6 PROGRAMME OF WORK

The time allowed for carrying out the work as entered in the tender shall strictly be observed by the contractor. It shall be reckoned from the date of issue of written orders to commence work. The work shall throughout the stipulated period of the contract be proceeded with, with all due diligence (time being deemed to be the essence of the contract on the part of the Contractor). To ensure good progress during the execution of the work, the contractor shall be bound (in all cases in which the time allowed for any work exceeds one month) to comply with the time schedule according to the programme of execution of the work as agreed upon and enclosed to the contract. In the absence of specific agreed programme the contractor shall be bound to complete.

$\frac{1}{4}$ of the work in	$\frac{1}{4}$ of the time
$\frac{1}{2}$ of the work in	$\frac{1}{2}$ of the time
$\frac{3}{4}$ of the work in	$\frac{3}{4}$ of the time
Total completion	within Stipulated Tender period

Note: The quantity of the work to be done within a particular time to be specified above when the programme chart is not annexed, shall be fixed and inserted in the blank space kept for the purpose by the officer competent upto the level of Chief Engineer to accept the contract after taking into consideration the circumstances of each case, and the contractor shall aTendere by the programme of detailed progress laid down by that officer.

26. EXTENSION OF THE INTENDED COMPLETION DATE

- 26.1 The Employer shall extend the Intended Completion Date if a Compensation Event occurs or variation is issued which makes it impossible for Completion to be achieved

within the Intended Completion Date without the Contractor taking steps to accelerate the remaining work and which would cause the Contractor to incur additional cost.

- 26.2 The Employer shall decide whether and by how much to extend the Intended Completion Date within 21 days of the Contractor asking the Employer for a decision upon the effect of variation and submitting full supporting information. If the Contractor has failed to give early warning of delay or has failed to cooperate in dealing with the delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.

27. DELAY ORDERED BY THE EMPLOYER

- 27.1 The Employer may instruct the contractor to delay the start or progress of any activity within the Works, such instructions shall be in writing for reasons to be stated.

28. MANAGEMENT MEETING

- 28.1 The Employer may require the contractor to attend a management meeting. The business of a management meeting shall be to review the progress achieved and the plans for remaining works.
- 28.2 The responsibility of the parties for action to be taken is to be decided by the Employer either at the management meeting or after the management meeting and stated in writing to be distributed to all who attend the meeting.

C. QUALITY CONTROL

29. IDENTIFYING DEFECTS

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

30. TESTS

- 30.1 If the Employer instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no Defect, cost of such test will be borne by BTDA, the employer.

31. CORRECTION OF DEFECTS

- 31.1 The Employer shall give notice to the Contractor of any Defects before the end of the Defects Liability period, which begins at successful commissioning of entire system, which is defined in the Contract Data. The Defects liability Period shall be extended at no extra cost to the employer as long as Defects remain to be corrected.
- 31.2 Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the time specified in the Employer's notice.

32. UNCORRECTED DEFECTS

- 32.1 If the Contractor has not corrected a Defect within the time specified in the Employer's notice, the Employer will assess the cost of having the Defect corrected, and the Contractor will pay this amount. Employer's decision in this regard is final and binding on the Contractor

D. COST CONTROL

33. BILL OF QUANTITIES

- 33.1 The Bill of Quantities shall contain items for the construction, installation, testing and commissioning work to be done by the Contractor.
- 33.2 Deleted
- 33.3 The Bill of Quantities is used to make progressive payment for various items of supplies and works. The Contractor is paid progressively for the item of work done at the rate specified in the Bill of Quantities for the respective item.
- 33.4 Payment made as above, do not alter the Lump sum Contract price except as otherwise provided in the Contract.
- 33.5 The Price quoted by the Tenderer shall be for the Whole Works as well as for the 5 years O&M (including 2 year Defect Liability Period and the handback requirements as detailed in Section 11) as noted in the Schedule, Specifications and elsewhere in this Document and shall hold good till the Completion of Work. It shall be inclusive of all Taxes, etc except GST. The Rate shall also include the Cost of all Labours, Materials, Plant, Machinery, Equipments, Carriage, statutory clearances and other Inputs involved in the Execution and Completion of the Work in all respects to the agreed specifications and
- 33.6 standards with quality workmanship.

34. VARIATIONS

- 34.1 The Employer shall have power to order the Contractor to do any or all of the following as considered necessary or advisable during the progress of the work by him.
- (a) Increase or decrease of any item of work included in the contract
 - (b) Omit any item of work;
 - (c) Change the character or quality or kind of any item of work;
 - (d) Change the levels, lines, positions and dimensions of any part of the work;
 - (e) Execute additional items of work of any kind necessary for the completion of the works; Change in any specified sequence, methods or timing of construction of any part of the work;
 - (f) Change in any specified sequence, methods or timings of construction of any part of the work
 - (g) Any other item as desired by the Client
- 34.2 The contractor is bound to carryout the works in accordance with any instructions in this connection, which may be given to him in writing by the Employer and such alteration shall not vitiate or invalidate the contract.
- 34.3 Variation shall not be made by the contractor without any order in writing by the Employer, provided that no order in writing shall be required for increase or decrease in the quantity of an item appearing in the BoQ so long as the work executed conforms to the approved drawings
- 34.4 The contractor shall promptly request in writing the Employer to confirm verbal orders and if no such confirmation is received within 15 days of request, it shall be deemed to be an order in writing by the Employer.

35. PAYMENTS FOR VARIATIONS

- 35.1 Deleted
- 35.2 Deleted
- 35.3 Deleted
- 35.4 Deleted
- 35.5 Deleted

35.6 Deleted

35.7 deleted

36.SUBMISSION OF BILLS FOR PAYMENT

36.1 Deleted

36.2 Deleted

36.3 Deleted

36.4 The Employer shall check the Contractor's Bill and determine the Value of the Work executed with reference to the breakup of payment schedule (as in Clause 5 of ITT/approved milestone/ approved work schedule as in Clause 36.1 above).

36.5 Payments to the Contractor shall be made as per the percentages of running account payment as in Clause 1.5 (5) of ITT supported by the certification by Engineer-in-Charge. Refer clause 18 of special Conditions of contract.

36.6 The Stage Wise Payment shall be in accordance with the Provisions made under Clause 18 of SCC. The successful Tenderer shall submit the payment schedule along with work schedule and should get it approved from the Employer and it forms part and parcel of the Agreement.

36.7 Along with the bill Contractor shall submit the certified copy of electronic measurement book, abstract Measurement book, quality control report, achieved progress vis-à-vis mile stone events, duly signed by the Contractor and certified by the Client towards quality and measurements. This will also form record/documentation related to proof of execution of items/project as per proof checked and approved drawings.

37.PAYMENTS

37.1 Payments shall be adjusted for deductions for advance payments and other recoveries in terms of the contract and deduction at source of taxes as applicable under the law. The employer shall pay the contractor within 60 days of submission of bill, subject to availability of funds. The contractor shall be liable to pay liquidated damages for shortfall in progress. For progress beyond the agreed program payment is subject to availability of grants.

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

37.3 Payment will be made by the Employer as indicated in the Contract Data.

37.4 TERMS OF PAYMENT:

A. PROPORTIONS OF THE CONTRACT PRICE

For different stages of Design and Construction of Layout development and Infrastructure works shall be as specified below;

Weightage in Percentage to the Contract Price

Sl. No.	Weightage in percentage to the Contract Price	Items of Sub work	Percentage weightage of each item w.r.t. Contract Price	Remarks
1	Chain Link Fencing, Tree Plantation, RCC Signs & Sector Boards			
	0.19%	Construction of Chain Link Fencing for Parks & CA sites	0.11%	
		Tree Plantation in Main Roads & Parks/CA sites	0.02%	
		Construction of RCC Sign Boards	0.01%	
		Construction of Sector Boards	0.05%	
2	Road Works			
	23.14%	Construction of New Roads of 9 m ROW - Flexible Pavement	4.42%	
		Construction of New Roads of 12 m ROW - Flexible Pavement	4.88%	
		Construction of New Roads of 18 m ROW - Rigid Pavement	2.96%	
		Construction of New Roads of 25 m ROW - Rigid Pavement	1.84%	
		Construction of New Roads of NMT (Pathway cum Cycle Track)	1.82%	
		Construction of New Roads of (18+6) m ROW - Rigid Pavement	1.62%	
		Site Grading (For 1082 Acres)	1.80%	
		Re-Construction of existing 9m ROW Roads - Flexible	0.03%	
		Re-Construction of existing 12 m ROW Roads - Flexible	0.04%	
		Re-Construction of existing 24 m ROW Roads - White Topping	2.10%	
		Re-Construction of existing 25 m ROW Roads - White Topping	0.91%	
		Re-Construction of existing 30 m ROW Roads - White Topping	0.71%	
3	Storm Water			
	19.35%	Construction of RCC box drain for Storm Water Network	13.33%	
		Construction of Recharge Pits	0.03%	
		Construction of RCC Electrical utility trench	6.00%	
4	Water Supply			
	1.43%	Construction of water distribution system	1.01%	
		Construction of Water supply House Service connections	0.42%	
5	Sewerage Systems			
	10.70%	Construction of Wastewater collection System	2.67%	
		Construction of HOUSE SERVICE CONNECTION.	1.09%	

Sl. No.	Weightage in percentage to the Contract Price	Items of Sub work	Percentage weightage of each item w.r.t. Contract Price	Remarks
		Construction of Wet Well cum pumping stations including SPS-1 of 5.565 MLD Capacity	0.50%	
		Construction of Wet Well cum pumping stations including SPS-2 of 17.22 MLD Capacity	0.71%	
		Construction of Wet Well cum pumping stations including SPS-3 of 9.71 MLD Capacity	0.61%	
		Construction of Wet Well cum pumping stations including SPS-4 of 2.867 MLD Capacity	0.47%	
		Construction of Wet Well cum pumping stations including SPS-5 of 0.092 MLD Capacity	0.35%	
		Construction of Wet Well cum pumping stations including SPS-6 of 2.274 MLD Capacity	0.46%	
		Construction of Wet Well cum pumping stations including SPS-7 of 12.043 MLD Capacity	0.64%	
		Construction of wastewater Transmission system (pumping System).	3.20%	
6	Infrastructure Technology	for Information and Communication		
	2.17%	Construction of HDPE 7- Way 40mm Multi Ducts	1.49%	
		Construction of OFC Chamber	0.68%	
7	Reconstruction of Nalla & Bridges out side Unit-3 area			
	23.91%	Construction of Retaining wall for Nalla	23.09%	
		Construction of Culvert / Bridges Type-1	0.83%	
8	Electrical Works - Street Lighting			This is only for guidelines payment will be made as per the price breakup submitted by the agency after approval from the competent authority.
	4.74%	Procurement	2.13%	
		Errection & Laying	1.42%	
		Testing & commissioning	0.71%	
		Charging & Handing over	0.47%	
9	Electrical Works _ HESCOM			
	9.18%	Procurement	4.13%	
		Errection & Laying	2.75%	
		Testing & commissioning	1.38%	
		Charging & Handing over	0.92%	
10	Design & GFC Submission			
	0.19%	drawings, including submission of Good for construction (GFC) drawings	0.19%	

Sl. No.	Weightage in percentage to the Contract Price	Items of Sub work	Percentage weightage of each item w.r.t. Contract Price	Remarks
11	Operation & Maintenance (O&M) cost - 5 Years for other works			
	5.00%	For First Year – 0.25% of reserved 5% Amount towards O&M	0.25%	
		For Second Year – 0.50% of reserved 5% Amount towards O&M	0.50%	
		For Third Year – 0.75% of reserved 5% Amount towards O&M	0.75%	
		For Fourth Year – 1.25% of reserved 5% Amount towards O&M	1.25%	
		For Fifth Year – 2.25% of reserved 5% Amount towards O&M	2.25%	
	100.00%		100.00%	

PROCEDURE OF ESTIMATING THE VALUE OF WORK

a. Procedure for estimating the value of Chain Link Fencing, Tree Plantation, RCC Signs & Sector Boards

Procedure for estimating the value of Chain Link Fencing, Tree Plantation, RCC Signs & Sector Boards done shall be as follows;

Chain Link Fencing, Tree Plantation, RCC Signs & Sector Boards

Stage of Payment	Percentage weightage	Payment Procedure
Design and Construction of Chain Link Fencing for Parks & CA sites	0.11%	Unit of measurement is linear length. Payment of each stage shall be made on pro rata basis on completion of a stage in a length of not less than 10 (ten) percent of the total length. @
Tree Plantation in Main Roads & Parks/CA sites	0.02%	Unit of measurement is Nos. Payment shall be made on pro rata basis on completion of Nos of Tree plantation of not less than 10 (ten) percent of the total qty/nos.
Design and Construction of RCC Sign Boards	0.01%	Unit of measurement is Each. Payment shall be made on pro rata basis on completion of Boards of not less than 10 (ten) percent of the total qty.
Design and Construction of Sector Boards	0.05%	

@ For example, if the total length of Chain Link Fencing work to be done is L km, the cost per km of Chain Link Fencing shall be determined as follows;

Cost per km of Chain Link Fencing = P x weightage for Design and Construction of Chain Link Fencing for Parks & CA sites x (1/L)

$$= P \times 0.11 \% \times (1/L)$$

Where,

P= Contract Price

L = Total length of Chain Link Fencing work in km

b. Procedure for estimating the value of Road Works

Procedure for estimating the value of road work done shall be as follows;

Road Works

Stage of Payment	Percentage weightage	Payment Procedure
Design and Construction of New Roads of 9 m ROW	4.42%	Unit of measurement is linear length. Payment of each stage shall be made on pro rata basis on completion of a stage in a length of not less than 10 (ten) percent of the total length. @
Design and Construction of New Roads of 12 m ROW	4.88%	
Design and Construction of New Roads of 18 m ROW	2.96%	For Payment purpose, Each Item Amount shall be broadly splitted as below; (1) Earthwork up to top of the sub-grade - 15% (2) Granular work (sub-base) - 15% (3) Wet Mix Macadam (base) - 15% (4) Concrete work (PQC/PCC) and Bituminous works (DBM & BC) - 30% (5) Footpath/ Utility corrior, Kerbs, Interlocking Paver blocks - 15% (6) Road furnitures (Traffic Sign boards, Road/ lane markings, Table top crossings, entry/exit ramps, concrete bollards, kerbs, studs, bicycle stand hoops, seating benches and balance works) - 10%
Design and Construction of New Roads of 25 m ROW	1.84%	
Design and Construction of New Roads of NMT (Pathway cum Cycle Track)	1.82%	
Design and Construction of New Roads of (18+6) m ROW	1.62%	
Site Grading	1.80%	
Design & Re-Construction of existing 9m ROW Roads	0.03%	Unit of measurement is linear length. Payment of each stage shall be made on pro rata basis on completion of a stage in a length of not less than 10 (ten) percent of the total length. For Payment purpose, Each Item Amount shall be broadly splitted as below; (1) Earthwork up to top of the sub-grade - 15% (2) Granular work (sub-base) - 15% (3) Wet Mix Macadam (base) - 15% (4) Concrete work (PQC/PCC) and Bituminous works (DBM & BC) - 30% (5) Footpath/ Utility corridor, Kerbs, Interlocking Paver blocks - 15% (6) Road furnitures (Traffic Sign boards, Road/ lane markings, Table top crossings, entry/exit ramps, concrete bollards, kerbs, studs, bicycle stand hoops, seating benches and balance works) - 10%
Design & Re-Construction of existing 12 m ROW Roads	0.04%	
Design & Re-Construction of existing 24 m ROW Roads	2.10%	
Design & Re-Construction of existing 25 m ROW Roads	0.91%	
Design & Re-Construction of existing 30 m ROW Roads	0.71%	

@ For example, if the total length of New Roads of 9 m ROW to be done is L km, the

cost per km of New Roads of 9 m ROW shall be determined as follows;

$$\begin{aligned}\text{Cost per km of Road} &= P \times \text{weightage for New Roads of 9 m ROW} \times (1/L) \\ &= P \times 4.42 \% \times (1/L)\end{aligned}$$

Where,

P= Contract Price

L = Total length of New Roads of 9 m ROW - in km

If further split up of amount is required on activity wise, then following formula shall be used;

Example For **Earthwork up to top of the sub-grade**

$$\begin{aligned}\text{Cost of Earthwork up to top of the sub-grade per km of Road} &= P \times \text{weightage for New Roads of 9 m ROW} \times \text{Earthwork up to top of the sub-grade} \times (1/L) \\ &= P \times 4.63 \% \times 15 \% \times (1/L)\end{aligned}$$

Where,

P= Contract Price

L = Total length of New Roads of 9 m ROW in km

c. Procedure for estimating the value of Storm Water

Procedure for estimating the value of Storm Water works done shall be as follows;

Storm Water Works

Stage of Payment	Percentage weightage	Payment Procedure
Design and Construction of RCC box drain for Storm Water Network	13.33%	Unit of measurement is linear length in km. Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10 % (ten per cent) of the total length
Design and Construction of Recharge Pits	0.03%	Payment shall be made on pro rata basis for completed facilities
Design and construction of Primary Drains / canal / nala outside Unit-3 area including culverts / bridges	23.91%	Unit of measurement is linear length in km. Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10 % (ten per cent) of the total length
Design and Construction of RCC Electrical utility trench	6.00%	Unit of measurement is linear length in km. Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10 % (ten per cent) of the total length

@ For example, if the total length of RCC box drain in Zone 1 to be done is L km, the cost per km of RCC box drain shall be determined as follows;

$$\begin{aligned}\text{Cost per km of RCC box drain} &= P \times \text{weightage for RCC box drain} \times (1/L) \\ &= P \times 13.33 \% \times (1/L)\end{aligned}$$

Where,

P= Contract Price

L = Total length of RCC box drain in Package-1 in km

d. Procedure for estimating the value of Water Supply

Procedure for estimating the value of Water Supply works done shall be as follows;

Water Supply Works

Stage of Payment	Percentage weightage	Payment Procedure
Design and construction of water distribution system.	1.01%	Unit of measurement is linear length in km. Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10 % (ten per cent) of the total length
Design and construction of Water supply House Service connections	0.42%	Payment shall be made on pro rata basis for completed facilities

@ For example, if the total length of water distribution system to be done is L km, the cost per km of water distribution system shall be determined as follows;

Cost per km of water distribution system = P x weightage for water distribution system x (1/L)

= P x 1.06 % x (1/L) Where,

P= Contract Price

L = Total length of water distribution system in km

e. Procedure for estimating the value of Sewerage network works

Procedure for estimating the value of Sewerage network works done shall be as follows;

Sewerage Network

Stage of Payment	Percentage weightage	Payment Procedure
Design and Construction of Wastewater collection System	2.67%	Unit of measurement is linear length in km. Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10 % (ten per cent) of the total length
Design and Construction of HOUSE SERVICE CONNECTION.	1.09%	Payment shall be made on pro rata basis for completed facilities
Design and construction of Wet Well cum pumping stations including SPS-1 of 5.565 MLD Capacity	0.50%	Payment shall be made on pro rata basis for completed facilities
Design and construction of Wet Well cum pumping stations including SPS-2 of 17.22 MLD Capacity	0.71%	Payment shall be made on pro rata basis for completed facilities

Stage of Payment	Percentage weightage	Payment Procedure
Design and construction of Wet Well cum pumping stations including SPS-3 of 9.71 MLD Capacity	0.61%	Payment shall be made on pro rata basis for completed facilities
Design and construction of Wet Well cum pumping stations including SPS-4 of 2.867 MLD Capacity	0.47%	Payment shall be made on pro rata basis for completed facilities
Design and construction of Wet Well cum pumping stations including SPS-5 of 0.092 MLD Capacity	0.35%	Payment shall be made on pro rata basis for completed facilities
Design and construction of Wet Well cum pumping stations including SPS-6 of 2.274 MLD Capacity	0.46%	Payment shall be made on pro rata basis for completed facilities
Design and construction of Wet Well cum pumping stations including SPS-7 of 12.043 MLD Capacity	0.64%	Payment shall be made on pro rata basis for completed facilities
Design and Construction of wastewater Transmission system (pumping System).	3.20%	Unit of measurement is linear length in km. Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10 % (ten per cent) of the total length

@ For example, if the total length of Wastewater collection System to be done is L km, the cost per km of Wastewater collection System shall be determined as follows;

Cost per km of Wastewater collection System = P x weightage for Wastewater collection System x (1/L)

$$= P \times 2.67 \% \times (1/L)$$

Where,

P = Contract Price

L = Total length of Wastewater collection System in km

f. Procedure for estimating the value of ICT works

Procedure for estimating the value of Information and communication Technology (ICT) works done shall be as follows;

Information and Communication Technology Works

Stage of Payment	Percentage weightage	Payment Procedure
Design and Construction of HDPE 7- Way 40mm Multi Ducts pipe	1.49%	Unit of measurement is linear length in km. Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10 % (ten per cent) of the total length

Stage of Payment	Percentage weightage	Payment Procedure
Design and Construction of OFC Chamber	0.68%	Unit of measurement is Nos. Payment shall be made on pro rata basis on completion of Nos of OFC Chambers of not less than 10 (ten) percent of the total qty/nos.

@ For example, if the total length of HDPE 7- Way 40mm Multi Ducts pipe works to be done is L km, the cost per km of HDPE 7- Way 40mm Multi Ducts pipe works shall be determined as follows;

Cost per km of HDPE 7- Way 40mm Multi Ducts pipe = P x weightage for HDPE 7- Way 40mm Multi Ducts pipe x (1/L)

$$= P \times 1.49 \% \times (1/L)$$

Where,

P= Contract Price

L = Total length of HDPE 7- Way 40mm Multi Ducts pipe in km

g. Procedure for estimating the value of Electrical Works

Procedure for estimating the value of Electrical Works done shall be as follows;

Electrical Works – Street Lighting

Stage of Payment	Percentage weightage	Payment Procedure
Procurement	2.13%	Unit of measurement is Lumpsum. Payment of each stage shall be made on pro rata basis on completion of a stage as mentioned below; (1) On supply of Machinery / Equipment's on pro-rata basis against monthly running bills at Site - 45% (2) On completion of Erection Works - 30% (3) On completion of Testing and Commissioning of Equipment - 15% (4) On completion of Commissioning of the Plant and issuance of handing over Certificate - 10%
Erection & Laying	1.42%	
Testing & commissioning	0.71%	
Charging & Handing over	0.47%	

Electrical HESCOM Works

Stage of Payment	Percentage weightage	Payment Procedure
Procurement	4.13%	Unit of measurement is Lumpsum. Payment of each stage shall be made on pro rata basis on completion of a stage as mentioned below; (1) On supply of Machinery /
Erection & Laying	2.75%	

Stage of Payment	Percentage weightage	Payment Procedure
Testing & commissioning	1.38%	Equipment's on pro-rata basis against monthly running bills at Site - 45%
Charging & Handing over	0.92%	(2) On completion of Erection Works - 30% (3) On completion of Testing and Commissioning of Equipment - 15% (4) On completion of Commissioning of the Plant and issuance of handing over Certificate - 10%

h. Procedure for estimating the value of Design Works

Procedure for estimating the value of Survey, Investigation, Design and GFC Drawings works done shall be as follows;

Design Works

Stage of Payment	Percentage weightage	Percentage weightage of each item w.r.t. Contract Price
Data, Drawing & Analysis of Survey & Investigation	0.19%	0.02%
Design, GFC Drawings & Report of Road components		0.03%
Design, GFC Drawings & Report of Storm Water drainage, Primary Drains, and Recharge Pits, Bridges & Culverts		0.03%
Design, GFC Drawings & Report of Water supply Distribution Network, Transmission main Network, Ground Level Service Reservoir and Property Connection		0.02%
Design, GFC Drawings & Report of Sewerage Network including Pumping main, Sewerage Pump Stations and Property Connection		0.03%
Design, GFC Drawings & Report of Sewerage Treatment Plant		0.02%
Design, GFC Drawings & Report of Utility / Service Ducts for ICT optical fiber cable network		0.02%
Design, GFC Drawings & Report of power supply network, streetlight network, Utility Ducts for electrical cables		0.02%
Design, GFC Drawings & Report of miscellaneous works		0.01%

i. Procedure for payment during Operation and Maintenance of Civil & Infrastructure works excluding:

The Amount quoted by the Contractor will be inclusive of Operation & Maintenance cost for 5 years for Civil works. An amount equivalent to 5% of the quoted amount will be reserved for Operation & Maintenance period and will be released year wise as follows:

Sl. No.	Year
1.	For First Year – 0.25% of reserved 5% Amount towards O&M
2.	For Second Year – 0.50% of reserved 5% Amount towards O&M
3.	For Third Year – 0.75% of reserved 5% Amount towards O&M
4.	For Fourth Year – 1.25% of reserved 5% Amount towards O&M
5.	For Fifth Year – 2.25% of reserved 5% Amount towards O&M

B. GUARANTEE / WARRANTY:

The Contractor shall warrant that all the equipments and works executed in accordance with the contract are free from defects in materials and workmanship for a period of O&M after satisfactory commissioning of entire system, and issue of completion certificate. The completion certificate will be issued only after successful completion of O&M period. The contractor shall submit warranty / guarantee certificates in respect of all equipments installations before requesting for issue of completion certificate.

Contractor shall undertake to replace any defective parts in the equipment at his own cost under normal operation and arising solely from faulty, design, material and / or workmanship during guarantee/ warranty period.

38. Compensation event

38.1 The following are the Compensation Events for Time Extension only unless they are caused by the Contractor. In any case, these Compensation Events shall not entitle the Contractor to claim financially whatsoever.

- a. The Employer does not give Access to a Part of the Site as per the mutually agreed Construction Schedule between the Employer and the Contractor.
- b. The Employer orders a Delay or does not approve Drawings, Specifications or Instructions Required for Execution of Works on time.
- c. The Employer instructs the Contractor to uncover or to carry out Additional Tests upon work which is then found to have no Defects.
- d. The Employer gives an Instruction for dealing with an Unforeseen Condition, caused by the Employer, or Additional Work required for Safety or other Reasons.
- e. The Effect on the Contractor of any of the Employer's Risks.
- f. The Employer unreasonably delays issuing a Certificate of Completion / Scheduled Payment.
- g. Other Compensation Events listed in the Contract Data or mentioned in the Contract.

38.2 Deleted

38.3 Deleted

38.4 The Contractor shall not be entitled to Compensation to the Extent that the Employer's Interests are adversely affected by the Contractor not having given Early Warning or not having cooperated with the Employer.

38.5 If a Compensation Event would prevent the Work being completed before the Intended Completion Date, the Intended Completion Date may be extended. The

Employer shall decide whether and by how much the Intended Completion Date shall be extended.

39. TAX

- 39.1 The rates quoted by the Contractor shall be exclusive of GST and includes all other taxes and duties as applicable. The Employer will perform such duties in regard to the deduction of such taxes at source as per applicable law.
- 39.2 The bills should be raised in the form of tax invoices under the GST Act and Rules. GST and TDS at the applicable rates at the time of payments will be made from the running / final bills of the contract.
- 39.3 Labour Cess of 1% or as modified by Govt from time to time will be recovered in the contract value as per the provisions of the building and other Construction Workers Welfare Cess Act 1996 and relevant Government notification. The employer will retain 1 % of such amounts towards administration charges and the balance amount will be remitted to the department

40. Price Adjustment:

40.1 Contract price shall be adjusted for increase or decrease in rates and prices of labour, materials, fuels and lubricants in accordance with the latest Government orders (given as Annexure-D-1) and any further order prevailing at the time of the execution as per the following principles and procedures and formula given hereunder.

- a. The price Adjustment shall apply for the work done from the date of commencement upto the end of original period of completion or extensions granted by the Employer and shall not apply to work carried out beyond the stipulated period of completion for reasons attributable to the contractor.
- b. Deleted
- c. The price adjustment shall be determined during each quarter from the formula given hereunder.
- d. Following expressions and meanings are assigned to the work done during the quarter:
 $R = \text{Total value of work done during the quarter. It would include the amount of secured advance for materials paid for (if any) during the quarter, less the amount of the secured advance recovered during the quarter. It will exclude value for works executed under variations for which price adjustment (if any) will be worked out separately based on the terms mutually agreed.}$

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

41. LIQUIDATED DAMAGES

- 41.1 The Contractor shall pay liquidated damages to the Employer as stated in the Contract Data, for every days delay, if the Completion Date is later than the Intended Completion Date (for the balance portion of the works for individual milestone as stated in the contract data). The total amount of liquidated damages shall not exceed the amount defined in the Contract Data. The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages does not affect the Contractor's liabilities.

41.2 If the Intended Completion Date is extended after liquidated damages have been paid, the Employer shall correct any over payment of liquidated damages by the Contractor by adjusting the next payment certificate.

42. Advance Payment:

- 42.1 Deleted
- 42.2 Deleted
- 42.3 Deleted
- 42.4 Deleted
- 42.5 Deleted

43. SECURITIES

43.1 The Security deposit (including additional security for unbalanced tenders) shall be provided to the Employer not later than the date specified in the Letter of Acceptance and shall be issued in the amount in the form of SMFS Bank Guarantee by a bank acceptable to the Employer.

44. COST OF REPAIRS

44.1 Loss or damage to the works or Materials to be incorporated in the Works between the Start Date and the end of the Defects correction periods shall be remedied by the Contractor at the Contractor's cost, if the loss or damage arises from the Contractor's act or omissions.

E. FINISHING THE CONTRACT

45. COMPLETION

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

46. TAKING OVER

46.1 The Employer shall take over the site and the Works within 7 days of the Employer issuing a Certificate of Completion.

47. FINAL ACCOUNT

47.1 The Contractor shall submit to the Employer a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Employer shall issue a Defect liability Certificate and certify any final payment that is due to the Contractor within 90 days on receiving the Contractor's account if it is correct and complete. If it is not, the Engineer shall issue within 90 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Employer shall decide the amount payable to the Contractor and issue a payment, within 60 days of receiving the Contractor's revised account.

48. 'AS BUILT' DRAWINGS / O & M MANUALS

48.1 If "As Built" drawings and / or O & M Manuals are required, the Contractor shall supply them before final payment is released.

48.2 If the Contractor does not supply the Drawings and / or manuals by the dates stated in the Contract Data or they do not receive the Employers approval, the Engineer shall with hold the amount as stated in Contract Data from payments due to the Contractor.

49. Termination

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

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

- a) The Contractor stops work for 45 days when no stoppage of work is shown on the current program and the stoppage has not been authorized by the Employer
- b) deleted
- c) The contractor becomes bankrupt or goes into liquidation other than for a reconstruction or amalgamation.
- d) deleted
- e) The employer gives notice that failure to correct a particular defect is a fundamental breach of contract and the contractor fails to correct it within a reasonable time determined by the Employer
- f) The contractor doesnot maintain a security which is required
- g) The contractor has delayed the completion of works by number of days for which the maximum amount of liquidated damages can be paid as defined in the contract data and
- h) If the contractor, in the judgement of the Employer has engaged in corrupt or fraudulent practices in competing for or in the execting the contract

For the purpose of this paragraph: "corrupt practice" means the offering, giving, receiving or soliciting of any thing of value to influence the action of a public official in the procurement process or in contract execution. "Fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Borrower and includes collusive practice among Tenderers (prior to or after Tender submission) designed to establish Tender prices at artificial non-competitive levels and to deprive the Borrower of the benefits of free and open competition."

49.3 When either party to the Contract gives notice of a breach of contract to the Employer for a cause other than those listed under Sub Clause 49.2 above, the Employer shall decide whether the breach is fundamental or not

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

49.5 If the Contract is terminated the Contractor shall stop work immediately, make the Site safe and secure and leave the Site as soon as reasonably possible

50. PAYMENT UPON TERMINATION

50.1 If the Contract is terminated because of fundamental breach of Contract by the Contractor, the Employer shall issue a certificate for the value of the work done less advance payments received up to the date of issue of the certificate and other recoveries due in terms of the contract, less taxes due to be deducted at source as per applicable law and less the percentage to apply to the work not completed as indicated in the Contract Data. Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor after considering the liquidated damages as per Para 40.1. The difference shall be a debt payable to the Employer.

50.2 If the Contract is terminated at the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Employer shall issue a certificate for the value of the work done, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the works and the Contractor's costs of protecting and securing the Works and less advance payment received up to the date of

the certificate, less other recoveries due in terms of the contract and less taxes due to be deducted at source as per applicable law and make payment accordingly.

51. PROPERTY

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

52. RELEASE FROM PERFORMANCE

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

F. SPECIAL CONDITIONS OF CONTRACT

PART - 1

The following Special Conditions of Contract shall be read in conjunction with the Conditions of Contract and Instructions to Tenderers as an Extension and not in Limitation of the Obligations of the Contract. In case of Discrepancy between these Special Conditions of Contract and the Conditions of Contract, the decision of the Employer shall be final and binding on the contractor.

- The Eligible Tenderer shall submit his Tender for the Work on Turnkey Basis. In this connection, the "Scope of Work" specified may be referred.
- The Contractor is not to vary or deviate from the Drawings, Specifications, Stipulation, Conditions of Contract or Instructions to execute any work of any kind whatsoever unless so authorized by the Employer in writing.
- **Setting out:** The Contractor is to set out the whole of the Work (based on the proof checked drawings submitted by the contractor and approved by the client) in conjunction with the Employer and during the Progress of the Works to amend on the requisition of the Employer any errors, which may arise therein and provide all the necessary Labour, Materials and Equipments for doing so. The Contractor is to provide all Tools, Plant, Machinery, Labour, and Materials, which may be necessary and required for the Work. All Materials and Workmanship shall conform to the Relevant Specifications mentioned in the Tender Documents. This task is incidental, and no payment will be made towards the same.

1. LABOUR

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

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

2. COMPLIANCE WITH LABOUR REGULATIONS

During continuance of the contract, the Contractor and his sub contractors shall at all times by all existing labour enactment's and rules made there under, regulations, notifications and by laws of the State or Central Government or local authority and any other labour law (including rules), regulations by laws that may be passed or notification that may be issued under any labour law in future either by the State or Central Government or the local authority. The Contractor shall keep the Employer indemnified in case any action is taken against the Employer by the competent authority on account of contravention of any of the provisions of any Act or rules made there under, regulations or notifications including amendments, including by the sub contractor if any. If the Employer is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications / by laws / Acts / Rules / regulations including amendments, if any, of the part of the Contractor or sub contractor if any, the Engineer / Employer shall have the right to deduct any money due to the Contractor including his

amount of performance security. The Employer / Engineer shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Employer in this context.

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

3. PROTECTION OF ENVIRONMENT

The contractor shall take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation. During continuance of the contract, the contractor and his sub-contractors shall at all times be bound by all existing enactments on environmental protection and rules made there under, regulations, notifications and bye-laws of the State or Central Government, or local authorities and any other law, bye-law, regulations that may be passed or notification that may be issued in this respect in future by the State or Central Government or the local authority.

4. Procedure for Dispute Resolution (Clause 24) –

(i) If any dispute or difference of any kind whatsoever were to arise between the Executive Engineer/ Superintending Engineer and the Contractor regarding the following matters namely.

- a. The meaning of the specifications, designs, drawings and instructions herein before mentioned.
- b. The quality of workmanship or materials used on the work and
- c. Any other questions, claim, right, matter, thing, whatsoever, in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, or orders, or those conditions or failure to execute the same whether arising during the progress of the work, or after the completion, termination or abandonment, thereof, the dispute shall, in the first place, be referred to the Chief Engineer who has jurisdiction over the work specified in the contract. The Chief Engineer shall, within a period of sixty days from the date of being requested by the Contractor to do so, give written notice of his decision to the Contractor. If the Contractor is aggrieved by the decision of the Chief Engineer, or if the Chief Engineer fails to give written notice of his decision within above said period of sixty days, the contractor may appeal to the Managing Director, KBJNL, within 60 days from the receipt of written notice of Chief Engineer's decision or from the expiry of first named period of 60 days.

(ii) Subject to the Managing Director's decision on the appeal and subject to other forms settlement hereafter provided, the Chief Engineer's decision in respect of every dispute, difference so referred shall be final and binding upon the contractor. The said decision shall forthwith be given effect to and contractor shall proceed with the execution of the work with all due diligence.

Remedy when Managing Director's decision on appeal is not acceptable to contractor

- (iii) In case the decision of the Managing Director is not acceptable to the contractor, he may approach the Law Courts at Bagalkote for settlement of disputes after giving the written notice in this regard to the Managing Director within a period of ninety days from the date of receipt of the written notice of the decision of the Managing Director.

Time limit for notice to approach law court by contractor

- (iv) The Managing Director has given written notice to the contractor of his decision on appeal and no written notice to approach the law court has been communicated to him. The contractor within a period of ninety days from the receipt of such notice, the said decision shall be final and binding upon the contractor.

Time limit for notice to approach law court by contractor when decision is not given by Managing Director.

- (v) If the Managing Director fails to give notice of his decision within a period of ninety days from the receipt of the contractor's appeal, the Contractor may within ninety days after the expiry of the above named period of ninety days approach the Law Courts-at Bagalkote giving due notice to the Managing Director.
- (vi) Whether the claim is referred to the Chief Engineer or Managing Director or to the Law of Courts, as the case may be, the contractor shall proceed to execute and complete the works with all due diligence pending settlement of the said dispute of differences.

Obligations of the Executive Engineer and Contractor shall remain unaltered during considerations of dispute.

- (vii) The reference of any dispute or difference to the Chief Engineer or Managing Director or the Law Court may proceed notwithstanding that the works shall then be or be alleged to be complete., provided always that the obligations of the Executive Engineer and the contractor shall not be altered by reason of the said dispute or difference being referred to the Chief Engineer or Managing Director or the Law Court during the progress of the works.
- (viii) It is clearly understood and agreed upon by both the parties that no part of the above clause shall be construed to be an Arbitration Clause under the Arbitration and Conciliation Act 1996 or any other Act. In the event of any dispute or difference arising between the parties to his contract; upon exhausting the remedies available under above clauses; the only final remedy available shall be approached the jurisdictional Civil Court agreed to under clause of this contract by filing a suit in accordance with law.

5. POSSESSION OF THE SITE

The Employer shall give the possession of the Site to the Contractor based on the mutually agreed Construction Schedule between the Employer and the Contractor. If

Possession of a part of the site is not given as per the mutually agreed Schedule then the Employer will assess the Probable Delay that may arise due to non availability of that particular part of Site to the Contractor

6. SITE VISIT:

The tenderer shall solely rely on his own survey, investigation and reports including design, quantities and cost for the purpose of Tender. The information provided in the tender documents and reports are for only for reference and no claim and correspondence from the Contractor is entertained in this regard at all stages of the contract.

The Tenderer shall, prior to submitting the Tender for the work, examine the Drawings, Conditions of Contract and Specifications of Work. He shall visit the Site and ascertain and satisfy himself regarding actual Climate and Physical Conditions of the Site, Nature, Extent and Practicability of Work, Means of Communication and access to Site, Availability of Materials, the extent of Leads and Lifts involved in the Work over the entire Duration of the Contract including Local Conditions, Probable Site for Labour Camps, Stores, Godowns, Casting Yard, Traffic Diversion, etc. The Tenderer's Offer shall take into Consideration all such Factors. The Tenderer shall himself obtain all necessary Information at his Risk, Contingencies and other Circumstances, which may affect or influence his Tender. No Extra Charges consequent of any Misunderstanding or otherwise shall be allowed. The expression 'Site' as stated above shall include the Construction Site including all Components described in the Scope of Work.

7. Progress of Work

The Contractor shall give the Employer on the 4th Day of each Month a Progress Report of the Work done during the Previous Month.

The Progress of Work will be reviewed periodically by the Employer with the Contractor and Shortfalls, if any sorted out, the Contractor shall thereupon take such Action as may be necessary to bring back his Work to Schedule without any Additional Cost to the Employer by employing Overtime Operations, increasing the Number of Shifts, Capacity of the Equipment or otherwise as directed by the Employer and nothing shall be paid extra.

8. DRAWINGS TO BE KEPT AT SITE

The Required Sets of the Proof checked Drawings as approved by the Employer shall be kept by the Contractor at the Site and the same shall at all reasonable time be available for Inspection and Use by the Employer and his approved Representative and any other person authorized by the Employer in writing.

9. INSPECTION OF WORKS

In addition to the Provisions of Relevant Clauses of the Contract, the Work shall also be open to Inspection by the Employer and his approved Representative. The Contractor shall at all times during the Usual Working Hours and at all times at which Reasonable Notices of the Intention of the Employer or his approved Representative as stated above to visit the Works shall have been given to the Contractor, either himself be present to receive the Orders and Instructions or have a responsible Site Engineer duly accredited in writing, to be present for that Purpose.

10. NIGHT WORK

For Completing the Work well within the Intended Completion Period, the Contractor might be required to work in two or more Shifts (including Night Work) and no Claim whatsoever shall be entertained on this account, notwithstanding, the Fact that the Contractor will have to pay to the Labours and other Staff engaged directly or indirectly on the Work according to the Provisions of the Labour Regulations and the Agreement entered into and for Extra Amounts towards any other Reason. None of the Permanent Works shall be carried out during Night or on Authorized Public Holidays without the permission in writing of the Employer except when Work is unavoidable or absolutely necessary for the Safety of Life, Property or Work in which case the Contractor shall immediately advise the Employer accordingly, provided that the Provisions of this Condition shall not be Applicable in the case of any Work which is customary to carry out by Rotation or in Double Shift.

11. CONTRACTOR'S RESPONSIBILITY

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

12. CONSTRUCTION WATER

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

13. CONSTRUCTION POWER

The contractor shall make his own arrangement for supply of electrical energy required at his sites and the works from HESCOM.

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

14. SURVEY

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

The Contractor shall for the purpose of checking the survey and setting out, provide to the Engineer all the assistance, which he may require. The surveyor shall be selected having appropriate experience and as far as possible, the same surveyor shall be provided throughout the contract period. Before commencing any work at any locations, the Contractor shall give the Engineer not less than 24 hours notice of his intention to

set out or give levels for any part of the work in order that arrangements may be made for inspection. The contractor shall provide for the sole use of the Engineer and his staff all necessary survey instruments and other equipment and all technicians, labour and attendants which the Engineer may require for checking the setting out and marking of the works. The contractor shall maintain in good working order at all time during the period of contract the instruments provided by him, for proper setting out of the works.

The contractor shall make available at his own expense, any poles, staging templates etc.

15. TEMPORARY FENCING

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

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

16. RETURN OF LABOUR AND PLANT

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

17. SANITARY FACILITIES

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

18. RESTRICTED ENTRY TO SITE

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

19. EXISTING SERVICES

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

20. LOCAL ROADS AND HAUL ROADS

- a) The approach roads and other public roads in the state may be used by the contractor to haul construction materials and equipment subject to restriction of load carrying capacity of the roads in particular over bridges and culverts. However, the contractor will have to pay customary vehicles license and permit fees for use of public roads.
- b) The contractor shall plan transportation of construction materials to site in such a way that road accidents are avoided.

21. PERMISSION FOR ROAD CUTS

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

22. TEMPORARY DIVERSION OF ROADS

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

23. NOTICE TO TELEPHONE, RAILWAYS AND ELECTRICITY SUPPLY UNDERTAKING

Before commencing operations, the Contractor has to obtain specific permission from local bodies / Highways Department when he wants to cut any section of the road. Where operations involve cutting of roads, shifting utilities etc, during the process of work, the Contractor shall also give notice to the concerned authorities viz., The Panchayats / the Municipalities, the Railways Department, the Electricity Board, Telegraphs Department, the Traffic Department attached to the police and other departments or companies as may be affected by the work. The notice should identify the specific details so that the necessary diversion of traffic may be arranged and permissions obtained. The Contractor shall co-operate with the department concerned and provide for necessary barricading of roads, protection to existing underground cables etc, met during the excavation of trenches. The Contractor shall provide at his own expenses watching and lighting arrangements during day and night and put the required notice board such as "Caution Road Closed for Traffic" etc., He should also provide and maintain at his own cost the necessary supports for underground cables etc. to afford best protection to them in consultation with the authorities in-charge of the properties and to their best satisfaction.

24. BARRICADING

The pit/trench shall be barricaded on all four sides. The contractor who has dug up the trench shall be responsible for any mishap, which may occur.

25. WATCHING AND LIGHTING

The contractor shall at his expense provide at the site of work sufficient lighting and watching and fencing by night and by day and shall in every aspect conform to the police regulations in these matters and he shall free and relieve the BTDA. Should he

neglect to do so, the same shall be provided by the Engineer and the cost thereof will be recovered from the Contractor.

26. FREE FLOW OF TRAFFIC

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

27. TOOLS AND PLANTS

All tools and plants required for the work including sheet piles and timber for shoring and strutting, pump sets etc. shall be supplied by the contractor at his own cost. The rates of the relevant item of works are inclusive of all such tools and plants and apparatus required for the execution of the work. If however, there is any difficulty in procurement of the above tools and plants by the contractor, the Employer may make available such tools and plants which are available, in which case, necessary hire charges will be recovered from the contractor as per the BTDA/KBJNL's rules in force. But it should be clearly understood that any assistance to be rendered by the Employer is not obligatory and not to be taken for granted. Non-supply and/or delayed supply of such tools and plant materials cannot be cited as reasons for any slow progress by the Contractor.

28. EXCESS MATERIALS

The Contractor shall be responsible for the procurement of required quantity of materials for roads, pipes for water supply, Waste water collection, special machinery, electrical items etc. Any materials procured for the work even though as per Bill of Quantities, if found excess due to any reasons after completion of the works, shall be taken back by the Contractor and the Employer/Engineer shall not be responsible for such excess materials. Amount paid if any for such excess materials shall be deducted from any bills payable to the Contractor.

29. GENERAL

Before submitting the Tenders, the Tenderer should carefully go through all the Tender documents and in particular the Tender schedule and the drawings, also inspect the place of work so as to get full and first knowledge of the site conditions based on which he has to quote his rates.

30. ACCIDENTS

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

31. FLOOD DAMAGES ETC.

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

32. WATER AND LIGHTING

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

33. RATES

The contractor shall particularly note that the lumpsum amount quoted shall be inclusive of all incidental charges such as bailing by manual labour, dewatering, shoring etc., if found necessary during the execution and no extra shall be due therefore on any account during the currency of the contract.

34. ROYALTY CHARGES

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

35. PAYMENT TO LABORERS

The Contractor should note that in the event of specific emergency to be formally declared by the Engineer, he shall pay his laborers every day and if this is not done, KBJNL may make requisite payment and recover the cost from the Contractor. The Contractor shall not employ any laborer below age of 15 years.

36. NIGHT WORKS

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

37. ERRORS, OMISSIONS AND DISCREPANCIES

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

- a) In case of discrepancies in dimensions of any item of work as described between the descriptive specifications and detailed working drawings, the dimensions given in the detailed working drawings shall apply.
- b) In case of discrepancies in description of scope of work between what is indicated in the item of work given in Bill of Quantities and the corresponding detailed technical specifications, the latter shall apply.
- c) Figured dimensions shall supersede scaled dimensions. The drawings on a large scale shall take precedence over those on a smaller scale.

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

38. EQUIVALENCE OF STANDARDS AND CODES

Whenever reference is made in the contract to the respective Standards and Codes in accordance with which plant, equipment or materials are to be furnished and work is to be performed or tested, the provisions of the latest current edition or revision of the relevant Standards and Codes in effect shall apply, unless otherwise expressly set forth in the Contract. Where such Standards and Codes are national in character, or relate to a particular country or region, other authoritative standards which ensure equal or higher quality than the Standards and Codes specified, will be accepted subject to the prior review and written approval by the Engineer. Difference between the standards specified and the proposed authoritative standards must be fully described in writing by the Contractor and submitted to the Engineer well in advance for approval. If on the prior review, the Engineer determines that such proposed deviations do not ensure equal or higher quality, the Contractor shall comply with the Standards set forth in the Contract Document.

39. TENDERER TO INFORM HIMSELF

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

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

40. EMPLOYMENT OF SCARCITY LABOUR

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

- A. All laborers and other employees of the Contractor should be covered by a suitable Accident Insurance Policy to cover liabilities under the Workmen's Compensation Act.

B. **ELECTRICITY TARIFF**

The unit rates and prices quoted by the Tenderer in the Bill of Quantities shall include the cost of electric energy required for construction at the rates fixed by the KPTCL/ HESCOM.

41. Third Party Inspection

- a. The successful Operation and maintenance in a year will be certified by third party to be appointed by BTDA. Third party consultant/ inspector will be appointed before completion of contract of project. The expenditure on third party will be shared between the Employer and the agency equally.

- b. Successful operation and maintenance of entire system means, the Tenderer should carry out the complete Infrastructure maintenance constructed by him for the entire 405 acres along with SPS including the external infrastructure developed by him. The O&M charges will be released in each year after successful completion of O&M as per scope of work.

42. Additional Clause;

- a. In the case of the death of a contractor after executing the agreement / commencement of the work, his legal heir, if an eligible registered contractor and willing, can execute and complete the work at the accepted tender rates irrespective of the cost of the work. The decision of the client to accept/reject this proposal/consideration is final and binding.
- b. In case of death of lowest quoted tenderer before executing the agreement the tender will be rejected and the tender will be re-invited.

PART - 2

1. SAFETY PROVISION

- 1.1 Suitable scaffolds shall be provided for workers for all that cannot safely be done from the ground or from solid construction, except such short period work, as can be done safely from ladder. When a ladder is used, an extra mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well suitable footholds and handholds shall be provided on the ladder and the ladder shall be given an inclination no steeper than 1/4 to 1(1/4 horizontal to 1 vertical). Site codes for scaffolding and ladders 1.23696-19196 part - I and part - II and latest revisions to be followed.
- 1.2 Scaffolding or staging more than 3.25 meters above the ground or floor swing or suspended from an overhead support or erection with stationary support, shall have guard rail properly attached bolted, braced and otherwise secured at least 1 metre high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or the structure.
- 1.3 Working platform, gangways and stairways shall be so constructed that they do not sag unduly or unequally, and if height of a platform or gangways or stairways is more than 3.25 meters above ground level, it shall be closely boarded, have adequate width and be suitably fenced, as described in 2 above. Every opening in floor of a building or in a working platform shall be provided with suitable means to prevent fall of persons or materials by providing suitable fencing or railing with a minimum height of 1 meter. Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be 7 meters in length, width between side rails in a rung ladder shall in no case be less than 30 cm, for ladder, this width shall be increased by atleast 6 mm for each additional 30 cm length. Uniform steps spacing shall not exceed 30 cm.
- 1.4 Adequate precautions shall be taken to prevent danger from electrical equipment. No material on any of the sites shall be so stocked or placed as to cause danger or inconvenience to any person or to the public. The contractor shall provide all necessary fencing and lights to protect public from accidents and shall be bound to bear expenses of defense of every suit, action or proceedings at law that may be brought by any person for injury sustaining, owing to neglect of the above precautions and to any such suit, action or proceedings to any such person or which may with the consent of the contractor be paid to compromise any claim by any such person.
- 1.5 All necessary personal safety equipment as considered adequate by the Engineer shall be available for use of persons employed on the site and maintained in a condition suitable for immediate use and the contractor shall take adequate steps to ensure proper use of equipment by those concerned.
- 1.6 Workers employed on mixing asphaltic materials, cement and lime mortars/concrete shall be provided with protective footwear, hand gloves and goggles.
- 1.7 Those engaged in handling any materials, which is injurious to eyes, shall be provided with protective goggles.

- 1.8 Stone breakers shall be provided with protective goggles and protective clothing.
- 1.9 The contractor shall not employ men below the age of 15 and women on the work of painting with products containing lead in any form. Whenever men above the age of 18 are employed on the work of lead painting the following precautions shall be taken.
- a. No paint containing lead or lead products shall be used except in the form of paste or readymade paint.
 - b. Suitable facemasks shall be supplied for use by workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scraped.
 - c. Overalls shall be supplied by the contractor to workmen and adequate facilities shall be provided to enable working painters to wash during and on cessation of works.
- 1.10 When the work is done near any place there is risk of drowning, all necessary equipment shall be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provisions made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.
- 1.11 Use of hoisting machines and tackles including their attachments, anchorage and supports shall conform to the following:
- d. shall be of good mechanical construction, sound material and adequate strength and free from patent defects and shall be kept in good repair and in good working order.
 - e. Every rope used in hoisting or lowering material or as a means of suspension shall be durable quality and adequate strength, and free from patent defects.
 - f. Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years shall be in-charge of an hoisting machine, including any scaffold winch or give signals to Operator.
 - g. In case of every hoisting machine and of every chain ring hook, shackle, swivel and pulley block used in hoisting machine or lowering or as means of suspension safe working load shall be ascertained by adequate means.
 - h. Every hoisting machine and all gear referred to above shall be plainly marked with safe working load. In case of hoisting machine having a variable safe working load and the conditions under which it is applicable shall be clearly indicated. No part of any machine or of any gear referred to above in the paragraph shall be loaded beyond safe working load except for the purpose of testing.
 - i. As regards contractor's machine, the contractor shall notify safe working load of each machine to the Engineer. Whenever he brings to the site of work and gets it verified by the Engineer.
- 1.12 Motors, gearing, transmission, electrical wiring and other dangerous parts or hoisting appliance shall be provided with such means as will reduce to the minimum risk and accidental descend of load: adequate precautions shall be taken to reduce the minimum risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations which are already energized, insulating mats, wearing apparel such as gloves, sleeves and boots, as may be

necessary shall be provided. Workers shall not wear any rings, watches and carry keys or other materials, which are good conductors of electricity.

- 1.13 All scaffolds' ladders and other safety devices mentioned or described here in shall be maintained in a safe condition and no scaffold ladder or equipment shall be altered or removed, while it is in use. Adequate washing facilities shall be provided at or near place of work.
- 1.14 The safety provision shall be brought to the notice of all concerned by displaying on a notice board at a prominent place at the work spot, persons responsible for ensuring compliance with the safety provision shall be named therein by the contractor. A safety Engineer employed by the contractor shall look after all safety factors during the execution of works.
- 1.15 To ensure effective enforcement of the rules and regulations relating to safety precautions, arrangements made by the contractor shall be open to inspection by the Engineer or his representative and the Inspecting Officer.
- 1.16 The Contractor shall obtain previous permission of the competent authority such as Chief of Fire services for the site, manner and method of storing explosives near the site of work. All handling of explosives including storage, transport shall be carried out under the rules approved by the "Explosive Department of the Government".
- 1.17 The Contractor shall at his own cost provide and maintain at the sites of works, standard first aid box as directed and approved by the Engineer for the use of his own as well as the Employer's staff on site.
- 1.18 Notwithstanding the above provision 1 to 13 contractor is not exempted from the operation of any other Act or rules in force relating to safety provisions.
- 1.19 A vehicle shall be specially reserved at work spot to take any ill / injured persons to medical aid facilities.
- 1.20 The contractor shall provide two separate SUV vehicle for the use of Departmental Engineers in charge of works for supervision and for coordinating with other line departments.
- 1.21 The contractor shall provide a well furnished, site office of 1200 Sqft for Departmental Engineers and PMC / Third party Inspection Engineers each with all facilities (Chair, computer, printer, Telephone, plotter with internet facilities) along with basic needs such as water, Power and Air condition facilities as per the Engineer In Charge.
- 1.22 The Tenderer should maintain the electrical safety clearance for various voltage class lines in the proposed layout during execution of the work as per Central Electricity Authority (CEA)/ Indian Electricity (IE) Rules.

2. SITE CLEARANCE

The site clearance shall be done with minimum damage or existing structures, flora and fauna, electricity and telephone lines and other infrastructures service.

3. EARTH WORK AND EXCAVATION

The Contractor shall inform the local authorities/government if any fossils, coins, artifacts of value or antiquity, structures and other remains of geological or

archaeological interests and excavation shall be stopped until identification of cultural relics by the authorized institution is completed.

The Contractor shall dispose off surplus/waste material at identified sites approved by the Engineer. The Contractor shall ensure that there is minimum hindrance to normal activities and business. The Contractor shall avoid damage to permanent structures and shall avoid loss of standing crops along the road.

4. REPLANTATION

The Contractor shall carry out Re-plantation on areas/on the periphery of construction sites to minimize visual impact and soil erosion. The Contractor shall pay special attention to the type of trees to be replanted to prevent fouling of water through falling leaves and bird droppings. A list showing the types of trees to be planted will be got approved before replanting and trees.

5. SOIL EROSION AND WATER QUALITY

The Contractor shall ensure that earth and stone do not silt up existing irrigation/drainage systems. The Contractor shall take suitable measures to prevent direct discharge of polluted waters from construction activity into lakes/rivers/irrigation channels.

The Contractor shall minimize exposure of soil types susceptible to wind and water erosion.

The Contractor shall control run-off and erosion through proper drainage channels and structures.

6. SOIL COMPACTION

The Contractor shall restrict traffic movement and use low ground pressure machines. The contractor shall preserve topsoil to be replaced after completion of construction activity. The Contractor shall avoid wet soils.

7. SOCIAL DISRUPTION

The Contractor shall minimize interruptions to utility services through proper planning and scheduling of activities. The contractor shall provide temporary roads and diversions as may be necessary for smooth flow of traffic. The Contractor shall preferably use local labour/skilled persons during construction.

8. DUST/AIR POLLUTION

The Contractor shall provide effective dust control through sprinkling/washing of construction sites and access roads. The Contractor shall cover/water steeples and storage areas to prevent dust pollution.

The Contractor shall cover trucks transporting construction materials to minimize spills. The Contractor shall have a preventive maintenance programme for construction equipment and vehicle to meet emission standards.

9. NOISE POLLUTION

The Contractor shall normally undertake construction work during daytime only (between 7:30 to 18:00 hrs) and when authorized to work beyond these hours adopt suitable noise control methods during such works. The contractor shall maintain

machines and trucks to keep them with low noise. The Contractor shall install sound barriers and plant tree as appropriate during construction.

10. CONSTRUCTION CAMPS

The contractor shall take adequate measures such as provision of septic tank/pit latrines at construction site/camps. The Contractor shall provide crèches to working women labour. The Contractor shall provide drinking water conforming to IS:10500. The Contractor shall provide garbage cans at suitable fixed place and have the garbage disposed off regularly.

11. AESTHETIC IMPROVEMENTS

The contractor shall through proper housekeeping enhance aesthetic appearance of construction sites. The Contractor shall dispose-off construction wastes at approved disposal sites.

The Contractor shall remove after completion of construction, all temporary structures and restore the project and surrounding areas nearest possible to the pre-construction condition.

12. CONSERVATION OF ECOLOGICAL RESOURCES

The Contractor shall not use farmland and forest belts as materials borrow sites. The contractor shall not select arable land as material borrows site. In case excavation in arable land is unavoidable, topsoil layer (30 cms depth) shall be saved and returned after construction work is completed so as to minimize impact on ecosystem, agriculture and animal husbandry. The Contractor shall educate construction workers to protect natural resources, wild plants and animals.

13. RISK OF ACCIDENTS

The Contractor shall provide efficient lighting equipment and safety signs on temporary roads during construction and shall adopt and implement adequate traffic regulation. The Construction shall take effective safety and warning measures to reduce accidents. The Contractor shall provide suitable temporary crossings to facilitate normal life and business.

14. RESPONSIBILITY FOR ACCIDENTS, DAMAGES ETC.

The care of the whole of the permanent work until their completion as defined and for the period prescribed and of the whole of the temporary work until their removal shall remain with the Contractor who shall be responsible for all accidents or damages from whatever cause arising and chargeable for anything that may be stolen, removed, destroyed or damaged to whomsoever belonging and also for making good all defects and damages to the said workers or to any property adjoining or any cause whatever, whether such damage or defects here occasioned by the negligence of the Contractor or not or may be or might have been discovered during the progress of the works or in consequence thereof or shall appear to be known after the completion whereof or whether payment may wholly or partially have been made or the works approved as supposed to have been properly done and no certificate or approval of any works by any officers or members of the Board shall effect.

15. Special conditions for operation and maintenance:

Flushing arrangement shall be made for MS, DI, RCC, DWC & HDPE Pipes for every 15 days with forced water pumping by separate source so that there shall be no silt deposited in the pipes.

Out lets of Scour valves shall be provided at main lines, at branch lines, at distributaries, at minors /Sub Minors/ Bleeders, water should go to the nearest natural nalas without affecting the farmers' land.

Spare MS pipes, HDPE Pipes, Solenoid valves, pressure regulating valves, water meters, air valves shall be kept for immediate and timely maintenance of leakage replacement of faulty equipments by providing two vehicles with generators

PART – 3

CLAUSE-1:

Recovery of extra cost on unexecuted work

The employer has the right to measure up the work of the contractor and to take such part thereof as is remaining unexecuted out of his hands, and to give it to another contractor to completed in such case any expenses which may be incurred in excess of the sum which would have been paid to the original contractor, if the whole work had been executed by him (as to the amount of which excess expenses the certificate in writing of the employer shall be final and conclusive) shall be borne and paid by the original contractor and shall be deducted from any money due to him by the BTDA under the contract or otherwise or from his security deposit or the proceeds of the encashment thereof, or a sufficient part thereof.

CLAUSE-2:

Submission of designs and GFC (Good for Construction) drawings to be submitted by contractor

Details and drawings given in Tender document are for information purpose only and successful Tenderer shall undertake confirmatory survey for accuracy and completeness of data. It is in scope of successful Tenderer to undertake all Site related surveys, Geotechnical investigations, and should submit the same to the BTDA for checking approval prior to the commencement of work.

Accordingly, the contractor shall submit the detailed design of all works including working drawings for review and approval of BTDA and after incorporating all comments and on getting approval from BTDA, the same will be released as Good for construction drawings. The Contractor shall Submit 5 (Five) hard colour copies of all Good for construction drawings and electronic copy in the form of AutoCAD drawings, all design model files in CIVIL 3D, Revit, Staad Pro, Water GEMS, Sewer GEMS, Strom CAD etc of the drawings.

Successful Tenderer shall have to prepare and submit maintenance manual to Employer for approval before start of Maintenance period.

As Built Drawings

The Contractor shall Submit 'As Built Drawings' depicting the exact construction carried out on site, in **5 (Five) colour hard copies and soft copies** in the form of AutoCAD drawings, all design model files in CIVIL 3D, Revit, Staad Pro, WaterGEMS, SewerGEMS, StromCAD etc software. During the course of the Works, the Contractor shall maintain a fully detailed record of all changes from the approval to facilitate easy and accurate preparation of the As-Built Drawing in GIS database.

On Award of work the Contractor shall submit the design and drawing for review and approval. Drawings mentioned in the list are indicative and for Information. Contractor shall not limit himself to the same but it is in scope of Contractor to submit all required design and drawings for review and approval as per Instruction from Engineer-In-Charge

I. Boundary fencing and Tree Plantation:

1. Design, Drawings, Location plan details of Chain Link Fencing, RCC Signs boards & Sector Boards
2. Location Plan details of Tree Plantation

II. Road works

1. Design Reports such as Horizontal Alignment, Vertical Profile extracted from Civil-3D/ MX Roads
2. Pavement Design Report (Rigid, Flexible and Interlocking concrete paver blocks)
3. Junction / Intersection (minor & major) design and drawings
4. Earthwork quantity report from the design software (Civil 3D/ MX Roads)
5. Report on Treatment for Black cotton soil (Stabilization or Replacement)
6. Design & Test Report of Borrow soil
7. Design Mix Report for GSB, WMM, PQC, PCC, DBM, BC, etc.,
8. Centre line layout Plan with Road Coding/ Numbering
9. Plan & Profile for all ROW roads
10. Cross Sections with utility mapping & Pavement crust details for all ROW roads at regular interval of 100m and additional cross sections at critical locations, junction, etc.,
11. Drawings (Plan & Sections) of road furniture items including Traffic Sign boards, Road/ lane markings, Tabletop crossings, entry/exit ramps, concrete bollards, kerbs, studs, bicycle stand hoops, seating benches, crash barriers, etc.,
12. Drawings Plan & Sections of Bus bays, Parking lanes, etc.,
13. Plan & Sections of Utility chambers (ICT, Water supply, cable cross ducts, etc.,)
14. Design of Cycle track, coloured cold plastic paint Drawings of road plan and profile including horizontal alignment, vertical profile, and typical and detailed/working cross sections
15. Drawings of cross drainage works
16. Drawings of landscaping and horticulture
17. Drawings of street lighting system
18. Standard and miscellaneous drawings

III. Water supply system

1. Layout of potable water feeder mains including the longitudinal plan and profiles including valves and Bulk meter location
2. Potable water supply distribution network including the valve and bulk meter locations
3. Pipe encasement details
4. Valve and chamber details
5. Property connection details
6. Thrust blocks and Anchor blocks
7. Crossing details of natural drains / Canal system/ railway lines
8. Locations, plan and section of HDD (trench less technology) locations with details

9. Drawings of Ground Service Reservoirs for all 4 locations including the compound wall, Security Cabin and layout planning

IV. Sewerage network

1. Sewerage collection network drawings
2. Bedding and backfilling details
3. Manhole details
4. Scraper manhole
5. Drop manhole
6. RCC vent shaft/ vent cowl
7. Pipe encasement details
8. Valve and chamber details
9. Property connection details
10. Thrust blocks and Anchor blocks
11. Details of Sewage pump stations for all 7 locations including the layout plan, site grading, internal roads, storm water drains and streetlighting facilities along with the location maps, compound wall, etc
12. Details of Sewage pump stations for all 7 locations including the civil, electrical, Mechanical, instrumentation systems including the collection chamber, screening arrangement, security cabin, twin operators' quarters building with necessary water sewage and power supply arrangements
13. Layout of Wastewater pumping mains including the longitudinal plan and profiles
14. Crossing details of natural drains / Canal system/ railway lines
15. Locations, plan and section of HDD (trench less technology) locations with details

V. Storm water drainage system

1. Drawings of Storm water drainage network
2. Layout of Roadside storm water collection network system including the culvert details
3. Drawings of primary Storm water drainage network including L-section and cross sections at every 30m intervals
4. Catch pit details
5. Details of Rainwater harvesting pits including silt traps
6. Details of Recharge ponds.

VI. ICT system

1. Drawings of ICT piped ducting system including the chamber locations
2. Details of ICT systems in all SPS locations including CCTV camera locations

VII. Electrical system

1. Drawings of Electrical utility network system
2. Drawings of Electrical streetlighting system

VIII. Other Works

- a. Drawings of Utility/Services ducts for ICT network, power supply network, and other networks including structures

- b. Drawings of project facilities
- c. Drawings of miscellaneous works for parks and open spaces
- d. SCADA, Instrumentation / Automation systems for Sewerage pumping stations
- e. Any other drawing requested by Employer's Engineer for execution of project work

The BTDA will appoint Proof checking Consultant like Indian Institute of Science / Technology as per directions of Engineer-in-Charge. The Proof checking Consultant shall Proof Check the detailed calculations, drawings and designs which are finalized.

The Contractor shall prepare and submit, with reasonable promptness and in such sequence as is consistent with the Project Completion Schedule, three copies each of the design and Drawings, duly certified by the Proof Consultant submitted to the Engineer-In-Charge for review.

CLAUSE-3: WORK TO BE OPEN TO INSPECTION - CONTRACTOR OR RESPONSIBLE AGENT TO BE PRESENT

(a) All works under or in course of execution or executed in pursuance of the contract shall at all times be open to the inspection and supervision of the employer or other competent authority and his subordinates, and the contractor shall at all times during the usual working hours, and at all other times at which reasonable notice of the intention of the employer or other competent authority or his subordinate to visit the work shall have been given to the contractor, either himself be present to receive orders and instructions or have a responsible agent duly accredited in writing present for the purpose. Orders given to the contractor's duly authorized agent shall be considered to have the same force and effect as if they had been given to the contractor himself.

Employment of technical staff

The Tenderer must demonstrate that he has the personnel for the key positions that meet the following requirements. Key personnel should have experience in similar type of work i.e. in Roads & Storm water drainage, Water supply, Sewerage system, Power Supply system, ICT system

No.	Position	Nos.	Qualification	Experience
1	Project Manager Multidisciplinary (Graduate Engineer)	1	- Graduate in Engineering with Postgraduate in Management or Master's in Engineering or equivalent will be preferred. 15 years' experience in planning, design, construction and project / programme management Management)	- management and administration of major infrastructure projects connected to roads, water supply, sewerage system; - Construction supervision, quality monitoring, contract management; - Hands on experience in Construction Management and Project Performance Monitoring and Reporting System; Ability to resolve

No.	Position	Nos.	Qualification	Experience
			At least 4 years as Team Leader or Dy. Team Leader in PMC / Design and Construction Supervision	contractual issues
2	Assistant Project Manager – Multidisciplinary (Graduate Engineer)	2	- Graduate in Engineering. 10 years' experience in planning, design, construction and project / programme management of Urban Service delivery (Water Supply/ Sewerage / Drainage / Transportation / Roads/ Drainage System) - Experience in leading the team shall be an advantage	- Ability to Monitor the construction method by assessing the adequacy of the contractor's input materials, labour, equipment and construction methods; - ability to review and advise construction drawings as necessary; - to coordinate with third party inspections, as decided by Employer; - Experience in interim and final certification of the bills of payment; - issue of completion certificates. - experience in preparing Project Completion Report and progress reports - Ability to Resolve contractual issue during implementation
3	Project Engineers (Graduate Civil / Mechanical Engineer)	5	- Graduate in Engineering. 5 years' experience in, construction and project/ programme management of Urban Service delivery (Water Supply/ Sewerage / Drainage / Transportation / Roads/ Drainage system)	- Experience in monitoring of Construction works at site. - Experience in recording / Measurement/ Certifying of contractor bills - Carryout quality control activities at site and lab
4	Electrical Engineer (Graduate Electrical)	2	- Graduate in Engineering. 5 years' experience in, construction and	- Experience in monitoring of Construction works at site. - Experience in recording /

No.	Position	Nos.	Qualification	Experience
	Engineer)		project/ programme management of Urban Service delivery (Electrical Utility works)	Measurement/ Certifying of contractor bills • Carryout quality control activities at site and lab
5	Instrumentation Engineer (Graduate Electrical Engineer) (Part Time)	1	• Graduate in Engineering. • 5 years' experience in, construction and project/ programme management of Urban Service delivery (Instrumentation works)	• Experience in monitoring of Construction works at site. • Experience in recording / Measurement/ Certifying of contractor bills • Carryout quality control activities at site and lab
6	Safety Engineer (Graduate Engineer)	1	• Graduate in Engineering with minimum 10 years of experience	Carrying out safety related checks at site, well-versed with relevant safety manual of IS/ other international organization

No.	Position	Nos.	Experience In Similar Works [years]
1	Project Coordinator Multidisciplinary (Graduate Engineer)	1	15-20
2	Design Manager (Graduate Engineer)	2	10-15
3	Project Manager –Multidisciplinary (Graduate Engineer)	2	10-15
4	Assistant Project Manager (Graduate Civil / Mechanical Engineer)	3	10-15
5	Electrical Engineer (Graduate Electrical Engineer)	2	5
6	Instrumentation Engineer (Graduate Electrical Engineer)	2	5
7	Safety Engineer (Graduate Engineer)	2	5

Tenderers should provide the names of suitably qualified personnel to meet the requirements for execution of the project. The data on their experience should be supplied using the Form below for each candidate.

Form PER – 1: Proposed Personnel

1.	Title of position*
	Name
	Title of position*

2.	Name
3.	Title of position*
	Name
4.	Title of position*
	Name

Form PER – 2: Resume of Proposed Personnel

Position		
Personnel information	Name	Date of birth
	Professional qualifications	
Present employment	Name of employer	
	Address of employer	
	Telephone	Contact (manager / personnel
	Fax	E-mail
	Job title	Years with present employer

Summarize professional experience in reverse chronological order. Indicate particular technical and managerial experience relevant to the project.

From	To	Company / Project / Position / Relevant technical and management experience

In addition to above, the contractor shall employ different types of technical personnel as may be directed by the Employer to ensure efficient execution of work.

The technical staff so employed should be available at site whenever required by the Engineer-in-charge to take instructions.

If the contractor fails to employ technical staff as aforesaid, he shall be liable to pay a sum of Rs. 10000 (Ten thousand only) for each month of default in the case of each Graduate Engineer.

If the contractor himself possesses the required qualification and is available at the site for receiving instructions from the employer or other competent authority 'vide' sub-clause (a) above it will not be necessary for the technical staff to be available at site for receiving instructions.

CLAUSE-4: NOTICE TO BE GIVEN BEFORE WORK IS COVERED UP

The contractor shall give not less than Seven days notice in writing to the Engineer or his subordinate in charge of the work before covering up or otherwise placing beyond the reach of measurement any work in order that the same may be measured, and correct dimensions thereof taken before the same is covered up or placed beyond the reach of measurement, and shall not cover up or place beyond the reach of measurement, any work without the consent in writing of the employer or other competent authority or his subordinate in charge of work; and if any work shall be covered up or placed beyond the reach of measurement without such notice having been given or consent obtained, the same shall be uncovered at the contractor's expense, and in default thereof no payment or allowance shall be made for such work or for the materials with which the same was executed.

CLAUSE-5: METHOD OF PAYMENT OF BILLS

Payment shall be made into the designated bank account of the contractor by NEFT / Bank Transfer.

CLAUSE-6: CONTRACTOR TO SUBSCRIBE TO WORKER'S AND CONTRACTORS' BENEVOLENT FUND

The contractor shall subscribe to the Workers' and Contractor's benevolent fund at the rate of 0.10% of the gross amount of each bill payable to him in respect of the contract. The amount of subscription should be recovered out of the amount payable to him in each bill.

PART-4

1. The scope of work is not limited to, scope defined in this document / BOQ, but includes all the work to which are necessary to complete the work in full manner, commission of the job successfully & smooth functioning of the work. Also, in any case mention of any scope of work, equipment & accessories are left out which may be necessary to complete the work in full manner, the same has to be treated as part & parcel of the scope of the work and need to be carried out as per the directions of Engineer-in-charge within the contract amount.
2. The Contractor should carryout the additional utility shifting works such as shifting of electrical poles/ lines, watersupply lines, UGD lines and any other public utilities and coordinate with different government agencies for finalizing the Drawings, Implementation Schedule, shifting and Alignment of Utilities for Proper Execution of works. All the Statutory Charges/ depository charges/ Fees. etc. payment for the same shall be paid based on the prevailing SR rates/department rates to the particular works of the concerned department. However, same shall be reimbursed by BTDA after submission of proof. The works shall be carried out to the satisfaction of Engineer in charge/ Line department.

PART-5

1. LAND

It is the policy of the BTDA to acquire the lands permanently required for the works following the procedure set forth in the Land Acquisition Act.

2. QUARRIES AND BORROW AREAS

All materials for construction which are not available from excavation shall be obtained from the quarries and borrow areas which shall be got approved from the Engineer. In no case, the quarry / borrow area shall be within the acquired area of BTDA. The BTDA will not make available any quarry or borrow area. The contractor shall himself explore the quarries and borrow areas required for the work and quote his rates for finished items of work in Schedule B accordingly with all heads and lifts. The leads considered in the sanctioned estimate are for the estimate purposes and shall not be taken as the actual leads for materials during execution. No claims whatsoever shall be made, nor entertained for any extra leads over and above the leads considered in the estimate. No claim of any compensation shall be due to the contractor, on any account whatsoever, such as the quarries and borrow areas considered in the estimate being found unsuitable or inadequate in yield, the haulage routes reckoned being found unsuitable, the leads reckoned being found incorrect, the landowners obstructing the procurement and conveyance etc. The BTDA does not undertake to acquire lands for the quarries and borrow areas. It is the responsibility of the contractor to negotiate with landowners and acquire the lands to him, either permanently or temporarily, and procure the required materials. If the quarries /borrow areas do not give sufficient quantity of material, contractor shall make his own arrangements for additional quarries/borrow areas, with the approval of the Engineer and bear cost of investigations and negotiations, all leads and lifts, cost of land etc. at his own expense without claim for any payment over and above his tendered rates.

Departmental investigations of the quarries and borrow areas, on the basis of which the departmental estimates of cost are prepared, have been made with the intention of having the most economical leads for the construction of work. If at any time after the entrustment of work, the department finds quarries and borrow areas affording more economical leads and obtains possession of such lands, the department reserves the right to order the contractor to bring materials from such quarries and borrow areas and to reduce his rates in consequence thereof. In all such cases, whether the contractor complies with the orders or not, the rate of the concerned item of work in Schedule B will be reduced for the quantities executed after two weeks from the date of communication of the order by an amount corresponding to the difference in the lead charges computed on the basis of the departmental schedule of rates adopted for preparing the comparative statement at the time of the acceptance of tender plus or minus the percentage above or below in the original tender rates for that particular item of work.

3. RATES ARE ALL INCLUSIVE

The amount quoted in this tender shall be for finished items of work, complete in all respects, inclusive of all materials all tools and plant and all labour required for the work, all leads and lift and all incidental charges such as dewatering and desilting, diversion of rain and nala flows, diversion of traffic, initial and final clearance of site, providing labour

amenities etc., and all taxes (excluding GST), levies & royalty charges etc. complete. The rates shall hold good for all conditions of site, moisture, weather etc.,

4. ROYALTY

Royalty as per GO. No. MG/DCB/2020-21 Dated 03rd July 2020 issued in Commerce and Industries Department of the Government of Karnataka and the subsequent government notifications shall be paid by the contractor by deductions from his bills. The schedule of Royalty charges is annexed.

5. INCOME TAX

Deduction at source towards Income Tax will be made from the contractor's bills at the rates prevailing at the time of payment as fixed by the Income Tax Authorities and the tax deductions certificate will be issued at the end of the financial year.

6. GOODS & SERVICE TAX (GST)

Deduction at source towards GST will be made as per the norms and the statutory order of government prevailing on the date of payment of the bill.

7. DEWATERING, DESILTING AND DIVERSION OF FLOWS

Any water encountered during the execution of work shall be suitably removed by baling out or pumping and any accumulated silt due to any reason whatsoever, during the execution of work shall also be removed and disposed off. All surface flows shall be diverted outside the work area by suitably channelising the flows, by providing cross bunds and conducting the flows in pipes, conduits, etc., or by cross bunding and pumping etc depending upon the site conditions and exigencies of work. The cost of all such operations shall be considered as included in the quoted rates of the concerned finished items of work and shall not be separately paid.

8. PROCUREMENT OF CEMENT, STEEL AND BLASTING MATERIALS

The responsibility of procuring all materials including cement, steel and explosives (and license there of) shall rest with contractor only. The material shall be procured from reputed firm and shall be got tested from the respective department along with the approval from statutory department at the cost of contractor.

9. CLEARING THE SITE

The area to be occupied by the work and the quarries and borrow areas shall be cleared off all vegetations, including trees, roots, ant hills and other extraneous matters. The site shall be cleared to the full width of the works as directed by the Engineer-in-charge. No separate payment is admissible for clearing the site.

10. ALL PROPERTIES, PRECIOUS STONES, METAL AND RELICS TO BE HANDED OVER TO DEPARTMENT.

All gold, silver, oil or other materials of any description what-so-ever and other similar things that may be discovered on the site shall remain the property of the Government and the contractor shall duly intimate the Engineer-in-charge or any person duly authorised by him to receive such property from time to time.

11. PRESERVATION OF TREES

The contractor shall preserve all existing trees in and adjacent to the site which do not interfere with the construction as determined by the Executive Engineer.

12. DRAWINGS AND WORKING DETAILS

The work shall be carried out strictly in accordance with the sanctioned plans and estimates and specifications and as per the instructions of the Engineer-in-charge, and no deviations or changes are permitted without the written order of the Engineer. The designs and drawings enclosed with the tender documents are only typical and tentative. The working drawings and the working details of the several components of works will be prepared and made available at the time of execution and contractor shall carryout the work in accordance with such working drawings and working details.

13. OMISSIONS AND DISCREPANCIES IN DRAWINGS AND INSTRUCTIONS

a) In all cases of omissions, doubts or discrepancies in the dimensions or discrepancies in the drawings and item of work, a reference shall be made to the Chief Engineer, whose elucidation and elaboration shall be considered as authorised.

The contractor shall be held responsible for any error that may occur in the work through lack of such reference and precautions.

b) The contractor shall be responsible for accuracy for all shapes, dimensions and alignments etc, of all the components of the work.

14. TAKING INITIAL LEVELS, MARKING OUT THE LAYOUT AND FIXING THE REFERENCE LINES

Before starting the work, the contractor or his authorised agent shall be present while taking levels of the ground along and across the portion of the Land for works, which the contractor has agreed to execute. He will further be required to sign the field book and also L sections and cross sections of the works based on the ground levels taken in token of acceptance of the ground levels before the commencement of work or fresh items of excavation below a preceding item. In case he commences the work without verifying and accepting the cross sections and L-sections of the ground, it will be assumed that he has accepted the L-sections and cross sections taken by the BTDA staff and no complaint or claims what-so-ever in this behalf will be entertained. It shall be the responsibility of the contractor to mark the line-out as per directions of the Engineer-in-charge. The contractor or his duly authorised agent shall be present at the time of setting out giving profiles etc., and shall supply all the materials and sufficient number of mazdoors required for taking measurements of works, giving line out etc., at his cost.

The stone masonry platforms and reference pillars etc., of suitable size as directed by the Engineer-in-charge with level top shall be built and maintained by the contractor at his cost till the completion of work along the reference lines to facilitate the mark out and layout of various appurtenant works.

15. COMMENCEMENT OF WORK

The contractor shall not enter upon or commence any portion of the work except with the written authority of the Engineer, failing which the contractor shall have no claim to ask for measurement or payment for work and shall on the other hand, be responsible for any claim of damage that may arise due to such unauthorised commencement or entry.

16. PROGRAMME OF WORK

The Schedule of progress mentioned under Clause-2 of the conditions of contract is only indicative. Within one month from the date of notice to commence the work, the contractor shall furnish a detailed programme of the schedule that he intends to adopt, which shall show both physical and financial programme weekly/monthly as desired by the Engineer and aTendere by it.

17. PLANT LAYOUT, CONTRACTORS OFFICE, MACHINE YARD, LABOUR CAMP ETC.

Within a fortnight of the date of award of the contract, the contractor shall submit to the for the approval of the department the layout of the construction plant and equipment for execution of work and also the location and layout of contractors office, machine yard, workshop, stores, storage yard, labour camps etc including the layout of necessary services such as water supply, sanitation etc.

18. ACCESS ROADS, QUARRY ROADS ETC.

All haulage roads, access roads to work spot, quarry roads etc. and all diversion roads found necessary during construction shall be formed and maintained by the contractor at his cost to such standards as may be directed by the Engineer-in-charge as per the requirements of the work. The contractor should make himself thoroughly conversant with the conditions of existing public roads of the area and the existing arrangements for their maintenance. If any damage to the existing public roads is caused due to any natural or other causes or due to bad maintenance, BTDA will not be held responsible for the inconveniences caused to the contractor including any extra cost or temporary stoppage of work. The existing roads, constructed and maintained by the BTDA if any shall be used by all concerned contractors. No claim of compensation from any contractor shall be entertained on the excuse of non maintenance of such roads.

19. POWER SUPPLY FOR THE WORKS

The contractor has to make at his own cost, all necessary arrangements for the supply of power required for the work and his camps from Karnataka Electricity Board or from any other source. The BTDA will not undertake any responsibility with regard to power supply and no claims due to failure, or delay in supply of power or variations in voltage in supply will be entertained by the BTDA.

20. WATER FOR CONSTRUCTION

Supply of water for construction and for drinking and for his camps shall be arranged for by the contractor at his own expense.

21. AMENITIES TO LABOURS

These are covered in the conditions of contract. The following are further elucidation.

The contractor shall provide the following labour amenities for the imported labours, if any:

- i) A shed of 6.1M x 3.05M per family on a platform of 0.15m height.
- ii) Distance between sheds shall be 4.6m minimum and not more than two rows sheds shall be built back to back.
- iii) Peripheral roads 6.1m wide shall be built for every 300 families.
- iv) Necessary surface drainage and sanitary arrangements shall be provided.
- v) Water supply with one stand post for every 20 sheds.
- vi) Electric streetlights at one point for every 61m.

The contractor shall provide layout for the labour camp and arrange water supply and electricity as above. In case of default the BTDA may provide the same and recover the cost (capital and recurring) from the contractor.

The contractor shall also be responsible for complying with all the requirements of the Labour Authorities and Health Department particularly in regard to sanitation, water supply and anti malaria measures in the labour camps as may be directed from time to time.

All the labour employed by him should be got inoculated against cholera once in 6 months and against small pox once in three years. Any new labour employed by him should be got inoculated against cholera and vaccinated against small pox within a fortnight of being employed by contacting the local health authority at his own cost.

On the work spot, at safe distance, adequate number of rest sheds, crèches and drinking water arrangements shall be made by the contractor at his cost to the satisfaction of the Engineer-in-charge. If the BTDA provides the rest sheds, the contractor shall be levied rent at Rs. 30 per sqm per month and is bound to avail of such sheds.

22. LANDS FOR THE USE OF THE CONTRACTORS CAMP

The contractor shall have to make his own arrangements with regard to land required for construction of quarters at the work spot. However, the BTDA at its discretion may make land available. In such a case necessary charge as fixed by the Engineer-in-charge will be levied.

23. UNDESIRABLE PERSON TO BE REMOVED FROM SITE

The contractor shall not employ on site any person who is undesirable. If in the opinion of the Engineer-in-charge the person or persons at site of work employed on behalf of the contractor is/are considered undesirable, the Engineer-in-Charge shall notify the contractor to this effect and the contractor will be bound by the decision of the Engineer-in-Charge to remove such person or persons from the site of work and from the labour camp. The contractor shall not be entitled to any damage or loss on this account. On the contrary, the contractor shall be liable to compensate the BTDA for any loss or damage to the BTDA property caused by the employment of such person.

24. WORK ORDER BOOK

A work order book shall be maintained by the contractor at the site and all instructions shall be entered in the book in ink. The contractor shall be responsible for obtaining all the orders entered in the work order book and he or his authorised agent shall sign, acknowledging the orders issued and shall carry out orders. Copies of the orders entered in work order book shall be submitted by the contractor to the concerned officer and to the within two days, for their record.

25. HINDRANCE REGISTER

A Hindrance Register shall be maintained by the contractor at the site of work and all factors causing hindrance to the work, as perceived by him shall be entered by him in that register in ink under his dated signature or of his authorised agent from time to time for being brought to the notice of the Engineer-in-Charge and obtaining prompt relief. The signature of the Engineer-in-Charge shall be obtained in the register for having noted the entries and a record of the factual verifications made by the Engineer-in-

Charge and of his comments will also be made in the register by the Engineer-in-Charge along with instructions if any issued in the matter. The Engineer-in-Charge shall obtain prior approval of the higher authorities, where necessary, before issuing instructions. Copies of the entries made in the Hindrance Register will be submitted by the contractor to the Engineer-in-Charge and the within two days from their record. The issues will also be promptly brought for discussions in the periodical review meetings held in pursuance of the clause-2 of the general conditions of contract.

26. LABOUR STATISTICS

The contractor shall submit daily reports on the following:

- i) Total No. of labour imported into working area.
- ii) Total No. of labour living in the working area.
- iii) The details of attendance and payment made to employees engaged in the work as required by the PF authorities in the format prescribed by them each month.

27. EXECUTION OF WORK DURING NIGHT TIME

The work shall normally be carried out between 8 hours and 17 hours with a break of one hour and when permitted during night period, the second shift shall be between 17 hours and 0 hours with a break of half an hour during night. when ordered to work at night, adequate provision for lighting the working area should be made by the contractor at his cost and got approved by Engineer-in-charge. whenever the work is done at night by the contractor with his own interest he shall take the permission of Engineer in charge with sufficient provision for lighting arrangement at his own cost

28. MEDICAL AID

These are covered by clause 30(b) and 31(ii) of the conditions of contract. The following are further stipulations.

- i) The contractor shall arrange all the necessary medical facilities for his staff and labour at his own cost and to the satisfaction of Engineer-in-Charge. The contractor shall arrange in his office, work shop, work site and camps facilities of clear portable treated water and arrange for proper drainage and proper disposal of sewage. He shall aTendere by the rules framed on this behalf by the Engineer-in-Charge or Health Officer of the project.
- ii) The contractor shall also provide for medical supervision of his workers against epidemics. The contractor shall comply with all the directions given by Health Officer in this regard.

29. SAFETY CODE

- i) These safety provisions should be brought to the notice of all concerned by display on notice board by the Contractor at a prominent place at work spot. The persons responsible for compliance of the safety code shall be named therein by the contractor.
- ii) To ensure effective enforcement of the rules relating to safety precautions, the arrangement made by the contractor shall be open to inspection by the Labour-Officer, Engineer or their representatives.
- iii) All necessary personal safety equipments as considered adequate by the Engineer-in-Charge should be kept available for the use of persons employed at the site and maintained in a condition suitable for immediate use and the contractor should take adequate steps to ensure proper use of equipment by those concerned.

- a) Workers employed on mixing concrete, cement grout, cement mortar shall be provided with protective footwear and protective goggles and protective gloves.
 - b) Those engaged in mixing or stacking cement or any materials injurious to the eye, nose and mouth shall be provided with a face mask and protective cover free of cost by the contractor.
 - c) Those engaged in welding work shall be provided with welder's protective eye shield and gloves.
 - d) Stone breakers shall be provided with protective goggle and protective clothing and seated at sufficiently safe intervals.
 - e) Those engaged in binding and fabricating steel shall be provided with protective gloves.
 - f) Those Engaged in deep cuts, tunnels, large rock excavation shall be provided with helmets.
- iv) When the work is near any place where there is risk of drowning all necessary equipments shall be kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provisions should be made for prompt first aid treatment of all injuries likely to be sustained during the course of work.
 - v) Adequate and suitable caution and danger signal boards shall be prominently exhibited at road/river crossing/high tension over head line/where heavy electrical machines are working/where overhead cranes or hoist; derricks, winches are working/where blasting zone is demarcated. The content of the board shall be in English and the local language for easy identification.
 - vi) All scaffolding, ladder, stairways, gangways, staging, centering, form work and temporary support and safety devices etc. shall be sound in strength and construction and maintained as such throughout its use.
 - vii) No materials on any site of work shall be so stacked as to cause danger or inconvenience to any persons or public.
 - viii) The contractor shall provide all necessary fencing and lighting to protect the public/working men from accident and shall be bound to bear the expense of defence of every suit action or other proceedings of law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and costs, which may be awarded in any such suit action or proceedings to any such persons or which may with consent of the contractor be paid to compensate any claims by any such persons.
 - ix) No electric cables or apparatus which is liable to be a source of danger to persons employed shall remain electrically charged unless a caution Board is put in to that effect and close approach to the same is prohibited.
 - x) All practical steps shall be taken to prevent danger to persons employed from risk of fire or explosives or flooding. No floor, roof or other portion of any building used for residence shall be so over-loaded with debris or materials so as to render it unsafe.
 - xi) The final disposal of water used for work or removed from work spot as well as the supply used for domestic consumption shall be as directed by the Executive Engineer. The contractor shall make his own arrangement for purification of domestic water supply used by his staff and labour colony and used on the site of work to the satisfaction of the Executive Engineer.
 - xii) The source of drinking water supply/distribution system in workers colony shall be protected from chances of contamination by poisonous materials/epidemic causing infections bacteria etc., by maintaining the source and system under adequate hygienic conditions.

xiii) Notwithstanding the above clauses from (i.) to (xii) there is nothing in this to exempt the contractor to exclude the operations of any other Act or Rules in force of the Central Government and State Government.

30. EMPLOYER'S SUPERVISION

All the works shall be carried out under the direction and to the satisfaction of the Engineer and the Engineer-in-Charge. Reference lines and reference bench mark will be set-up on the site by the Engineer-in-Charge based on which the contractor shall at his cost and responsibility, locate and establish lines and grades for all structures of the works according to the drawings and specifications. The Engineer-in-Charge may, for satisfying himself carryout checks. The contractor shall provide, at his own cost, all labour, materials and instruments that may be required for carrying out the check. Such a check shall not, however, absolve the contractor of his responsibility from carrying out the works strictly according to drawings and specifications and as per instructions issued to him by the Engineer-in-Charge during the execution of the work.

31. EMPLOYER'S DECISION

In respect of all matters which are left to the decision of the Engineer/Engineer-in-Charge, the Engineer/Engineer-in-Charge shall if required so by the contractor give the decision in writing.

32. MAINTENANCE OF WORK DURING EXECUTION

It is the responsibility of the contractor to maintain the work satisfactorily until it is handed over to the BTDA in a complete manner as per the terms of agreement. Any damages caused during construction to any part of the work due to any reason arising out of his own action or negligence shall be made good at the contractor's expenses.

33. RETURN OF BTDA LANDS IN GOOD CONDITION

The lands if any, made available to the contractor for his camps by the BTDA shall be handed back to the within three months after the completion of the work under this contract. Also, no land shall be held by the contractor for a longer period than necessary and the contractor shall on due notice by the vacate and return the land which the may certify as no longer required by the contractor for the purpose of the work. The lands shall be returned in good condition.

34. DRAINAGE OF QUARRIES AND BORROW PITS ETC.

The several quarries or borrow pits shall be interconnected to prevent stagnation of water and breeding of mosquitoes. Similarly, if any hindrance is caused by the contractor to the natural drainage of the lands handed over to him for the work and camps it shall be satisfactorily eased out.

35. CO-OPERATION WITH OTHER CONTRACTORS

The Contractor will have to co-operate with the other agency/agencies working in the same or adjoining area. Any inconvenience or interruption in any portion of working area does not make the contractor eligible for any claims. In case of any disputes with the adjacent contractor the decision of the Engineer-in-Charge shall be final. No extra payment is admissible on this account.

36. TEST RESULTS FROM Q.C. AUTHORITIES

The contractor should carry out the necessary Quality control Tests at his own cost. A laboratory has to be set up at site. A quality Assurance Programme shall be submitted and got approved by the department before commencement of work. Further work should be commenced only after obtaining the test results clearance from the Engineers engaged by BTDA for Quality assurance duly obtaining the permission from the Engineer in-charge.

37. CLOSURE OF THE WORK AFTER EXPIRE OF CONTRACTOR

In the case of the death of a Contractor after executing the agreement/ commencement of the work, his legal hire, if an eligible registered contractor and willing, can execute and complete the work at the accepted tender rates irrespective of the cost of the work.

If the contractor expires during the course of execution the work shall be closed at the discretion of the Chief Engineer, BTDA.

38. SYNCHRONISATION OF WORKS

The contractor shall plan properly so that all the components of works shall be executed in synchronization with each other. He shall also co-ordinate with other agencies engaged by BTDA is same work site for execution infra-structure works. Any damages or repetition of the work for which contractor is sole responsible and same shall be restored at his own cost.

SECTION - 6

CONTRACT DATA

SECTION 6: CONTRACT DATA

The following documents are also part of the Contract:

- The Schedule of Operating and Maintenance Manuals
- The Methodology and Program of Construction
- Site Investigation Reports
- The Schedule of Key and Critical Equipment to be deployed on the work as per agreed program of construction.

The Employer is:

Name: Bagalakote Town Development Authority (BTDA)

Address: NAVANAGAR, BAGALAKOTE

Name of authorized Representative: CHIEF ENGINEER / EXECUTIVE ENGINEER

The name and identification number of the Contract is

Tender Notification No. Dated 05.11.2022 as per e-portal for the work

The Work consist of “Design and Construction along with Operation & Maintenance for a Period of 05 Years for (1) Layout development and Infrastructure works consisting of Roads, Water Distribution, Ground Service Reservoirs, Sewer Network, Storm Water Drains , Power Supply System (HESCOM), ICT infrastructure system works, Chain link fencing for Parks / open areas, Tree plantation for Sector B, C & D and (2) Primary drains outside Unit-3 area, along with Sewage Pumping Stations (SPS) (including pumping machineries & pumping mains for all sectors) for Navanagar- Unit 3 Area- Bagalakote- under Lumpsum Turnkey Contract”

The start date shall be the date of issue of notice to proceed with the work.

The Intended Completion Date for the whole of the Works is as detailed in Section 10 is 30 months including monsoon with the following milestones, During Construction period, the Contractor shall comply with the requirements set forth in this Project Milestones and the **Scheduled Completion Date**. Within 15 (fifteen) days of the date of each Project Milestone, the Contractor shall notify the EMPLOYER of such compliance along with necessary particulars thereof

Project Milestones will be as follows:

Milestone	Time (Days)	Percentage of Work
Milestone I	150 th	10%
Milestone II	300 th	25%
Milestone III	450 th	45%
Milestone IV	600 th	65%
Milestone V	750 th	85%
Milestone VI (Scheduled Completion)	900 th	100%

1.1. PROJECT MILESTONE-I

- a) Project Milestone-I shall occur on the date falling on the 150th (One hundred and fiftyth) day from the Appointed Date (the “Project Milestone-I”).

- b) Prior to the occurrence of Project Milestone-I, the Contractor shall complete all the designs for the entire Project work and shall have commenced Construction of the Project components (roads and utilities / services) and submitted to the Employer duly and validly prepared Stage Payment Statements for an amount not less than 10% (Ten Percent) of the Contract Price.

1.2. PROJECT MILESTONE-II

- a) Project Milestone-II shall occur on the date falling on the 300th (Three Hundred) day from the Appointed Date (the "Project Milestone-II").
- b) Prior to the occurrence of Project Milestone-II, the Contractor shall have continued with construction of the project components and submitted to the Employer duly and validly prepared Stage Payment Statements for an amount not less than 25% (Twenty Percent) of the Contract Price.

1.3. PROJECT MILESTONE-III

- a) Project Milestone-III shall occur on the date falling on the 450th (Four Hundred and Fifty) day from the Appointed Date (the "Project Milestone-III").
- b) Prior to the occurrence of Project Milestone-III, the Contractor shall have continued with construction of the project components and submitted to the Employer duly and validly prepared Stage Payment Statements for an amount not less than 45% (Fortyfive Percent) of the Contract Price.

1.4. PROJECT MILESTONE-IV

- a) Project Milestone-IV shall occur on the date falling on the 600th (Six Hundred) day from the Appointed Date (the "Project Milestone-IV").
- b) Prior to the occurrence of Project Milestone-IV, the Contractor shall have continued with construction of the project components and submitted to the Employer duly and validly prepared Stage Payment Statements for an amount not less than 65% (Sixty Five Percent) of Contract Price

1.5. PROJECT MILESTONE-V

- a) Project Milestone-V shall occur on the date falling on the 750th (Seven hundred and fifty) day from the Appointed Date (the "Project Milestone-V").
- b) Prior to the occurrence of Project Milestone-IV, the Contractor shall have continued with construction of the project components and submitted to the Employer duly and validly prepared Stage Payment Statements for an amount not less than 85% (Eightyfive Percent) of Contract Price

1.6. PROJECT MILESTONE-VI (SCHEDULED COMPLETION DATE)

- a) The Scheduled Completion Date shall occur on the 900th (Nine Hundered) day from the Appointed Date.

On or before the Scheduled Completion Date, the Contractor shall have completed construction in accordance with this Agreement

The Site Possession date is; the site of Unit -3 area will be handed over at the time of issue of Work Order.

The site for the proposed Unit 3 BTDA Township is located in Bagalakote city of Bagalakote District of Karnataka state and has a total area of 1885 acres.

The defect liability period for Roads, Water supply, Sewage, Mechanical, Electrical & Other works is 24 months (2 Years) and 60 months (5 Years) of O&M period. Both Defect Liability Period and O&M Period run in parallel.

1.7. INSURANCE REQUIREMENTS ARE AS UNDER:

[13 OF CC]

Type of Cover		Minimum cover for Insurance
(i)	Works and of Plant and materials	The sum stated in the Agreement plus 20%
(ii)	Loss or damage to equipment	Full replacement cost
(iii)	Loss or damage to property of Third Party	Full replacement cost
(iv)	Personal injury or death insurance (a) for Third Party ⁴	Rs. 20.00 lakhs to cover 4 persons @ Rs. 5.00 lakhs each for normal works
	(b) for Contractor's employees or labour	In accordance with the statutory requirements applicable to Karnataka

1.8. PRICE ADJUSTMENT FORMULA:

Adjustment for labour component:

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

$$V_L = 0.85 \times P_L / 100 \times R \times (L_i - L_o) / L_o \text{ where,}$$

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

L_o = The average consumer price index for industrial workers for Hubli Centre for the quarter preceding the date of opening of tenders as published by the Labour Bureau, Ministry of Labour, Government of India;

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

P_L = Percentage of labour component of the work.

R = as per GO, dated: 26-02-2016

Adjustment for Cement Component:

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

$$V_c = 0.85 \times P_c / 100 \times R \times (C_i - C_o) / C_o \text{ where,}$$

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

Co= The all India average wholesale price index for cement (Ordinary Portland cement) for the quarter preceding the date of opening of the tenders as published by the office of Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

Ci = The all India average wholesale price index for cement (Ordinary Portland cement) for the quarter under consideration as published by the Office of Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

P_C = Percentage of cement component of the work.

R = as per GO, dated: 26-02-2016

Note: For the application of this clause, index of Ordinary Portland Cement has been chosen to represent Cement group.

Adjustment for Steel component:

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

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

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

S_o = The all India average wholesale price index for steel (M.S. Bars and rods) for the quarter preceding the date of opening of Tenders as published by the Office of Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

S_i = The all India average wholesale price index for steel (M.S. Bars and rods) for the quarter under consideration as published by the Office of Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

P_s = Percentage of steel component of the work.

Note: For the application of this clause, index of M S rods, bars and steel plates for fabrication of M S works have to be chosen to represent relevant and appropriate Steel groups.

R = as per GO, dated: 26-02-2016

Adjustment of Fuel and Lubricant component:

- iv) Price adjustment for increase or decrease in the cost of Fuel and Lubricants shall be paid in accordance with the following formula.

$V_F = 0.85 \times P_F / 100 \times R \times (F_i - F_o) / F_o$
Where,

V_F = Increase or decrease in cost of work during the quarter under consideration due to changes in rates for Fuel and Lubricants;

F_o = The official retail price of High-Speed Diesel (HSD) at the IOC /HPCL/BPL or other consumer pump at Bagalakote on the day 30 days prior to the date of opening of Tenders;

F_i = The official retail price of HSD at the IOC/HPCL/BPL or other consumer pump at Bagalakote for the 15th day of the middle calendar month of the quarter under Consideration;

P_F = Percentage of Fuel and Lubricant component of the work.

R = as per GO, dated: 26-02-2016

Note: For the application of this clause, the price of HSD has been chosen to represent Fuel and Lubricant Group.

Adjustment for Plant and Machinery Spares component:

- v) Price adjustment for increase or decrease in the cost of plant and Machinery Spares Procured by the contractor shall be paid in accordance with the following formula.

$$V_p = 0.85 \times P_p / 100 \times R \times (P_i - P_o) / P_o \text{ Where,}$$

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

P_o = The all India average wholesale price index for Heavy Machinery and Parts for the quarter preceding the date of opening of Tenders, as published by the Office of the Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

P_i = The all India average wholesale price index for Heavy Machinery and Parts for the quarter under consideration as published by the office of the Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

P_p = Percentage of plant and Machinery Spares component of the work

R = as per GO, dated: 26-02-2016

Note : For the application of this clause index of Heavy Machinery and parts has been chosen to represent the plant and Machinery Spares Group.

Adjustment for Bitumen component:

- vi) Price adjustment for increase or decrease in the cost of Bitumen Procured by the contractor shall be paid in accordance with the following formula.

$$V_b = 0.85 \times P_b / 100 \times R \times (B_i - B_o) / B_o \text{ Where}$$

VB = Increase or decrease in the cost of work during the quarter under consideration due to changes in the rate for bitumen:

Bo = The official retail price of bitumen at the IOC/HPCL/BPL or MRPL at Mangalore depot on the day 30 days prior to the date of opening of Bids.

Bi = The official retail price of bitumen at the IOC/HPCL/BPL or MRPL at Mangalore depot at for the 15th day of the middle calendar month of quarter under consideration.

P_B = Percentage of Bitumen component of the work.

R = as per GO, dated: 26-02-2016

Adjustment for Pipe component:

- vii) Price adjustment for increase or decrease in the cost of Pipes (HDPE, MS pipes, DI pipes, etc.,) Procured by the contractor shall be paid in accordance with the following formula.

$$V_{PI} = 0.85 \times P_{PI}/100 \times R \times (PI_I - PI_0) / PI_0 \text{ Where,}$$

V_{PI} = Increase or decrease in cost of work during the quarter under consideration due changes in rates for Pipes;

PI₀ = The all India average wholesale price index for Pipes for the quarter preceding the date of opening of Tenders, as published by the Office of the Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

PI_I = The all India average wholesale price index for Pipes for the quarter under consideration as published by the office of the Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

P_{PI} = Percentage of Pipe component of the work

R = as per GO, dated: 26-02-2016

Adjustment for Electrical Cable component:

- viii) Price adjustment for increase or decrease in the cost of Electrical Cables Procured by the contractor shall be paid in accordance with the following formula.

$$V_{EC} = 0.85 \times P_{EC}/100 \times R \times (EC_I - EC_0) / EC_0 \text{ Where,}$$

V_{EC} = Increase or decrease in cost of work during the quarter under consideration due changes in rates for Electrical Cables;

EC₀ = The all India average wholesale price index for Electrical Cables for the quarter preceding the date of opening of Tenders, as published by the Office of the Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

EC_i = The all India average wholesale price index for Electrical Cables for the quarter under consideration as published by the office of the Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

P_{EC} = Percentage of Electrical Cables component of the work

R = as per GO, dated: 26-02-2016

Adjustment for Other materials:

- ix) Price adjustment for increase or decrease in the cost of other materials other than labour, cement, steel, bitumen, pipes and Fuel & Lubricants, procured by the contractor shall be paid in accordance with the following formula.

$V_M = 0.85 \times P_M / 100 \times R \times (M_i - M_o) / M_o$ Where,

V_M = Increase or decrease in cost of work during the quarter under consideration due to changes in rates for local materials other than labour, cement, steel, bitumen, pipes, electrical cables and fuel & lubricants;

M_o = The all India average wholesale price index for all commodities for the quarter preceding the date of opening of Tenders, as published by the Office of the Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

M_i = The all India average wholesale price index for all commodities for the quarter under consideration as published by the office of the Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

P_M = Percentage of other material component (other than labour, cement, steel, bitumen, pipes, electrical cables and fuel & lubricants;) of the work.

R = as per GO, dated: 26-02-2016

The following percentage will govern the price adjustment for the entire contract

1.	Labour - P_L	:	24%
2.	Cement - P_C	:	18%
3.	Steel - P_S	:	08%
4.	Fuel & Lubricants - P_F	:	06%
5.	Bitumen - P_B	:	02%
6.	Pipes (HDPE, RCC, etc.) - P_{PI}	:	03%
7.	Plant & Machinery spare - P_P	:	15%
8.	Electrical Cable - P_{EC}	:	04%
9.	Other Materials - P_M	:	20%
	Total	:	100.00%

1.9. LIQUIDATED DAMAGES:

The liquidated damages for the whole of the works are 0.1 percent per day⁵ and that for the milestones are as under:

For Milestone 1:	Rs. 6,61,494 per day
For Milestone 2:	Rs. 9,92,242 per day
For Milestone 3:	Rs. 13,22,989 per day
For Milestone 4:	Rs. 13,22, 989 per day
For Milestone 5:	Rs. 13,22, 989 per day
For Milestone 6:	Rs. 9,91,241 per day

The maximum amount of liquidated damages for the whole of the work is **Ten** percent of final contract price.

1.10. ADVANCE PAYMENTS: DELETED

1.11. THE AMOUNT TO BE WITHHELD FOR FAILING TO SUPPLY “ASBUILT” DRAWINGS OR SUPPLY OF

Operation and Maintenance manuals by the date required is Rs. 70 Lakhs (usually 0.1% of amount put to tender).

1.12. THE FOLLOWING EVENTS SHALL ALSO BE FUNDAMENTAL BREACH OF CONTRACT

- The contractor has contravened Sub clause 7.1 and clause 9 of CC
- The percentage to apply to the value of the work not completed representing the Employers additional cost for completing the works shall be 30 percent.

⁵ The amount is usually computed on the basis of 0.01% of the contract price per day. The amount has to be specified as a round figure nearest to the hundred.

SCOPE OF WORK AND SITE INFORMATION

2. SITE INFORMATION AND LOCATION

2.1. SITE

The site for the proposed Unit 3 BTDA Township is located in Bagalakote city of Bagalakote District of Karnataka state and has a total area of 1874 acres. Bagalakote is located at 16.18° N 75.7° E. It has an average elevation of 533 metres (1,749 ft). It is situated on the bank of the river Ghataprabha. The location of Bagalakote city is shown in Figure 1

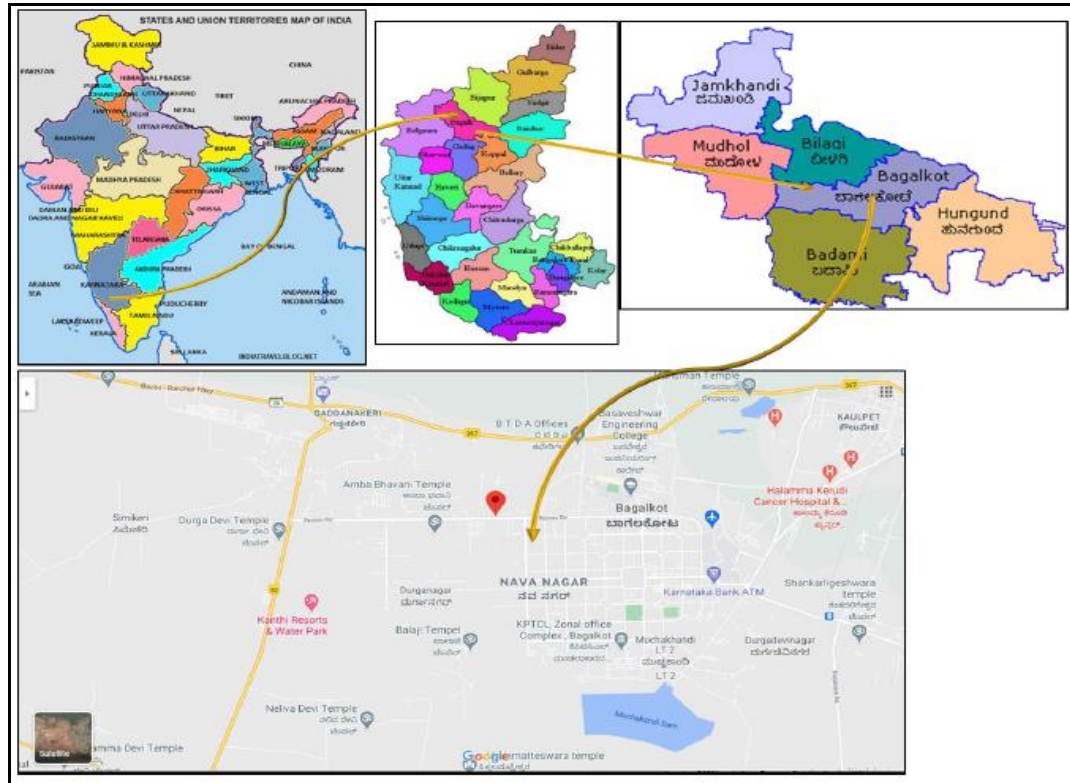


Figure 1: Project Site Location

2.2. LOCATION

The site is located at a road distance of 475 km from Bangalore - State Capital. The Bangalore Solapur Railway line passes through the project area and Bagalakote Railway station is situated at about 1Km in the Northern part of the project area.

2.3. BAGALAKOTE REHABILITATION PROJECT

Bagalakote Town has an approximate population of 1.30 lakh. Substantial portion of Bagalakote town gets submerged in backwater of Almatti reservoir. The Resettlement and Rehabilitation (R&R) of 173 out of 176 villages affected by the backwaters of both Narayanpur and Almatti dam (up to Reservoir Level-RL 519.60 metres) was completed in 2001-02. The R&R of the people living in Bagalakote Town was completed up to RL 521 metres as part of BTDA-Unit-1 area development and for the submergence between 521m to 523m RL was taken under Unit 2 area and for submergence between 523m RL to 525m RL is planned under this project i.e., Unit 3 area.

2.4. NAVANAGARA - UNIT 1:

Master plan of new township was prepared by M/s. Ar. Correa Consultant, Pvt. Ltd., Bombay. The structure of new Bagalakote town as per the master plan consist of 49 sectors with each unit of 280 x 280 m comprising of a town centre, 4 Bazaar sectors, 34 residential sectors and 11 sectors for parks & playground connected by a network of 30 m wide Boulevard, 24.00 m wide arterial roads, 18.00 m wide peripheral road, access roads and internal roads etc. In addition to these 49 sectors, 7 sectors (Sector No. 50 to 56) are developed adjoining to Unit-I for distribution of D & E plots to PDFs (Project displaced families). Adjoining to these sectors, additional sectors No. 57 to 63 and 63-A are developed for distribution of plots to Non-PDF to encourage habitation by Non-PDFs also as a onetime opportunity. The Unit 1 layout map is as shown in **Figure 2**



Figure 2: Map of Unit 1-Navanagar

2.5. NAVANAGARA - UNIT 2:

It is planned to have one more unit of 50 sectors towards western end of Unit-I to accommodate the PDF families lying between RL 521.00 to 523.00 m. This unit is called as Unit-II and consists of 36 residential sectors, 6 sectors for garden & public amenities and 8 sectors for institutions, Government offices and relocating the shifting of utilities such as Electrical Sub-station etc., with an area of 1333 acres. Each residential sector in turn is composed of a flexible mix of clusters and strips containing different types of housing. Each sector is designed to accommodate about 300 families. The town planning for Unit-II is designed by BTDA, vetted by town planning authorities and approved by Commissioner, R & R, UKP, Bagalakote and then adopted for demarcation and proposed for development. The Layout map of Unit 2 area is provided in **Figure 3**



Figure 3: Layout Map of unit 2 Navanagar

2.6. UNIT 3 MASTER PLAN (PROPOSED UNIT FOR CONSTRUCTION OF LAYOUT)

For the area identified between Old Bagalakote Town and Unit-I of Navanagar, Unit-III area is intended to be developed. An area of 1635 Acres – 37 Guntas has been proposed to be acquired by BTDA out of which 1547 Acres – 39 Guntas has been acquired. However, the total area including the existing private land/ layouts (within the Unit-3 boundary) is 1874 acres which is proposed for construction of infrastructure services in this tender. The proposed Land use Map for Unit 3 area was prepared and necessary approval for the Master plan has already been obtained by BTDA from Bagalakote Urban Development Authority, Bagalakote vide letter no. 304 dated 20.10.2020. The approved Master plan of Unit 3 area is provided in **Figure 4**



Figure 4: Approved Master plan of Unit 3 area

2.7. PROPOSED LAND USE PLAN OF UNIT 3

The total area of unit 3 is 63,41,126.10 sq m. It consists of 49.39% Residential units (31,31,580.66 sqm), 2.75% of commercial units (1,74,246.07 sqm), 11.69% of open spaces (7,41,381.60 sqm), 5.22% of Civic amenities (3,31,115.19 sqm.), and 30.95% of Transportation (19,62,802.58 sqm). Unit 3 is divided into 11 sectors. The sector map is as shown in the **Figure 5**. However the works shall be carried out for the respective sectors as defined in the Tender document.

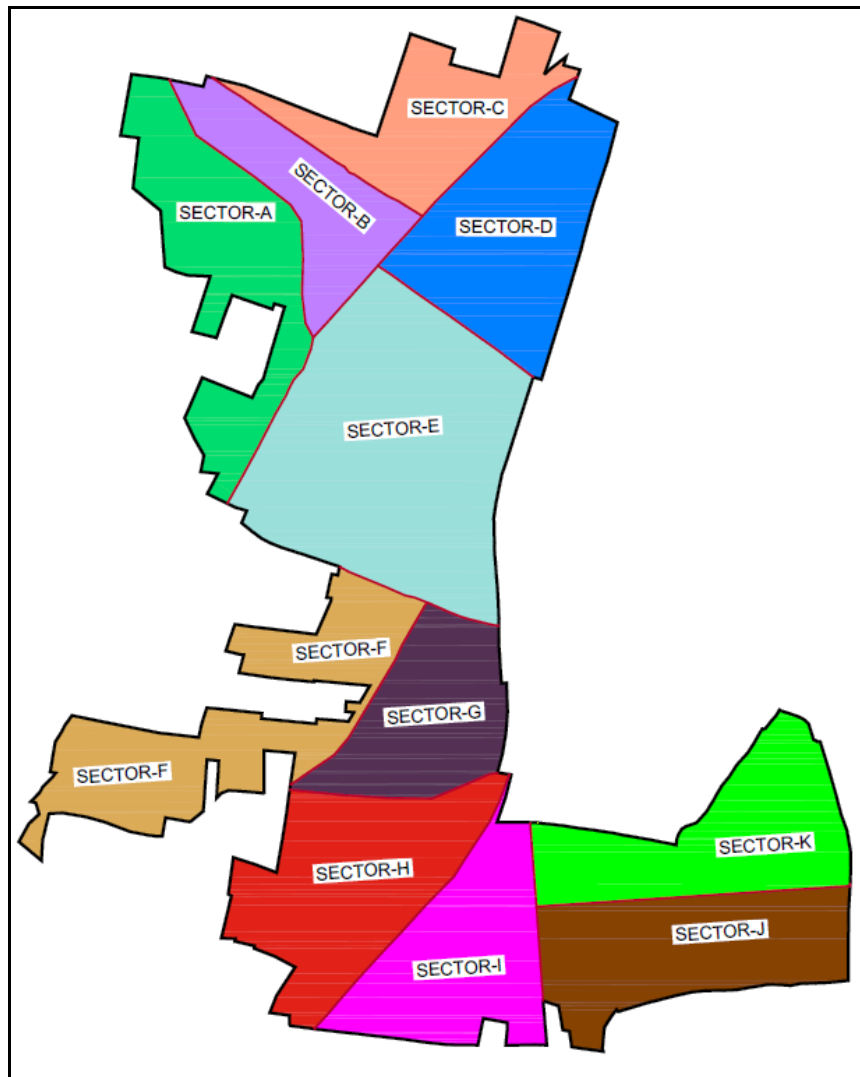


Figure 5: Map indicating sectors of Unit 3

3. BROAD SCOPE OF WORK

3.1. DEVELOPMENT OF THE PROJECT (DESIGN CRITERIA, WORKS REQUIREMENT AND PERFORMANCE CRITERIA)

The infrastructure works for Unit-3 area covering all 11 sectors (i.e., Sector A to K) is intended to be developed in five packages as under:

1) Package-1:

This package covers infrastructure works in Sector B, C & D including the Primary drains outside the Unit-3 area, Sewage Pumping Stations (SPS) including sewage pumping main proposed outside the Unit-3 area (Near Old APMC). The works also include the necessary surveys, geotechnical investigation, designs of all infrastructure services including the Operation & Maintenance (O&M) works. O&M is 5 Years for infrastructure works as specified in this document.

2) Package-2:

- This package covers infrastructure works in Sector A, & E including the Water Transmission main from Gadankeri cross (WTP location) to the proposed reservoirs inside Unit-3 area.

The works includes Utility Roads of 9m ROW

- connecting to the existing WTP location at Gaddankeri cross (i.e., for construction of clear water transmission main) of about 9 Km road length.
- connecting to the proposed STP location behind Bagalakote Railway station (i.e., for construction of Wastewater pumping main) of about 6.66 Km.
- Additional Length of 2.0 km of approach road connecting Unit-3 main roads (minimum 24m ROW) is considered for improvements. These roads shall be identified and improved as per the directions of Engineer-in-charge.
- Ongrid Solar works shall be executed as per the directions of Engineer-In-Charge.
- The works also include the necessary surveys, geotechnical investigation, designs of all infrastructure services including the Operation & Maintenance works for 5 years as specified in this document.

3) Package-3:

- This package covers infrastructure works in Sector F, G & H. The works also include the necessary surveys, geotechnical investigation, designs of all infrastructure services including the Operation & Maintenance works for 5 years as specified in this document.

4) Package-4:

- This package covers infrastructure works in Sector I, J & K. The works also include the necessary surveys, geotechnical investigation, designs of all infrastructure services including the Operation & Maintenance works for 5 years as specified in this document.

5) Package-5:

- This package covers the electrical and its allied infrastructure works of KPTCL (Karnataka Power Transmission Corporation Limited) for construction of electrical sub stations inside the Unit – 3 area. The works also include the necessary surveys, geotechnical investigation, designs of all infrastructure services including the Operation & Maintenance works for 5 years as specified in this document.

Development of Infrastructure works for Unit 3 BTDA area shall include design and construction of the Infrastructure Works as described in the subsequent paragraphs.

The designs to be carried out for all the 11 Sectors and for all the infrastructure components (Civil, Electrical, Mechanical, etc.,) comprehensively as per the directions of the Engineer-In-Charge. However, the final designs approved by the Engineer-In-Charge shall be shared with all the Contractors of Unit-3 area for executing the works. Any observations on the approved designs shall be brought to the notice of the Engineer-In-Charge within 10 days of receipts of Final Design and based on the written instructions of Engineer-In-Charge, the works shall be carried out and shall be binding on

the Contractors for the performance of the systems during the Operation & Maintenance period.

However, Package-5 bidder shall carryout the designs of Sub station, Terminal bay (KPTCL) works comprehensively considering all the requirements & needs of all the Sectors (Sector A to Sector K) or all the four Packages (Package-1 to Package-4) as per the directions of Engineer-In-Charge.

The details such as quantities length, area, volume, nos, etc., are indicative and has to be reasertained the exact values / quantities by the bidders before tendering as per the approved Master Plan uploaded.

3.2. CHANGE OF SCOPE

The work specified hereinabove shall be treated as an approximate assessment. The actual works as required on the basis of detailed topographical survey, Geotechnical investigation and design shall be determined by the Contractor in accordance with the Specifications and Standards. Any variations in the works shall not constitute a Change of Scope, and except any variations in the works arising out of Change of Scope undertaken in accordance with the provisions of this contract.

3.3. ROAD NETWORK IN UNIT-3 AREA AS PER SCOPE

As per the Master Plan, based on the ROW, roads are categorized into eight types i.e., 9m, 12m, 18m, 24m, 25m, 30m, Non-Motorized Transport (NMT) (6m) and 18m ROW with 6m additional NMT i.e., (18+6) m ROW. The details are shown in below tables. 24m, 25m and 30m roads are Major roads which connects old city and Navanagar (Unit-1 & 3). By considering major roads as reference, the internal roads have been designed to match the FRL (Finished Road Levels). The proposed ROW & Package wise Road Length in Unit-3 area is provided in the Table 1

Table 1: ROW & Package wise Road Length in Unit-3 Area

Description	ROW	Package -1	Package -2	Package -3	Package -4	Total, Km
ROW wise Proposed Road Length (Km)	9m	16.29	17.66	30.35	35.24	99.53
	12m	12.69	18.62	11.43	11.09	53.83
	18m	3.37	4.27	2.76	2.41	12.81
	25m	1.44	1.65	4.52	4.77	12.39
	6m (NMT)	3.79	1.34	1.75	2.32	9.21
	24m (18+6)	1.23	1.10	2.31	1.94	6.57
ROW wise Existing Road Length (Km)	9m	0.12	0.50	0.31	0.00	0.94
	12m	0.10	0.35	0.50	0.00	0.95
	24m	2.29	0.00	0.00	0.00	2.29
	25m	1.00	1.66	0.00	0.00	2.66
	30m	0.77	1.67	0.00	0.84	3.28
ROW wise Total Road Length (Km)	9m	16.41	18.17	30.66	35.24	100.47
	12m	12.80	18.97	11.93	11.09	54.78
	18m	3.37	4.27	2.76	2.41	12.81
	24m (18+6)	1.23	1.10	2.31	1.94	6.57
	24m	2.29	0.00	0.00	0.00	2.29

Description	ROW	Package -1	Package -2	Package -3	Package -4	Total, Km
	25m	2.44	3.31	4.52	4.77	15.05
	30m	0.77	1.67	0.00	0.84	3.28
	6m (NMT)	3.79	1.34	1.75	2.32	9.21
Total Length, in Km		43.08	48.83	53.93	58.61	204.45

3.3.1. Cross Sectional Elements

The road width and cross section adopted for different ROW roads are tabulated as shown in the Table 2:

Table 2: Cross sectional elements adopted – ROW wise Roads

Sl. No.	ROW Roads	Carriageway (m)	Median (m)	Utility Corridor (m)		Landscape Corridor (m)		Footpath (m)		Cycle Track (m)		Total width (m)
				LHS	RHS	LHS	RHS	LHS	RHS	LHS	RHS	
1	9m	5.50	0.00	1.00	1.00	0.00	0.00	0.75	0.75	0.00	0.00	9.00
2	12m	7.00	0.00	1.50	1.50	0.00	0.00	1.00	1.00	0.00	0.00	12.00
3	18m	9.00	0.00	0.00	0.00	1.00	1.00	1.50	1.50	2.00	2.00	18.00
4	24m	14.00	0.50	0.00	0.00	0.00	0.00	1.50	1.50	1.50	2.00	21.00
5	25m	14.00	1.00	0.00	0.00	1.00	1.00	2.00	2.00	2.00	2.00	25.00
6	30m	18.00	1.00	0.00	0.00	1.00	1.00	2.50	2.50	2.00	2.00	30.00
7	NMT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	4.00	6.00
8	(18+6)m	14.00	0.50	0.00	0.00	0.00	0.00	1.50	2.00	2.00	4.00	24.00

For ROW 9m and 12m roads, Utility corridor and footpaths are flushed to carriageway level. Camber

- 2.5% cross fall is proposed for Bituminous and Concrete surfaces
- 3.0% cross fall is proposed for earthen shoulder
- 1.5% cross fall is proposed for Footpath and Cycle track

3.3.1.1. Utility Roads & Approach Roads

1. Apart from the project area road Infrastructure requirements, Roads are also required for connecting it to external utility infrastructures such as
 - connecting to the existing WTP location at Gaddankeri cross (i.e., for construction of clear water transmission main).
 - connecting to the proposed STP location behind Bagalakote Railway station (i.e., for construction of Wastewater pumping main).

Though the road networks exist in these locations to the project area, as the proposed Water transmission pipeline needs to be laid in the centre of the carriageway, it is anticipated that, the road would get damaged to an extent that, new road construction needs to be undertaken. Hence, a length of 15.66 Km (About 9 Km for Clear water

transmission and about 6.66 Km Road for Wastewater pumping main) of 9m RoW, additionally has been considered in the designs.

2. Additional Length of 2.0 km of approach road connecting Unit-3 main roads (24m ROW) is considered for improvements. These roads shall be identified and improved as per the directions of Engineer-in-charge.

3.3.2. Design and Construction of Roads

The **Design and Construction of Roads** shall be in accordance with IRC guidelines and MORT&H standards. Notwithstanding anything to the contrary contained in the Schedules. The Finished Road Level (FRL) shall be designed based on area drainage requirement.

Width of Carriageway:

Width of carriageway is as per the typical cross section drawings enclosed along with this Tender.

3.3.3. Typical Cross Sections

Typical Cross Sections details are given below in Table below

Table 3: Typical Cross Sections

Sl. No.	Road Name	Length (km)	ROW (m)
1	Local Street – 1 (9m ROW)	100.47	9
2	Local Street – 2 (12m ROW)	54.78	12
3	Collector Street – 3 (18m ROW)	12.81	18
4	Collector Street – 4 (25m ROW)	12.39	25
5	Collector Street – 5 (18+6m ROW)	6.57	24
6	Non-Motorised Transport – 6 (NMT)	9.21	6
7	Roads for external utility – 7 (9m ROW)	15.66	9
8	Rehabilitation of Existing Road – 8 (24m ROW)	2.29	24
9	Rehabilitation of Existing Road – 9 (25m ROW)	2.66	25
10	Rehabilitation of Existing Road – 10 (30m ROW)	3.28	30

Note:

1. The actual length of roads may vary as per detailed engineering design and site conditions.
2. Additional Length of 2.0 km of approach road connecting Unit-3 main roads (minimum 24m ROW) are considered for improvements. These roads shall be identified and improved as per the directions of Engineer-in-charge.

3.3.4. Geometric Design and Other Features

3.3.4.1. General

Road Geometry shall be prepared keeping in view safe passage of vehicle, Vehicular Comfort and safety of the vehicles. The design speed along the road length shall be as per IRC-86 2018, and speed shall be negotiated wherever necessary especially at curves, and super elevations shall be restricted to maximum 5.0% for vehicle comfort and safety on curve portions. For both flexible and rigid pavements 2.5% camber shall be provided to drain

– off the rainwater that falls on the road surface. As there is no scope of change in the alignment of the approved masterplan, at most care shall be taken to fit horizontal geometrics without compromising the adjacent plots.

Vertical profiles of the crossroads shall be designed to match the existing main roads FRL's. At most care shall be taken to design the profile to achieve the minimum cut and fill quantity. All the designs shall be carried out in accordance with IRC: SP:23, IRC: 86-2019, IRC: 38:1988 and other relevant codes. Any other Geometric design and other features of the Project Roads shall be in accordance with the Standards and Specifications enclosed with this tender.

3.3.4.2. Design Speed

The Design Speeds for different category of roads are given below in Table 4

Table 4: Design Speed

Sl. No.	Road Name	Design Speed (km/hr)
1	Local Street – 1 (9m ROW)	30
2	Local Street – 2 (12m ROW)	30
3	Collector Street – 3 (18m ROW)	40
4	Collector Street – 4 (25m ROW)	40
5	Collector Street – 5 (18+6m ROW)	40
6	Non-Motorised Transport – 6 (NMT)	15
7	Roads for external utility – 7 (9m ROW)	30
8	Rehabilitation of Existing Main Roads – 8 (24m ROW)	40
9	Rehabilitation of Existing Main Roads – 9 (25m ROW)	40
10	Rehabilitation of Existing Main Roads – 10 (30m ROW)	60

Note: To contain roadway elements within ROW the speed may be reduced at curve and approach to junctions

3.3.5. Junctions (At grade)

The road intersections / junctions are the most challenging aspect of the street design in an urban environment. Junctions are focal point of activity & decision, and a critical part of the city streetscape & transportation network. The function of a designed intersection is to control conflicting and merging streams of traffic, to minimize the delay including pedestrian and bicycle traffic. Following junctions has been identified and shall be considered for design as per IRC-SP-41, IRC-65-2017 and other relevant codes. Drawings pertaining to typical junction improvements of few major junctions are enclosed.

Junction details are given below in Table 5

Table 5: Major Junctions

Sl. No.	Major Junction No.	Junctions serving under sectors
1	MJ-01	Sector-A
2	MJ-02	Sector-A
3	MJ-03	Sector-B
4	MJ-04	Sector-B
5	MJ-05	Sector-C & D
6	MJ-06	Sector-A, & E

Sl. No.	Major Junction No.	Junctions serving under sectors
7	MJ-07	Sector-A & E
8	MJ-08	Sector-K & J
9	MJ-09	Sector-D
10	MJ-10	Sector-E
11	MJ-11	Sector-E
12	MJ-12	Sector-F & G
13	MJ-13	Sector-F & G
14	MJ-14	Sector-G & H
15	MJ-15	Sector-H
16	MJ-16	Sector-H
17	MJ-17	Sector-I
18	MJ-18	Sector-J
19	MJ-19	Sector-J
20	MJ-20	Sector-J
21	MJ-21	Sector-K

Any other minor or major junctions which are not listed in the Table 5 in the project area shall also be considered for design and execution.

3.3.6. Embankment & Pavement Design

Project area consists of 60% of Black cotton soil and 40% of gravelly soil, BC soil treatment or replacement with borrow soil shall be considered for embankment, subgrade, for filling in the utility corridor/footpaths. Any other components w.r.t construction of embankment and pavement shall conform to the Standards and Specifications enclosed.

3.3.6.1. Pavement Design

Pavement is primarily designed to support the traffic load, provide riding comfort, to reduce vehicle operating costs and provide efficient drainage. The pavement design involves the design of different layers and to decide the thickness of those pavement layers. The design of Indian pavements is primarily based on Indian Roads Congress (IRC) guidelines.

For 9m, & 12m ROW roads, flexible pavement is proposed with minimum thickness of DBM with 50mm and BC with 30mm with suitable base layers as per design. For 18m and above ROW roads, Rigid / Cement concrete pavement (minimum M-40 grade of concrete) is proposed with suitable base layers as per design.

Pavement design shall be carried out as per technical specification enclosed.

3.3.6.2. Type of Pavement

The pavement type for different roads and cross sections shall be as given below in Table 6

Table 6: Type of Pavement

Sl. No.	Road Name	Main Carriageway	Pedestrian Pathway/ Utility corridor/ Parking Lane
1	Local Street – 1 (9m ROW)	Flexible	
2	Local Street – 2 (12m ROW)	Flexible	
3	Collector Street – 3 (18m ROW)	Rigid	

Sl. No.	Road Name	Main Carriageway	Pedestrian Pathway/ Utility corridor/ Parking Lane
4	Collector Street – 4 (25m ROW)	Rigid	Interlocking Cement Concrete paver blocks
5	Collector Street – 5 (18+6m ROW)	Rigid	
6	Non-Motorised Transport – 6 (NMT)	Rigid	
7	Roads for external utility – 7 (9m ROW)	Flexible	
8	Rehabilitation of Existing Main Roads – 8 (24m ROW)	Whitetopping	
9	Rehabilitation of Existing Main Roads – 9 (25m ROW)	Whitetopping	
10	Rehabilitation of Existing Main Roads – 10 (30m ROW)	Whitetopping	

3.3.7. Design Requirements

3.3.7.1. Design Period

- Rigid / Cement concrete pavement shall be designed for a minimum of 30 years.
- Flexible pavement shall be designed for a minimum period of 20 years.

3.3.7.2. Design Traffic

Notwithstanding anything to the contrary contained in the Schedules, the Contractor shall design the pavement for minimum CVPD for Rigid pavement and MSA for Flexible pavement as given below in Table 7

Table 7: Design Traffic

Sl. No.	Road Name	Traffic CVPD (30 Years)	Traffic MSA (20 years)
1	Local Street – 1 (9m ROW)	-	4
2	Local Street – 2 (12m ROW)	-	4
3	Collector Street – 3 (18m ROW)	500	
4	Collector Street – 4 (25m ROW)	500	
5	Collector Street – 5 (18+6m ROW)	500	
6	Non-Motorised Transport – 6 (NMT)	50	-
7	Roads for external utility – 7 (9m ROW)	-	4
8	Rehabilitation of Existing Main Roads – 8 (24m ROW)	800	
9	Rehabilitation of Existing Main Roads – 9 (25m ROW)	800	
10	Rehabilitation of Existing Main Roads – 10 (30m ROW)	800	

Note: Traffic survey for arriving at CVPD / MSA shall be carried out to check the traffic on existing main roads and same shall be considered for design.

3.3.7.3. Non-Motorized Transport (NMT)

Non-motorized transport consists of cycle track and pedestrian pathway, for cycle track rigid pavement is proposed with application of coloured cold plastic paint and for pathway interlocking concrete paver blocks is proposed as per the guidelines given in IRC: SP: 63-2018., also seating benches, concrete bollards are proposed at regular intervals to avoid the entry of motor vehicles.

3.3.7.4. Utility Crossings

For 9m & 12m ROW roads, interlocking concrete paver blocks of minimum 0.8m width (along shall be proposed at 100m interval in 9m & 12m ROW roads).

For 18m and above ROW roads, two no. of NP3 pipes shall be proposed at every 150m interval with RCC chambers (with cover slabs designed to heavy vehicular load) on both side of the carriageway for accessing the utilities at the Footpath / Shoulders.

3.4. STRUCTURAL WORKS

Standard Basic Specifications

The “*Standard Specifications (civil works)*” issued by the **Karnataka PWD/ KUWSDB / BWSSB**, shall be followed for construction of General Works. Particular Technical Specifications for the works to be tendered are as set out in these Schedules. In the event of any discrepancy between the provisions of the Standard Basic Specifications and the Particular Technical Specifications, the provisions of the Particular Technical Specifications will prevail.

Particular Technical Specifications

Design Submissions

Contractor shall submit design basis report, design calculations, general arrangement drawings, reinforcement detail drawings and explanatory sketches, to the Engineer. Separate design calculations for foundations or superstructures submitted independent of each other shall be deemed to be incomplete and will not be accepted by the Engineer.

Submissions of detailed design calculations and Good for Construction drawings shall include the following as a minimum:

3.4.1. Detailed Design Calculations

1. One (1) Copy of a Compact Disc (CD) containing electronic files relevant to the structure’s modelling, analysis and design calculations (Microsoft Excel, STAAD Pro, etc.). Files submitted shall be in editable format.
2. Print copy (6 Copies) of the contents as submitted in the Compact Disc.

3.4.2. Good for Construction Drawings

1. One (1) Copy of a Compact Disc (CD) containing Autocad files (Civil General Arrangement, Structural Dimensions and Reinforcement Details) pertaining to the structure. Files submitted shall be in editable format.
2. Print copy (6 Copies) of the contents as submitted in the Compact Disc. Prints to be submitted on A1 Size Sheet as a minimum or A0 Size Sheet when required by the employer.
3. Bar-bending schedule indicating the number, shape and size of the rebars shall be submitted as part of the Reinforcement Details
4. Detailed drawing showing the location, number and depth of inserts shall be included for any structural steel inserts/Metal inserts in the structure such as rungs, bolted connections for ladders/railings, etc.
5. Location of Construction Joints and pour sequence shall be included on the drawing for base slabs, walls and top slabs.

Revised drawings shall be submitted by clouding at the location with the latest revision number and also show the history of revisions in a table format just above the title block. The

design considerations described hereunder establish the minimum basic requirements of plain and reinforced concrete structures, masonry structures and structural steel works. However, any particular structure shall be designed for the satisfactory performance of the functions for which the same is being constructed. The Contractor shall also ensure the stability of the partly completed structures.

3.4.3. Design Standards

All designs shall be based on the latest Indian Standard (IS) Specifications or Codes of Practice. The design standards adopted shall follow the best modern engineering practice in the field based on any other international standard or specialist literature subject to such standard reference or extract of such literature in English language being supplied to and approved by the Engineer. In case of any variation or contradiction between the provisions of the I.S. Standards or Codes and the specifications given along with the submitted tender document, the provision given in this Specification shall be followed.

All reinforced concrete structural design shall generally conform to latest editions of the following publications of the Indian Standards Institution:

I.S. 456	Code of Practice for plain and reinforced concrete
I.S. 875	Code of Practice for design loads for buildings and structures (Part I to V)
I.S. 3370	Code of Practice for concrete structures for the storage of liquids (Part I to IV)
I.S. 1893	Criteria for earthquake resistant design of structures (Part-1)
IS:1893 (Part 2)-	Criteria for Earthquake Resistant Design of Structures (Part 2 – Liquid retaining tanks– Elevated and ground supported).
I.S. 2974	Code of Practice for design and construction of machine foundations (Part 1 to 4)
IS 5525	Code of Recommendations for detailing of reinforcement in reinforced concrete works
I.S. 13920	Ductile Detailing of Reinforced Concrete Structures subjected to Seismic forces- Code of Practice
IRC: 6	Standard specification and Code of Practice for road bridges - section-II Loads and Stresses
IRC112	Code of Practice for Concrete Road Bridges.
IRC89	Guidelines for Design and Construction of River Training and Control Works for Road Bridges.
IRC SP13	Code of Practice for Small Bridges and culverts.
IRC 78	Standard Specifications and code of practice for road bridges
IS: 4701	Code of practice for earthwork on canals
IS-2911 all parts	Code of Practice for design and construction of pile foundations.

All structural steel design shall generally conform to the following publications of the Indian Standards Institution:

- (i) I.S. 800 : Code of Practice for general construction in steel
- (ii) I.S. 806 : Code of Practice for use of steel tubes in general building construction

3.4.4. Design Life

The design life of all structures and buildings shall be 50 years.

3.4.5. Durability

The design life is specified as 50 years. The special considerations made to ensure the long life of the structures are presented below.

The reinforced concrete that will go into the construction will be exposed to moderate environment conditions.

The use of structural steel is to be bare minimum as it is prone to corrosion.

To achieve durability of concrete it is to be ensured that there is minimal cracking and has a very low permeability. Also the concrete should have high strength, should be dense and compact. To reduce permeability and cracking, proper and adequate curing techniques shall be adopted. The crack width shall be checked with respect to the allowable crack width. Reinforcement in RC structures shall be placed at closer spacing to reduce crack width. Further, sharp corners, edges are to be avoided. All edges of RC sections shall be chamfered or rounded to avoid cracking.

To achieve higher design life of 50 years,

1) It is recommended to use structural concrete of minimum Grade M30 using Portland Pozzolana Cement as per IS: 1489-1991 (Part -1) with minimum content of PPC to 320 kg/m³ and maximum water binder ratio of 0.45 for water retaining structures as per IS3370 part I.

2) It is recommended to use structural concrete of minimum Grade M25 using Portland Pozzolana Cement as per IS: 1489-1991 (Part -1) with minimum content of PPC to 300 kg/m³ and maximum water binder ratio of 0.5 for other reinforced structures as per IS456.

Incorporation of fly ash in concrete improves its long-term strength and modulus of elasticity, reduces its long term shrinkage and creep, decreases its permeability significantly at later stages and enhances its long term durability properties. Use of pozzolanic material like fly ash in concrete reduces the amount of heat generated in the concrete mass that in turn reduces the thermal gradients and thermal stresses in concrete. It also reduces its water demand. It also offers higher resistance to chloride ion penetration and higher resistance to sulphate attack, if exposed to such chemicals. Pozzolanic Material like fly ash shall be of approved quality (IS 1489 part 1)

Low permeability of concrete can be checked in the concrete mix design at site by conducting the Rapid Chloride Penetration Test as per AASHTO T277 (ASTM C1202) and the chloride ion penetration can be checked to be within the range of 1000 -2000 Coulomb ("low permeability" category). To reduce permeability and cracking we must ensure that proper and adequate curing techniques are adopted.

The reinforcing bars used in RC structures shall be Thermo – Mechanically Treated (TMT) bars, as these have better corrosion resistance as compared to ordinary cold twisted bars and have a longer life. Further, the steel used shall be provided with adequate cover so as to protect it from corrosion. From durability and 2 hours fire resistance considerations, reinforcement in the concrete shall be protected by adequate concrete cover.

As an additional measure of protection, PVC water stops shall be provided at the construction joints in the water retaining structures.

The roof slab shall be protected with a layer of thermal insulation in the form of cast-in-situ autoclaved concrete as per IS: 2185-1984 (Part 3). This will be further protected by the membrane water proofing treatment.

The measures mentioned above, will go in the long way to protect the structure for the desired long life.

The bidder shall submit a note in his bid, on how he proposes to achieve the durability in the works under this tender in terms of design, materials and construction practices to achieve leak proof and durable water retaining structures.

Geotechnical Data

Geotechnical report and calculations has been given in tender only for guideline purpose. Contractor shall carry detail geotechnical investigation and accordingly shall carry out detail design before starting the work. It is mandatory to contractor to get design and drawings approval from client engineer before start of work.

Design Loadings

All buildings and structures shall be designed to resist the worst combination of the following loads/stresses under test and working conditions; these include dead load, live load, equipment load, water pressure, soil pressure, wind load, seismic load, stresses due to temperature changes, shrinkage and creep in materials, dynamic loads:

3.4.6. Dead Load:

This shall comprise all permanent construction including walls, floors, roofs, beams, columns foundations, partitions, stairways, fixed service equipments and other items of machinery. In estimating the loads of process equipment all fixtures and attached piping shall be included, but excluding contents, shall be considered.

The following minimum unit weights shall be considered in design of structures:

Loading Area	Load Intensity
Water	9.81 kN/m ³
Soil (irrespective of strata available at site and type of soil used for filling etc). However, for checking stability against uplift, actual weight of soil as determined by field test shall be considered	16.50 kN/m ³
Plain concrete	24.00 kN/m ³
Reinforced concrete	25.00 kN/m ³
Brickwork (exclusive of plaster)	20.00 kN/m ³
Siporex Blocks (exclusive of plaster)	8.00 kN/m ³
Plaster to masonry surface	20.00 kN/m ³
Granolithic terrazzo finish or rendering screed, etc.	24.00 N/m ² per mm thickness
MS chequered plates	78.50 kN/m ³
Structural steel	78.50 kN/m ³

3.4.7. Live Load:

Live Load (LL) shall include the superimposed loads due to the use/occupancy of the structure/building not including dead, wind or earthquake load. Live loads shall be in general as per I.S. 875 Part (II). However, the following minimum loads shall be considered in the design of structures:

Loading Area	Load Intensity (KN/m ²)
Inaccessible Roof	0.75
Accessible Roof	1.50
For Sloping Roof with slope greater than 10 degrees (if applicable)	0.75 kN/m ² less 0.02 kN/m ² for every degree increase in slope

Loading Area	Load Intensity (KN/m ²)
	over 10 degrees, subject to a minimum of 0.40 kN/m ²
Balconies, Corridors, passages, lobbies and staircases	5.00
Storage Area	5.00
Pantry	3.00
Kitchen	3.00
Cafeteria	4.00
Toilets	2.00
Electrical room (H T/ LT Panel room)	5.00
AHU / HUB	5.00
Mechanical room	5.00
UPS rooms/Transformer/Battery room	10.00
Lobby	5.00
floors supporting equipment such as pumps, valves etc.	10.00
Control Panel	10.00
DG room	10.00
Parking/ Ramp	5.00
Landscape/ Lawn	5.00

In the absence of any suitable provisions for live loads in I.S. Codes or as given above for any particular type of floor or structure, assumptions made must receive the approval of the Engineer prior to starting the design work. Apart from the specified live loads or any other load due to material stored, any other equipment load or possible overloading during maintenance or erection/construction shall be considered and shall be partial or full whichever causes the most critical condition.

3.4.8. Wind Load:

Wind loads shall conform to I.S. 875 Part (III).

3.4.9. Earthquake Load:

Seismic loads shall be computed according to latest IS 1893. Bagalakote area falls in Zone II of Seismic map of India. An importance factor appropriate to the type of structure shall be considered for design of all the structures. Environmental condition shall be considered appropriate as per IS 456, IS 800 and IS3370. Seismic loads for water retaining structures shall be computed according to IS 1893 part-2.

3.4.10. Impact Loads

Dynamic loads due to working of plant items such as pumps, travelling cranes, etc. shall be considered in the design of structures.

3.4.11. Water Pressure:

Water pressure is the horizontal pressure of the water acting on the structure. The water pressure shall be calculated as follows:

$$P = \gamma_w h$$

Where

P = water pressure

h = depth of water pressure

γ_w = Unit weight of water (kN/m³)

Hydrodynamic forces due to water shall be considered for water retaining structures as per IS1893-PART2-2014

3.4.12. Earth Pressure:

Earth pressure means the horizontal pressure of the soil acting on the underground structure and foundation. Earth pressure for all underground structures (walls of basement / tanks) shall be calculated using coefficient of active earth pressure or pressure at rest.

The earth pressure of submersed soil shall be calculated as follows:

$$P = K(\gamma_{sub}) h + \gamma_w h$$

Where

P = Submerged soil weight (kN/m³)

h = depth of earth pressure

γ_w = Unit weight of water (kN/m³)

K = Earth pressure coefficient

γ_{sub} = Submersed soil weight (kN/m³)

The earth pressure of saturated soil shall be calculated as follows:

$$p = K (\gamma_{sat}) h$$

Where

γ_{sat} = Saturated soil weight (kN/m³)

h = depth of earth pressure

K = Earth pressure coefficient

Uplift pressure:

Ground water table shall be considered as per geotechnical investigation. Appropriate seasonal variation shall be considered while calculating ground water table.. Uplift pressure due to ground water on foundation is calculated as follows:

$$p = \gamma_w H$$

Where

H = depth of foundation bottom from water table level (m)

γ_w = Unit weight of water (kN/m³)

3.4.13. Surcharge Load:

Minimum surcharge of 10kN/m² shall be considered for design of all underground structures to take in to account the construction load and vehicular traffic in the vicinity of structure. The soil parameters and ground water table will be considered as per soil investigation report. If structure is near the road, surcharge shall be considered as per latest IRC-6 code.

3.4.14. Vehicular Load

For any structure or pipeline below roads, shall be designed for Class A , Class AA or 70R whichever is governing of IRC loading.

3.4.15. Load Combinations

The individual members of the frame shall be designed for worst combination of forces such as bending moment, axial force, shear force and torsion as applicable. Permissible stresses

for different load combinations shall be taken as per latest IS 456 & relevant IRC codes. Structural Steel Building shall be designed in accordance with latest IS 800.

3.4.16. Collapse/Strength Load Combinations

For the strength design, factored load combinations as specified in latest IS 456, IS 875 part V & relevant IRC codes shall be used.

3.4.17. Serviceability Load Combinations

For ascertaining safety under service load conditions the **Serviceability** load combinations shall be used as per latest IS 456 & relevant IRC codes.

3.4.18. Load Combinations for Structural Steel Frames

The design load combinations for Structural Steel Frames shall be used as per latest IS800

3.4.19. Joints

Location of Construction joints and shrinkage strips shall be designed & planned by the contractor and only be used in locations pre-approved by Engineer. All construction joints for water retaining structures in RCC shall be made water tight using approved make water stops. PVC water-stops of 230 mm width shall be provided in all construction joints below ground level in addition to any joint which may be detailed on the drawing. To avoid segregation of concrete in walls, horizontal construction joints shall be provided at maximum 2.0 m spacings.

3.4.20. Expansion Joint

To relieve the structure from temperature stresses, appropriate expansion joints shall be provided as per design requirements & as agreed by the Client Conforming to IS codes. This spacing may vary depending of the Geometry & lateral load resisting system adopted for the structure. Gap for the expansion / separation joint shall be provided as per the provisions mentioned in IS 1893 part IV. The gap in between shall be filled by approved board & sealant with proper treatment to make the joint leak proof. Dual column system supported on single foundation shall be provided at the expansion joint.

3.4.21. Permissible Deflections

Permissible deflections shall be as per IS: 456 clause 23.2. Total deflection of various structural members shall be calculated as per ANNEX C of IS 456. Provisions of IS 1893 and IS 875 shall be followed for lateral deformations.

Crack Width

Water retaining elements like tank walls, base slab, cover slab etc. shall be designed for limiting crack width of 0.1 mm and elements in contact with soil like foundation shall be designed for limiting crack width of 0.2 mm and non water retaining elements like building floor slabs, beams shall be designed for limiting crack width of 0.3 mm as per IS 3370 and IS 456 respectively.

Design Conditions for Underground or Partly Underground Liquid Retaining Structures
All underground or partly underground liquid containing structures shall be designed for the following conditions:

- a) Liquid depth up to full height of wall: no relief due to soil pressure from outside to be considered.
- b) Structure empty (i.e., empty of liquid, any material, etc.): full earth pressure and surcharge pressure as applicable but minimum of 10 kN/m² shall be considered;

- c) Partition wall between dry sump and wet sump: to be designed for full liquid depth up to full height of wall on one side;
- d) Partition wall between two compartments: to be designed as one compartment empty and other full;
- e) Structures shall be designed for uplift in empty conditions with the water table till the finished ground level;
- f) Underground or partially underground structures shall also be checked against stresses developed due to any combination of full and empty compartments with appropriate ground/uplift pressures from below to base slab. A minimum factor of safety of 1.2 shall be ensured against uplift or floatation.
- g) All the liquid retaining structures shall be designed for maximum design crack widths of 0.1 mm for direct tension and flexure.
- h) All the structures wherever applicable shall be checked for overturning. Minimum factor of safety of 1.5 . Overturning shall be checked for empty condition
- i) All the structures wherever applicable shall be checked for sliding. Minimum factor of safety of 1.4 against sliding shall be considered. Sliding shall be checked for empty condition.
- j) All liquid retaining structures shall be designed for Seismic effects latest IS 1893 part 2 -2014.

3.4.22. Structural Analysis

General: The structural analysis will be carried out as **three-dimensional space** frames with finite elements using commercially available software STAAD Pro / ETABS

Mathematical Modelling of Structure: pump houses, office building, substation buildings etc shall be modelled analysed and using STAAD.Pro. Tank Structures shall be modelled analysed and designed using Finite Element Method. Pump house, office building, substation buildings etc shall be modelled, analyse and design as frame structures.

Analytical Result: Bending moments, Axial forces, Shear forces, Support reactions, Support displacements, Base pressures etc shall be considered while extracting force envelope.

3.4.23. Foundations

- (i) The minimum depth of foundations for all structures, equipment, buildings and frame foundations and load bearing walls shall be as per IS 1904.
- (ii) Maximum safe bearing capacity of soil strata shall be taken as indicated in geotechnical reports.
- (iii) Care shall be taken to avoid the fouling with the foundations of adjacent buildings or structure foundations, either existing or not within the scope of this Contract. Suitable adjustments in depth, location and sizes may have to be made depending on site conditions. No extra claims for such adjustments shall be accepted by the Employer.
- (iv) Special attention is drawn to danger of uplift being caused by the ground water table. All underground structural slabs shall be designed for uplift forces due to ground water pressure.

3.4.24. General Design Requirements

The following are the design requirements for all reinforced or plain concrete structures:

- a) All blinding and leveling concrete shall be a minimum 100 mm thick in concrete grade or M10 as shown in the drawing.
- b) For all Water retaining reinforced concrete structures, concrete shall be of a minimum M30 grade with a maximum 20 mm aggregate size for sections having 300 or

minimum thickness and with a maximum 40 mm aggregate size for sections having thickness more than 300 mm and for all other reinforced concrete structures, reinforced concrete shall be of a minimum M25 grade with a maximum 20 mm aggregate size for sections having 300 or minimum thickness and with a maximum 40 mm aggregate size for sections having thickness more than 300 mm. Reinforced concrete shall have minimum slump of 100 mm with maximum water cement ratio of 0.45.

- c) For all reinforced concrete structures, Portland Pozzolana Cement (PPC) shall be use confirming to latest IS: 1489
- d) The minimum clear cover to all reinforcement including stirrups and links shall be 50 mm for all water retaining structures. As design consideration to control crack, though general requirements of IS 3370 shall be followed, permissible crack width shall be limited to 0.1 mm for water retaining structures.
- e) The amount of reinforcement in each of the two directions at right angles within each surface zone should not be less than 0.35% of the surface zone cross section (As per Clause 8.1 of IS 3370-2-2009) for water retaining structures. For slabs, minimum of 10 mm dia bars shall be used to avoid any deformation of lesser diameter bars under loads prior to construction.
- f) The clear cover to the main reinforcing bars for different members shall be as per latest IS codes
- g) For reinforced concrete structures, reinforcement shall be HYSD TMTBARS of grade Fe 500
- h) All buildings shall have a minimum 1 metre wide, 100 mm thick plinth protection paving in M10 grade concrete or stone slabs/tiles. All plinth protection shall be supported on well compacted strata.
- i) All pipes and ducts laid below the structural plinth and road works shall be encased on all sides with concrete of grade M20 minimum.
- j) Any structure or pipeline crossing below roads shall be designed for Class A loading conforming to IRC-6.
- k) To relieve the upward ground water pressure, pressure release valves shall not be used.
- l) Maximum 40mm aggregate size shall be used for footings and rafts and maximum 20mm aggregate size for all other structural members.
- m) Grade slabs of liquid retaining structures shall have the following
 - (i) Minimum thickness of 200 mm.
 - (ii) Minimum percentage of distribution reinforcement shall be as per clause no 8 of IS 3370 (Part II).
 - (iii) Maximum length of pour panel considering partial or complete contraction joints shall be 7.5 meters.
 - (iv) Panels shall be poured in sequence and not in chessboard fashion.
- a) Walls of liquid retaining structures shall have the following:
 - (i) Minimum thickness of 200 mm.
 - (ii) Minimum percentage of distribution reinforcement shall be as per clause no 8 of IS 3370 (Part II).
 - (iii) Maximum length of pour panel considering partial or complete contraction joints shall be 7.5 meters.
 - (iv) Panels shall be poured in sequence and not alternately.

- b) Floors of water retaining structures shall have 50 mm thick Indian Patent Stone (IPS) finish of grade 1:1 ½:3. Joints in IPS shall be staggered from those in floor slab.
- c) For non liquid storage structures, expansion joints shall be located at a distance of about 45m, these expansion joints shall have appropriate & approved joint filler with sealing compound. Expansion joints for x for liquid retaining structures shall be spaced at 30 m maximum. .
- d) At all inner faces of construction and contraction joints in walls and floor slabs, a groove shall be provided. This groove shall be filled with joint seal compatible with water.
- e) Water test of water retaining structures shall be done in accordance with IS: 3370 (Part I).The depth of water for testing shall be upto the soffit of the top slab of the tank.
- f) Curing period shall conform to IS456 and IS3370.

The following minimum thicknesses shall be used for different reinforced concrete members, irrespective of design thicknesses:

(i) Walls for liquid retaining structures	:	200 mm
(ii) Roof slabs for liquid retaining structures (Other than flat slabs)	:	150 mm
(iii) Bottom slabs/Raft for liquid retaining structures	:	200 mm
(iv) Floor slabs including roof slabs, walkways, canopy slabs	:	125 mm
(v) Walls of cables / pipe trenches, underground pits etc.	:	200 mm
(vi) Column footings	:	300 mm
(vii) Parapets, chajja	:	100 mm
(viii) Precast trench cover	:	75 mm
(ix) Column Dimension	:	300 mm

3.4.25. Steel Structures

3.4.25.1. General

The requirements for design, material and fabrication including connections of steel framing for buildings, steel structures supporting equipment, pipe supports and miscellaneous structural steelwork like staircases, hand railing etc. are covered in this section.

3.4.25.2. Design Method

Design of all steel structural members shall conform to IS-800-2007.

3.4.25.3. Connections

All shop connections shall be welded (minimum structural weld 4mm throat thickness) except for shop connections for light platform framing etc. which may be bolted. Field connections may be bolted or welded. In case of welding, welders will be certified before they are allowed to work.

3.4.26. Materials in General

The term "materials" shall mean all materials, goods and articles of every kind whether raw, processed or manufactured and equipment and plant of every kind to be supplied by the Contractor for incorporation in the Works.

Except as may be otherwise specified for particular parts of the works the provision of clauses in "Materials and Workmanship" shall apply to materials and workmanship for any part of the works. All materials shall be of approved quality and sourced from the manufacturer. Relevant documents supporting the sources of the purchased material shall be submitted to the client.

Contractor shall supply the names of the supplier before the start of the work and place order only after the approval of the client. Approval of the material shall be done only after the samples identified by the Engineer is tested as. The Contractor shall thereafter keep the Engineer informed of the delivery dates of all materials.

Materials shall be transported, handled and stored in such a manner as to prevent deterioration, damage or contamination failing which such damaged materials will be rejected and shall not be used on any part of the Works under this contract. Appropriate and safe storage and stacking of all material is the sole responsibility of the contractor.

Material, Workmanship and Design Criteria

Materials specified will confirm to the latest edition of the relevant Indian Standard or other accepted standards. Specifications for materials will include sampling and testing as stipulated in the design standards. Detailed material specifications will be included in the Technical Specifications.

3.4.26.1. **Concrete**

a) Cement

Generally Ordinary Portland cement (OPC) conforming to IS: 8112 or Portland pozzolana cement (PPC) conforming to IS: 1489 shall be used for superstructure. It is recommended to use Portland pozzolana cement (PPC) as per IS 1489 for all structures.

b) Reinforced Cement Concrete (RCC)

Reinforced concrete conforming to Table 2; IS 456-2000 shall be used with 20mm and downsize graded crushed stone aggregate unless noted otherwise. The Minimum grade of reinforced cement concrete shall be M25 for moderate conditions of exposure for different structures and foundations as per Table 5 of IS456-2000. The Minimum grade of reinforced cement concrete shall be M30 for water retaining structures as per Table 1 of IS3370-2009.

The contractor has to submit the detailed methodology including quality control measures for the manufacture and supply of concrete to the project site and take prior approval of the engineer before proceeding.

c) Lean Concrete

Concrete of minimum 100 mm thickness of lean concrete grade M15 (by weight, using 20mm and downsize grade crushed stone aggregate) shall be provided under all RCC foundations.

Reinforcement Bars

- a) High Strength Deformed Thermo mechanically treated (TMT) Steel bars of grade Fe 550, conforming to IS: 1786 with minimum elongation of 14.5% and of approved make listed in the tender document shall be used.
- b) No re-rolled reinforcement bars shall be used.
- c) Couplers shall be used for laps of bars higher than 32 mm diameter

3.4.26.2. Aggregates

Selected aggregates of proper sizes shall conform to IS: 383.

3.4.27. Structural Design of RCC Elements

The design aims to achieve an acceptable probability that structures being designed will perform satisfactorily during their intended life. With an appropriate degree of safety, they should sustain all the loads and deformations of normal construction and use and have adequate durability and resistance to the effects of earthquake, wind as well as misuse and fire. Structures and structural elements will be designed by Limit State Method. Due consideration will be given to the accepted theories, experience and modern design philosophy and practices.

3.4.28. Samples and Tests of Materials

The Contractor shall submit samples of such materials as may be required by the Engineer and shall carry out the specified tests directed by the Engineer at the Site, at the supplier's premises or at a laboratory approved by the Engineer.

Samples shall be submitted, and tests carried out sufficiently early to enable further samples to be submitted and tested if required by the Engineer.

The Contractor shall give the Engineer seven days' notice in writing of the date on which any of the materials will be ready for testing or inspection at the supplier's premises or at a laboratory approved by the Engineer. The Engineer shall attend the test at the appointed place within seven days of the said date on which the materials are expected to be ready for testing or inspection according to the Contractor, failing which the test may proceed in his absence unless instructed by the Engineer to carry out such a test on a mutually agreed date in his presence. The Contractor shall in any case submit to Engineer within seven days of every test such number of certified copies (not exceeding six) of the test results as the Engineer may require.

Approval by the Engineer as to the placing of orders for materials or as to samples or tests shall not prejudice any of the Engineer's powers under the Contract.

The provisions of this clause shall also apply to materials supplied under any nominated sub-contract.

3.4.29. General Arrangement of structures

The following general guidelines shall be followed in the preparation of general arrangement of structures.

- Sufficient room shall be allowed between components of pumping stations, ESR, substations, administrative buildings, transfer stations and adjacent fixed structures to permit safe and convenient access for operation and maintenance.
- An area adjacent to all structures area shall be provided as maintenance lay down area.
- Fixed runways, lifting eyes or other means shall be provided to permit the removal of units that may be required to be removed during the course of its normal operational life for maintenance or any other purpose.

3.4.30. Orientation

The works shall be laid out within the confines of the Site in order to interface to the existing infrastructure of roadways and inlet and outlet pipe work. Underground services shall be relocated to accommodate the site layout after the approval of the Engineer.

3.4.31. Buildings and Structures

All the building and structure works shall generally comply with the following Employer's Requirements unless otherwise specified elsewhere.

1. All building works shall be of reinforced concrete framework.
2. All external walls above ground shall be in brick/ RC block masonry and shall be minimum 230 mm thick.
3. All internal partition walls shall be in brick/ RC block masonry. All internal walls shall be minimum 230mm thick. Toilet block internal partition walls shall be in 115 mm thick brick masonry.
4. All internal masonry surfaces finish shall have 12 mm thick plain faced cement plaster in cement mortar (1:4) with neat cement finish on top. Over this, one coat of primer and two coats of plastic emulsion paint of approved quality and shade shall be provided.
5. All external masonry surfaces and concrete surfaces with rough board finish shall have 20 mm thick sand faced cement plaster in two coats, base coat 12 mm thick in cement mortar 1:4 and finishing coat 8 mm thick in cement mortar 1:3. Waterproofing compound of approved make and quality shall be added to the cement mortar in proportions as specified by the manufacturer.
6. All RCC surfaces below ground shall be treated with anti-carbonation treatment
7. All external surfaces above ground level shall have one coat of primer and two coats of waterproof cement-based paint of approved quality and shade. A coat of silicone water repellent paint shall also be applied thereon.
8. Toilet areas, walls and ceilings, shall have one coat of primer and two coats of plastic emulsion paint.
9. Toilet floor slab shall be filled with brick bat coba (broken bricks in lime) and provided with waterproofing as per the specifications of an approved specialist waterproofing company.
10. The finished floor level in toilet areas shall be 25 mm below general finished floor level elsewhere in the building.
11. The flooring along with skirting in office building shall be of vetrified tiles of approved shade. 150mm high skirting shall be provided in these areas. Granite stone shall be provided for laboratory platforms fixed over double sandwiched cuddappah support as directed and the edges of granite is to be embedded into the wall.
12. Toilet areas shall be of ceramic tiles of approved shade. 1500 mm high dado, in 150 mm x 150 mm x 6 mm thick glazed tiles placed in cement mortar shall also be provided in these areas.
13. The toilet facilities shall include at least :
 - (i) 1 No. Water closet with white porcelain Orissa pan minimum 580 mm long with flushing cistern of 10 liters capacity.
 - (ii) 1 No. Urinal of sizes 600 mm x 400 mm x 300 mm flat back type in white porcelain separated by a marble partition of size 680 mm x 300 mm.
 - (iii) 1 No. wash basin of size 510 mm x 400 mm in white porcelain with inlet, outlet and overflow arrangements.

- (iv) 1 No. mirror of size 400 mm x 600 mm wall mounted type fitted over wash basin.
 - (v) 1 No. plastic liquid soap bottle
 - (vi) 1 No. chromium plated brass towel rails minimum 750 mm long.
 - (vii) All stopcocks, valves and pillar cocks shall be heavy duty chromium plated brass.
 - (viii) All fittings such as 'P' or 'S' traps, floor traps, pipes, etc.
14. All floor cut-outs and cable ducts, etc. shall be covered with precast concrete covers in outdoor areas and mild steel chequered plates of adequate thickness in indoor areas. All uncovered openings shall be protected with MS hand railing with minimum Class B pipes.
 15. All staircases shall be provided with Stainless MS hand railing for protection with minimum Class B pipes.
 16. The reinforced concrete roofs shall be made waterproof by application of an approved cement-based roof waterproofing providing brick bat coba with IPS finish. The finished roof surface shall have adequate slope to appropriately drain the storm water at the quick rate.
 17. For roofing drainage, uPVC rainwater down-take with all uPVC accessories shall be used. For roof areas up to 40 sq.m minimum two nos. 100 mm diameter down-take pipes shall be provided. For every additional area of 40 sq.m or part thereof, at least one no. 100 mm dia. down-take pipe shall be provided.
 18. Top surfaces of chajjas and canopies shall be made waterproof by providing a screed layer of adequate slope or application of an approved roof membrane and sloped to drain the rainwater.
 19. Building plinth shall be minimum 450 mm above average finished ground level around building.
 20. All Lintels over the openings shall be RCC with a cantilever canopy (Chajja). Minimum Chajja projection shall be 750 mm for rolling shutters, 600 mm for doors and 450 mm, with the width of the chajja larger than the opening by 150 mm on either side.
 21. All windows and ventilators shall have 25 mm thick Granite stone sills/ jambs bedded in cement mortar (1:3).
 22. All doors, windows and ventilators including all required accessories & frames shall be of aluminum conforming to IS: 1948 (latest).. Aluminum grills shall be provided in all the windows. Doors shall be in two panel and both panels shall be glazed/unglazed. Minimum weight of aluminum doors & windows shall be as follows.
 - I. Single Glazed Window: (Weights indicated shall be aluminum)
 - a) Openable

Outer Frame	:	Weight 0.70 kg/Rmt
Shutter Frame	:	Weight 0.97 kg/Rmt
Intermediate Mullion	:	Weight 0.97 kg/Rmt
Beading	:	Weight 0.31 kg/Rmt
 - Fixing Louvers windows/ventilators

Outer Frame	:	Weight 0.46 kg/Rmt
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II. Double Glazed Window

Outer Frame	:	Weight 0.72 kg/Rmt
Shutter Frame	:	Weight 0.97 kg/Rmt
Intermediate Mullion	:	Weight 0.98 kg/Rmt
Beading	:	Weight 0.31 kg/Rmt

III. Sliding Windows

Bottom & Top Frame	:	Weight 0.70 kg/m
Shutter Frame	:	Weight 0.42 kg/m
Interlocking Section	:	Weight 0.47 kg/m

IV. Aluminum Door

Outer Frame	:	Weight 2.508 kg/Rmt
Shutter Frame	:	Weight 2.508 kg/Rmt
Bottom Stile	:	Weight 2.508 kg/Rmt

Glazing shall be 6.0 mm thick glass.

23. Openings of the windows & ventilators shall be minimum 25% of the floor area
24. Ventilator shall be provided where height of floor is more than 3m. All windows and ventilators shall have wire mesh. Doors, Windows and Ventilators shall be of size as per schedule to be submitted by the Contractor for approval of Engineer. The minimum opening size shall be as below:
 Door of opening size 1.2m x 2.1m
 Door of opening size 0.75m x 2.1m for toilets
 Glazed windows of minimum size 1.2m x 1.2m
 Ventilators of minimum size 0.6m x 0.6m
25. Rolling shutters shall be made of 80 x 1.25 mm MS laths. Rolling shutter shall be of minimum size 2.5m wide x 3.0m high. Rolling shutter shall be provided in MCC cum panel room, chlorine tonner shed, at entry and exit of the pump house for access to pumps, motors, valves, panels and as wherever required.
26. All structural steel members shall be painted with two coats of enamel paint over one shop and one field coat of Zinc Phosphate primer.
27. All concrete channels and ducts used for conveying liquid shall have inside finish of type F2. The width of concrete channels shall not be less than 500 mm. All open channels shall be provided with MS hand railings.
28. Concrete Kerbs to be provided below the hand railing on the catwalks/pathways should be as per relevant IRC / IS Standards.
29. All units shall be provided with appropriate sign boards of approved material indicating the function of the rooms involved.
30. Wherever equipment and machinery are to be moved for inspection, servicing, replacement etc., suitable movable EOT crane as required shall be provided
31. The design of buildings shall reflect the climatic conditions existing on site. Office buildings shall as far as possible permit the entry of natural light, preference given to window openings protected by weather canopies.
32. All the walkways shall have minimum 1.0 m width.
33. Hand railings shall be minimum 32 NB medium MS pipe conforming to latest IS codes. Height of railing shall not be less than 1100mm. The distance between 2 vertical posts shall not be more than 1.5 metres.

3.4.32. Valve Chambers

All valve chambers, manholes are to be of adequate size to facilitate maintenance and operation. The base slab of valve chambers, manholes shall slope towards a sump pit from which water can be pumped to keep the chamber dry. All valve chambers, manholes shall be constructed in reinforced concrete. Chambers shall have removable cast iron / reinforced concrete covers, as appropriate, approach ladders and valve support.

The valve chambers for Water and Wastewater system shall be of RCC with minimum

- For Air valve- 1.5m x 1.5m chambers are proposed
- For Bulk meters and valves with actuators – 2.0m x 2.0m chambers are proposed

The minimum thickness shall be 0.15m and shall be designed to withstand class AA loading conditions.

Extension spindles with surface box: At suitable locations, valves shall be provided with extension spindles. The number of such extension spindles proposed in the project area is about 347 Nos; less than 150 mm dia 336 number and more than 150mm dia is 11 numbers is proposed.

3.5. WATER SUPPLY

3.5.1. Background

The water for Unit 3 area shall be tapped from the existing Balancing reservoir near the existing WTP location at Gaddankeri cross (Refer feeder main alignment drawings). From this point, water will be brought to the Clear Water Reservoir (CWR) within the project area by laying feeder main to the proposed Ground service reservoirs (GSR) / Existing Elevated service reservoir (ESR) in the project area. These service reservoirs are planned based on topography and the residual pressure requirements at the consumer level. From the GSR/ ESR water will be distributed by gravity to the consumers.

3.5.2. Potable water system

- Design, Construction, commissioning and maintenance of potable Water Feeder system from the tapping point at Gaddankeri Cross WTP location to the service reservoirs inside the project area of pipe diameters ranging from 250mm dia to 900mm dia for a length of approximately 17.00 KM. (DI -K-9 material / MS pipe with internal Epoxy coating and external coating of fibres, coal tar and solvent-based rubber modified bituminous primer) (gravity System).
This activity shall be part of Package-2 Tender works.
- Design, Construction, commissioning and maintenance of Ground level Service Reservoir of following Capacity
 - Two GLSR of 1.5 ML capacity proposed in Sector-E & Sector-I
 - Two GLSR of 0.5 ML capacity proposed in Sector-F & Sector-H
- Design shall be carried out for the entire Unit-3 area covering all Sectors (A to K), however Construction, commissioning and maintenance of potable Water distribution system (HDPE- PE 100 – PN8 / DI -K-9 material) (gravity System) of pipe diameters varying from 90mm to 500 mm dia including laying of parallel pipeline for pipe diameters more than 300mm for enabling House service connections.

Sl. No.	Packages	Pipe Length, Km	Transmission Main, Km
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1	Package-1 (Sector B, C & D)	74.04	-
2	Package-2 (Sector A & E)	86.35	16.98
3	Package-3 (Sector F, G & H)	97.34	-
4	Package-4 (Sector I, J & K)	98.78	-
	Total, Water supply systems	356.51	16.98

- The entire distribution zone shall be planned into different DMA (District Metered Area) so that, total incoming flow to a particular area can be measured.
- House service connection for individual plot accounting to 23,134 including communication pipe, meter chamber and valves. Package wise details of House Service connections are provided below;

Sl. No.	Packages	House Service Connection for Water Supply
1	Package 1	3,931
2	Package 2	4,500
3	Package 3	6,670
4	Package 4	8,033
5	Total	23,134

- Design, Construction and maintenance of Water Transmission / Distribution Main including its allied works such as thrust blocks, anchor blocks, concrete encasing of pipes, valve chambers, nalla crossings etc.
- Design of Surge protection system to control the maximum and minimum pressures within specified limits following the transient event. The maximum pressure anticipated should be less than the pipeline internal design pressure which is about 1.5 times the working pressure.
- Design and installation of Bulk flow meters at all Reservoirs and outlet locations.
- Wherever pipes lines are required to be laid in open (i.e crossing of nalla), DI pipe shall be laid instead of HDPE pipe in that particular portion. Also, for the HDPE pipe crossing the culverts, the same shall be embedded with DI pipe of higher diameter.

3.5.3. Water Supply Appurtenances

The water supply system (feeder and distribution system) shall be provided with the following appurtenances and specials etc as per the criteria given below,

- a) The mains shall be provided with sluice valves, particularly near start of the pipeline for isolation purpose. The size of the valve shall be same as the pipe dia upto 350mm dia and 2/3rd of the pipeline for pipes more than 350mm dia.
- b) The scour valves shall be provided at low points or at natural drainage for emptying the pipe when necessary. The drainage arrangement will consists of

- DI special having drain pipe at bottom and a sluice valve connecting to the nearby drain. The size of the drain valve will be as per CPHEEO guidelines.
- c) The pipeline shall be provided with air valves at every summit point and also at about 1 Km distance, suitably. The size of the air valve will be as per CPHEEO guidelines.
 - d) All the valves shall be enclosed in valve chambers with manhole cover and frames as per relevant standard and codes.
 - e) At bends and gaps suitable specials shall be provided. The use of specials shall be kept to minimum possible.
 - f) Concrete anchor and thrust blocks in M25 concrete shall be provided at bends and below valves to avoid movement of pipe as per the standard.
 - g) At crossing of roads, concrete encasing with re-filling and compaction along with necessary base layers and bitumen layers shall be provided.
 - h) Design and installation, maintenance of Electrical driven Actuator valves for valve operations in the feeder main system and at the inlet of the reservoirs.
 - i) Design and installation, maintenance of House service connections with HDPE saddle straps (for HDPE pipes) and DI straps (DI pipes), MDPE communication pipes, Water stops, globe valves, specials as per the requirements.
 - j) Above information is for guidance of the bidder. It is Contractor's responsibility to complete the work in all respect. Any additional work, if required, to complete the work shall be done by contractor at no extra cost and the same shall be deemed to be included in his Price Bid. Such additional work shall be as per design criteria and specifications as mentioned in Tender document and as approved by Employer.

3.5.4. Population and water demand

Population and water demand for the project is provided in the Table 8 and Table 9

Table 8: Population Details

Sl. No.	Description	Population
1	Residential Area	1,23,600
2	Commercial	35,714
3	CA Population	6,467
	Total	1,65,781

Table 9: Unit Water Demand

Sl. No.	Type of use	Domestic	Recycled	Total	Unit
Residential Area					
1	Residential	135	-	135	LPCD
2	Visitors	-	-	-	LPCD
Non-residential Area					
1	Commercial area	45	--	45	LPCD
2	Utility area	45	--	45	LPCD

Note: UFW losses to be considered as 15% for the designs

3.5.5. Design Criteria

3.5.5.1. Potable water feeder main

Potable water from tapping point shall be conveyed to the proposed service reservoirs by laying feeder mains. The limit for detailed design and implementation starts from the tapping point to Inlet of all Service reservoirs including required interconnections. The design parameters shall be as follows:

Table 10: Design Parameters

Sr. No.	Design Parameters	Value
1	Minimum Residual Pressure above FSL of GLR/ ESR (Peak flow)	2.0 m
2	Supply hours	22 hours
3	Design Velocity	0.8.0 m/sec - 1.5 m/sec
4	Max. Unit head loss in the Pipe	8 m / Km.
5	Hazen's William coefficient	130
6	Pipe Material	DI K-9 / MS pipeline
7	Clear Cover	1m above the crown of pipe

The feeder main should be designed based on economical size of pipeline and water hammer calculations with reference to CPHEEO Manual and relevant IS codes.

The summary of the potable water feeder main system is as under

Table 11: Summary of Portable water feeder main system

Sl. No.	Diameter (mm)	Material	Length (m)	Total Length after including 5% Additional Length for Wastages & Unforeseen (m)
1	250	DI	2335	2451.75
2	350	DI	923	969.15
3	400	DI	1320	1386
3	450	DI	1248	1310.4
4	500	DI	1560	1638
Sub Total			7386	7755.3
5	700	MS	8786.0	9225.3

Sl. No.	Diameter (mm)	Material	Length (m)	Total Length after including 5% Additional Length for Wastages & Unforeseen (m)
Sub Total			8786	9225.3
Grand Total			16173	16,980.6

3.5.5.2. Ground Storage Reservoir

The design parameters for the GSR shall be as follows:

Table 12: Design Parameters for GSR

Sr. No.	Design Parameters	Value
1	Minimum storage capacity of GSR	8 Hours of average daily water requirement of the project area (only 50% of the total water requirements including losses shall be executed in Phase 1 and balance as Phase 2); Layout preparation for accommodating the Phase 1 GSR and Phase 2 GSR shall be planned along with the compound wall construction by the bidder.
2	Maximum storage capacity of Zone wise ESR	1.5 ML- 2 Nos (Sector-E & Sector-I) 0.5 ML- 2 Nos (Sector-F & Sector-H)
4	Type	Circular type – RCC reservoir
5	Foundation	Raft foundation / Pile Foundation

3.5.6. Potable Water Distribution System

The design parameters for the Potable water distribution system shall be as follows:

Table 13: Design Parameters for distribution system

Design Parameters	Value
Minimum Residual Pressure at all nodes in the D/S system during Peak hours	7 m
Peak factor for design of water distribution system	2.5
Losses as Unaccounted for water (UFW) to be considered for designing	15% losses
Bedding: for pipe diameters up to 400 mm for pipe diameters greater than 400 mm.	Minimum Depth of Murrum encasement around the pipe 150 mm 200 mm
Clear cover above the crown of pipe	1 m (minimum)
Basis of supply to the consumers	24 x 7 and on gravity
Hazen's William coefficient	130 (DI/MS) 140 (HDPE Pipe)
Pipe Material	HDPE (PE -100/ PN 8.0)/ DI K-9 / MS pipe with internal Food grade epoxy lining and External PolyEurathane coating

Design Parameters	Value
	- Up to 250mm dia – HDPE 250-500mm dia DI 600mm and above MS Pipe
Software for designs	Water GEMs
Network type	Loop network-Gravity

The summary of the distribution system is as under

Table 14: Summary of Distribution System

Sl. No.	Pipe Material	Outer Dia	Package-1	Package-2	Package-3	Package-4	Total Length (m)
1	HDPE	90	65,153	76,310	77,828	71,669	2,90,959
2	HDPE	110	1,575	4,854	13,230	19,383	39,042
3	HDPE	160	3,211	1,552	3,549	1,785	10,097
4	HDPE	200	3,150	620	840	2,730	7,340
5	DI K-9	300	951	2,855	1,890	2,205	7,901
6	DI K-9	400	0	161	0	133	294
7	DI K-9	450	0	0	0	880	880
8	Total		74,040	86,351	97,337	98,785	3,56,513

3.5.7. Training

The Contractor shall provide on-site training on HDPE/DI pipe laying, jointing, testing, maintenance, operation, leak detection etc., to the personnel authorized by EMPLOYER.

3.5.8. Supply of Equipment's

It will be under obligation of Contractor to supply following brand-new equipment's of approved makes and specification to employer before handing over of project:

- Leak detecting machine- 2 nos.
- Electrofusion fusion welding machine – 2 nos

The equipment shall be procured only after obtaining necessary QAP approval from employer

Performance requirement

The contractor shall achieve the following Performance guarantees during the maintenance period

- Unaccounted for Water (UFW)- Less than 5%
Unaccounted for Water (UFW) is the difference between the total amount of water entering the distribution system and the total amount consumed (billed). This is the total volume of water in litres lost during the month.
- Quality compliance- 95%
Quality Compliance in 24x7 Area" shall mean the proportion measured in percentage terms of the number of water samples conforming to the water quality measured near the tapping point out of the total water samples tested for checking the quality both in terms of residual chlorine content, chemical quality and bacteriological quality during

the six months under review in the project area. Water samples shall be measured at every monthly at the locations specified by BTDA.

- Minimum Pressure compliance-95%
Pressure Compliance means the proportion of pressure measurements complying to 7 m residual pressure at customer tap undertaken during the months under review in the project area. Pressures shall be measured at the critical points every fortnightly at the locations specified by the Owner / at the installed pressure gauge locations.

3.5.9. Commissioning of the system

On completion of the Trial Run, commissioning of the System shall be done by the Contractor. The total time allotted for commissioning of the full system is 30 days. The commissioning of the system shall be considered as fully achieved after the entire system has run continuously for a period of 7 days without any breakdown to the satisfaction of Engineer. If continuous run is not achieved fully to the satisfaction of Engineer, the Contractor has to do the needful to achieve the same at his cost.

All the Costs including the cost of staff, water, electricity, chemicals, other consumables that are required for Operation & Maintenance of System during Commissioning period shall be borne by Contractor. It is the obligation of contractor to dispose off the water from the pipeline, if required as per the direction of employer to the nearest water body/ drain in an environmental friendly manner without affecting the project area.

3.5.10. Documents to be submitted by contractor

Contractor shall submit following documents/drawings for approval from employer before execution of work.

- Topographical survey report along with relevant drawing
- Geotechnical Investigation report
- Hydraulic Design of all components
- Structural Design of all RCC structures
- Design, general arrangement and drawing for instrumentation and automation system
- Design Calculations of all components
- Drawings for all components

3.6. SEWERAGE

3.6.1. Background

The Sewerage network system shall be designed for the expected domestic sewage flows from residential as well as other sectors such as commercial & institutional. Sewage flow from a plot shall be primarily based on the estimated population for the plot and per capita sewage generation rate as per the CPHEEO manual/ National Building Code norms / as per Development Plan.

There are seven zones planned for the project area contributing to the proposed 16.4 MLD STP (outside the project area; this includes additional 5MLD of waste water generated from the nearby areas).

3.6.2. Description of the works

Hydraulic design of sewage collection system including house service connections.

- Design, Construction and maintenance of Sewage collection system for the entire project area having a **total length of 210.39 KM.**, including laying parallel pipeline for pipe diameters more than 300mm along with other appurtenances.

The packagewise pipe length along with its diameter is provided below;

Sl. No.	Dia (mm)	Material	Package – 1 (m)	Package – 2 (m)	Package – 3 (m)	Package – 4 (m)	Total Length (m)
1	150	DWC SN 8	38,354	39,768	52,083	51,143	1,81,348
2	150	DWC SN 8 Add Rider line length	4,181	2,050	2,595	3,343	12,169
3	200	DWC SN 8	512	3,140	777	581	5,010
4	250	DWC SN 8	1,679	1,762	604	1,002	5,046
5	300	RCC NP3	198	276	63	149	686
6	350	RCC NP3	923	810	344	351	2,428
7	400	RCC NP3	1,493	0	355	712	2,560
8	450	RCC NP3	37	0	411	0	448
9	500	RCC NP3	0	0	0	649	649
10	600	RCC NP3	11	0	0	24	35
11	700	RCC NP3	20	0	0	0	20
		Total =	47,408	47,806	57,232	57,954	2,10,399

Design, Construction and maintenance of Sewage pumping main system for a **total length of 16.17 KM.**

The summary of the Sewage pumping main is provided below;

Sl. No.	Diameter (mm)	Material	Length (m)	Total Length after including 5% Additional Length For Wastages & Unforeseen (m)
1	140	HDPE	133	140
Sub Total			133	140
1	200	DI	1,052	1,105
2	300	DI	1,662	1,745
3	400	DI	1,446	1,518
4	500	DI	11,196	11,659
Sub Total			15356	16,027

Sl. No.	Diameter (mm)	Material	Length (m)	Total Length after including 5% Additional Length For Wastages & Unforeseen (m)
Grand Total			15,489	16,167

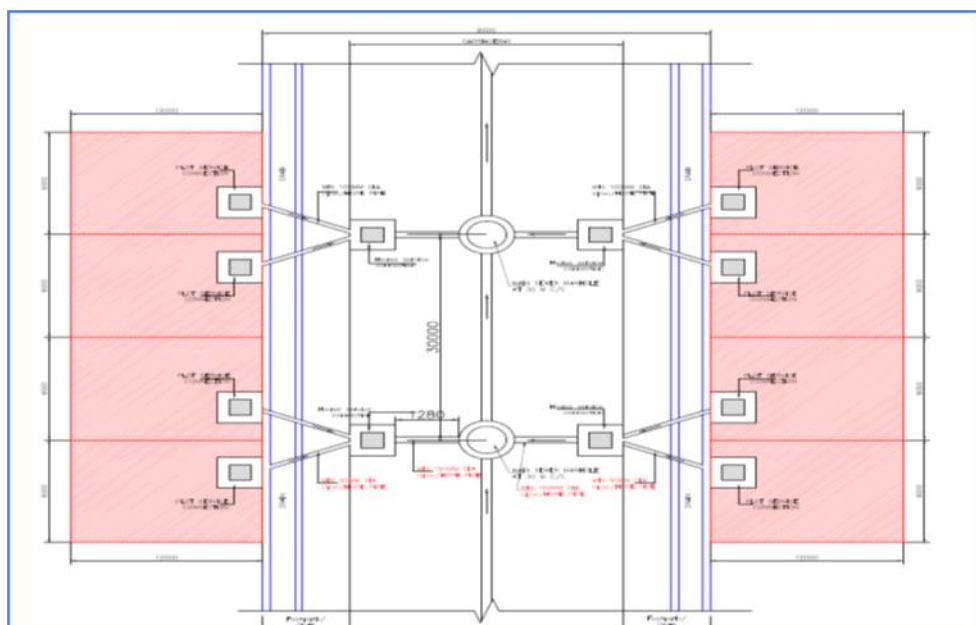
Design, Construction and maintenance of Sewage pumping station of the following capacities along with other appurtenances as per CPHEEO manual.

Table 15: Details of SPS

Sl. No.	SPS No.	Q (MLD)	H (m)
1	SPS-1	5.565	20
2	SPS-2	17.22	24
3	SPS-3	9.71	25
4	SPS-4	2.867	18
5	SPS-5	0.092	12
6	SPS-6	2.274	25
7	SPS-7	12.043	28

- The above pump stations are indicative only and the contractors can further reduce the no. of SPS based on his design without compromising the design criteria set in this document and as per the directions of Engineer-in-charge.
- Design, Construction and maintenance of plot service connection of RCC chamber of **33,701 No**, Pkgewise house service connection details are provided below; this includes Inspection chamber connecting to Manhole as indicated in the figure below;

Sl. No.	Packages	(No of plots +House service connection for 2 plots+CA area)
1	Package 1	5,646
2	Package 2	6,602
3	Package 3	9,703
4	Package 4	11,750
Total		33,701



- Above information is for guidance of the bidder. It is Contractor's responsibility to complete the work in all respect. Any additional work, if required, to complete the work shall be carried out by contractor at no extra cost and the same shall be deemed to be included in his Price Bid. Such additional work shall be as per design criteria and specifications as mentioned in Tender document and as approved by Employer.

Table 16: Sewerage generation calculations

Sr.	Type of Population	Unit	Total of per capita sewage excluding infiltration
1	Residential	LPCD	$135 \times 0.8 = 108 \text{ LPCD}$
2	Commercial	LPCD	$45 \times 0.8 = 36 \text{ LPCD}$

Population and Sewerage Generation

The projected population and sewage generation calculations is provided below:

Table 17: Projected population and sewage generation

Sl. No.	Sector	No. of plots	Residential Population	Commercial Population	CA Population	Total Population	Sewage Generation
							MLD
1	A	1811	9,910	10,807	242	20,959	1.61
2	B	1097	5,680	213	818	6,711	0.71
3	C	1426	7,620	1,346	483	9,448	0.97
4	D	1162	8,135	2,906	401	11,442	1.09
5	E	2525	16,690	4,268	2224	23,182	2.23
6	F	2905	14,790	2,784	497	18,071	1.88
7	G	1608	9,750	-	282	10,032	1.16
8	H	1911	10,095	2,920	282	13,297	1.32
9	I	2218	11,350	2,652	369	14,371	1.46
10	J	2690	14,445	5,906	359	20,711	1.95
11	K	2881	15,135	1,913	511	17,558	1.88

Sl. No.	Sector	No. of plots	Residential Population	Commercial Population	CA Population	Total Population	Sewage Generation
							MLD
		22234	1,23,600	35,714	6,467	1,65,781	16.26 MLD

3.6.3. Design Criteria

3.6.3.1. Sewage Collection Network

- Peak factors shall be considered based on contributory population to arrive at the peak flows as per CPHEEO manual.
- Design formula: Manning's formula
- System design: Gravity system
- Coefficient of Roughness: as prescribed in CPHEEO manual, 1993 / 2013.
- Pipe Material: DWC pipe upto 250mm and above RCC of NP3 Class as per IS 458.
- Bedding for Sewers: as per the relevant standards.
- Minimum size of sewers: 150mm
- Maximum depth of sewer system: 4.0m
- Design capacity of sewers: 80 % at ultimate peak flow
- Self cleansing velocities: Minimum velocity : 0.6 m/s (present peak flows)
: 0.8m/s (design peak flows)
- Maximum velocity: 2.5m/s
- As per relevant CPHEEO guidelines
- Depth of cover: The minimum depth of cover at sewers start is 0.9 meters
- Per capita sewage generation shall be 80% of potable water supply.
- In the hydraulic design of sewers, an allowance for infiltration for the project area shall be considered as per Part A of CPHEEO Manual, Nov 2013
- Peak factor for sewerage system shall be based on contributing population for domestic sewage as per CPHEEO sewerage manual, 2013.
- Manning's formula shall be adopted for design of gravity sewers with coefficient of roughness as specified in CPHEEO manual.

Sr. No.	Design Parameters	Value
1.	Ground water infiltration	As per CPHEEO manual
2.	Peak Factor	2.25
3.	Capacity of conduits	80% full at peak flow
4.	Minimum velocity	0.6 m/s – minimum velocity at initial peak flow 0.8 m/sec –peak flow
5.	Depth of cover	0.9 m Minimum depth of cover will be provided over top of pipe at the start of the sewers.
6.	Bedding for Sewers	Bedding Factor Type of Bedding Up to 1.9 Granular 1.9 -2.8 Concrete Cradle Bedding with Carefully compacted backfill (PCCB)

		2.8-3.4	Reinforced concrete cradle (RCCB)
		> 3.4	Reinforced concrete encasement (RCE)
7.	Manholes	@ 30 m c/c distance and at junctions	

3.6.3.2. Sewage Pumping station

- Peak factors ranging from 2 to 3.0 are considered for design peak flows as per CPHEEO manual.
- Velocity in pumping mains range from 0.6 m/sec to 2 m/sec.
- Wet well volume is generally computed based on the pump capacity and number of starts and stops per hour as given below. However individual cases need to be studied separately.

$$\text{Wet well volume, } V = 0.25 \times Q/N$$

(Considering design year flows)

Where Q is pumping rate in cum/hr of largest pump installed.

The value of N is related to the number of starts per hour and it is not advisable to exceed 6 Starts per hour. Accordingly, the value of N in the design is to be taken as 10 minutes for smaller pump capacities but 15 minutes is desirable and hence, N is No of starts and stops per hour considering manual start / stop also (N=4).

- Maximum sewage level in the wet well will be 300 mm lower than the maximum level of sewage in the lowest incoming sewer to avoid surcharge after considering the head loss through screens (clean / partially clogged) and gate openings.
- Velocity through the screen is 0.9 m/sec to 1.2 m/sec at peak flow.
- Sufficient slope shall be provided on the wet well floor towards the pump bell mouth to reduce accumulation of solids.
- Hazen William's Coefficient shall be considered as 140 for HDPE PE 100 PN 10.
- Minimum residual head is considered as 3m for pump head design.
- The Sewage pumping system shall be designed along with the ancillary units such as Compound wall of solid block walls, DG room cum panel rooms of 99 sqm of area with 2 rolling shuttered and fire door. The Twin operators quarters of 109sqm of an area as per structural drawing finishing with Glazed Vitrified tiles. Underground tank of (3.5mx2.0x1.5m) and polyethylene water storage tanks of 1000liters for each building, including the site grading, internal road network of 3.5m wide along with storm water drainage system with security cabin of (3mx3m). Work shall be done by Refer SPS layout Drawing enclosed. Complete as per the directions of Engineer In-charge.
- The summary of the sewage pump station is provided below

Table 18: Summary of SPS provided

SI No	Sector	SPS No	Q (mld)	H (m)	Pumps	HP of Pump
1	Sector -A	SPS- 1	5.565	20	2W+1S	30
2	Sector -C	SPS- 2	17.22	24	2W+1S	91
3	Sector -F	SPS- 3	9.71	25	2W+1S	60
4	Sector -F	SPS- 4	2.867	18	2W+1S	15
5	Sector -H	SPS- 5	0.092	12	2W+1S	1.5
6	Sector -G	SPS- 6	2.274	25	2W+1S	15
7	Sector -K	SPS- 7	12.043	28	2W+1S	94

3.6.3.3. Sewage Pumping main-

- Pumping Main:** The diameter of the pumping main shall be selected based on the economic analysis of the pumping main
- The minimum velocity shall be as per CPHEEO guidelines to prevent settlement of grit and the maximum velocity is selected so as to minimize erosion of the pipe.
 - The pipe material to be used in DI – K9 pipe suitable for sewage system as per the relevant IS code.
 - The minimum residual head at the delivery shall be 3m
- Design parameter for Sewage pumping main

Table 19: Design parameters for SPS

Sr. No.	Design Parameters	Value
1.	Minimum Residual Pressure at delivery	3m
2.	Peak factor for design	As per CPHEEO manual
3.	Bedding: for pipe diameters up to 400 mm for pipe diameters greater than 400 mm.	Minimum Depth of Murrum encasement around the pipe 150 mm 200 mm
4.	Clear cover above the crown of pipe	1 m (minimum)
5.	Hazen's William coefficient	130 (DI/MS) and 140mm for HDPE
6.	Pipe Material	HDPE (PE -100/ PN 8.0) upto 150mm dia and DI K-9 pipe

3.6.3.4. Manhole

- Precast RCC manholes.
- The manhole frame and cover proposed shall be of Steel Fibre Reinforced Concrete (SFRC) conforming to the relevant IS codes.
- Sizes of Manhole is as per relevant CPHEEO manual/ IS codes.
- The summary of the manholes proposed are

Table 20: Summary of Manholes

Sl. No.	Types of Man-hole	Package-1	Package-2	Package-3	Package-4	Total
1	1.2m Diameter					
	i)1m depth	1,178	1,243	1,427	1,585	5,433
	ii)2m depth	139	138	203	229	709
A	Total 1.2m Diameter	1,317	1,381	1,630	1,814	6,142
2	1.5m Diameter	0	0	0	0	0
	i)1m depth	0	0	0	0	0
	ii)2m depth	156	154	175	152	637
	iii)3m depth	123	77	107	52	359
	iv)4m depth	27	13	42	1	83
	iv)5m depth	0	0	0	1	1
B	Total 1.5m Diameter	306	244	324	206	1,080
	Total manholes Nos, (A+B)	1,623	1,625	1,954	2,020	7,222

3.6.4. General requirements

- Design, construction and maintenance of Sewer collection network including manholes, vent shafts etc.

3.6.4.1. Sewerage Appurtenances

- **Manholes:** Manholes shall be constructed at the locations as per the relevant codes. The manholes shall be circular and shall be of precast RCC as per the relevant specifications. The manhole spacing in general shall be 30m or more and at every junction, change in direction or change in diameter of pipe or as per the directions of Engineer in Charge. The manhole cover and frame shall be of heavy duty Steel Fibre Reinforced Concrete (SFRC) /CI / DI material and shall be capable of withstanding Class AA loading as per IRC and shall conform to IS: 12592 (Part I & II) for manholes up to 1.2m dia. For manholes greater than 1.2m dia, SFRC/RCC manhole cover and frames (heavy duty class-HD 20) shall be provided. The inspection and testing of manhole frames and covers shall be done at factory in presence of Engineer and the cost of such inspection shall be made by the contractor and shall be deemed part of the pipeline works. The entire height of the manhole shall be tested for water tightness as per the relevant specifications / Engineer In charge.
- **Connection of pipes and bedding:** Suitable pipe material with bedding shall be used. The pipe material used and its laying joining, testing and commissioning shall confirm to relevant IS codes. Granular bedding shall be provided for pipes as per the relevant IS codes. Road side chambers (House connection chambers) shall be constructed of RCC with Medium duty SFRC covers and frames as per the relevant IS codes.
- **Concrete encasements:** shall be provided in those places where the sewer lines cross the road or as per the directions of the engineer in charge. The pipe shall be encased all-around in 15 cm thick cement concrete 1:5:10 (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size) with compacted

sand or gravel. The material and construction shall confirm to relevant IS codes.

- **Chamber for property connection** Property connection chambers (at least 1 for each property) shall be constructed at suitable locations. Chamber shall be of rectangular sections made of RCC with suitable manhole covers and frame as per the relevant IS codes. All Masonry works shall be suitably plastered and painted as per the relevant IS codes.
- Design and Construction of Twin operator quarters and security room at all 7 numbers of Sewage pumping station.

Twin operator quarters shall not be not less than 1000 Sqft, and one security room with toilet facilities (of minimum 200 sqft area) aesthetically pleasing land mark building to accommodate Sewage pumping station operator, including kitchen and toilets facilities with vitrified flooring, aluminium windows, aluminium doors (External), Internal Flush Doors, with internal & external lighting systems such as wiring, LED lighting fixtures, switches, sockets, breakers, incoming power supply arrangement (standby arrangement and UPS), appropriately air conditioned and ventilated well lit with natural light and necessary public conveniences with all top grade plumbing fixtures & fittings with proper approach roads, landscaping, providing sufficient safety lighting for whole of plot ; the building will be designed with provision for horizontal / vertical expansion complete with all installations.

Indicative Bill of Material for Client Side Infrastructure at different command / viewing centers is given below:

- Civil including electrical wiring systems and LED bulb installations.
- Vitrified Flooring,
- Paint work
- Partitioning (as per requirement)
- Doors and Locking
- Insulating, Electrical Control System
- Rodent Repellant System
- UPS (adequate capacity to cover all with 30 min. Backup)
- One underground water sump of 10000 litres with Submersible motor of 1HP capacity each along with one overhead Water tank of 1000litres capacity for each building separately

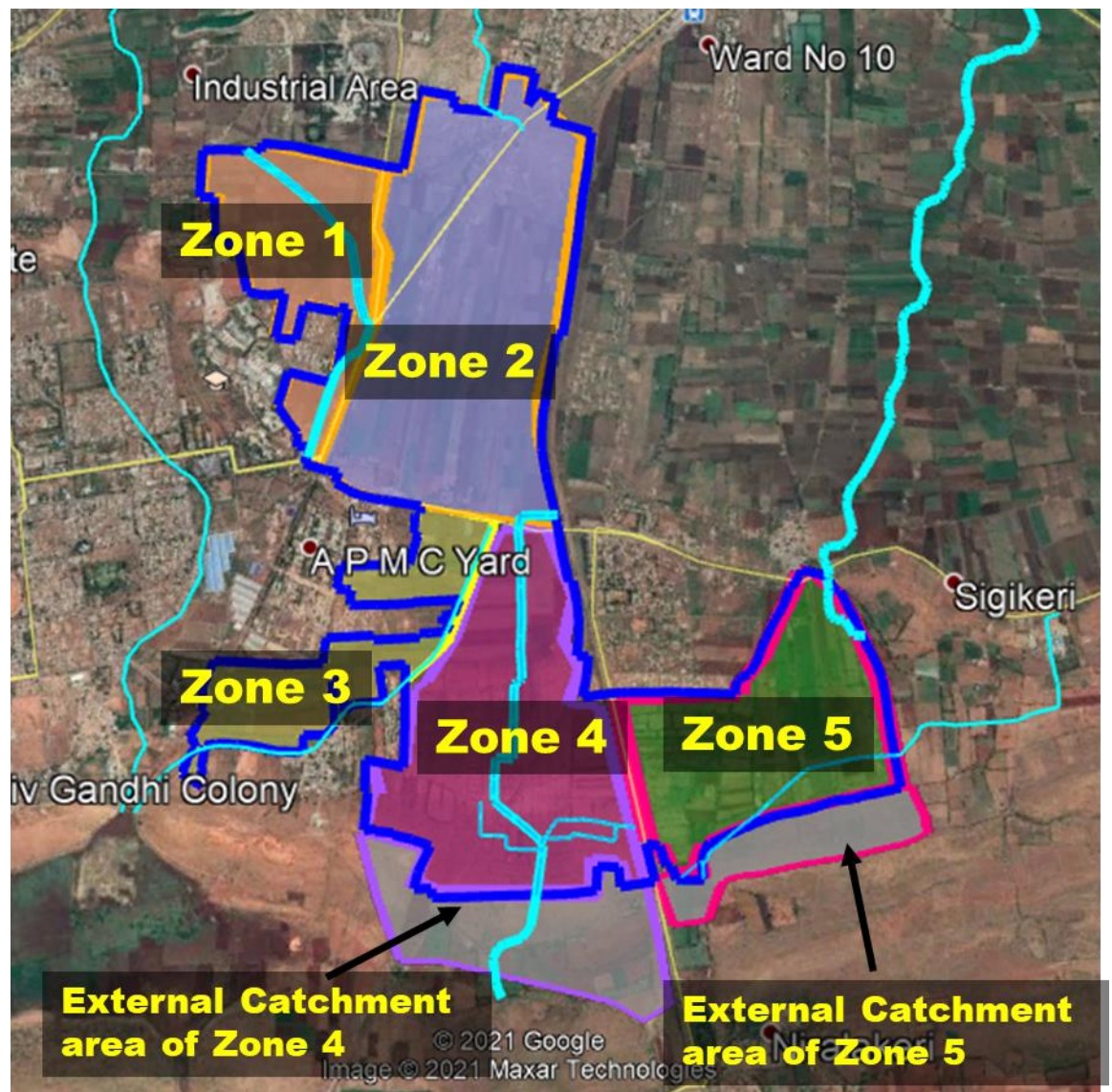
3.7. STORM WATER DRAINAGE

3.7.1. Background

The total project area is of 1885 acres. About 275 Acres open land located near the southern part of project area contributes as the external drainage catchment. Apart from this, there is no major external catchment contributing to the project site. Considering the external catchments, the total catchment area considered for design of storm water drains is about 2160 Acre.

There are many canal systems running within and adjacent to the project boundary. The terrain is undulating in nature with maximum elevation around 570m and the minimum elevation is 530m.

The project site is divided into five catchment zones. Old Muchkundi road, Bangalore – Highway, Railway line and Muchkundi canal acts as ridge lines in the project area. The proposed Catchment zones including internal and external catchments is provided below:



The storm water runoff from plot drains and roads gets collected via Vertical grating /catch basins located at the curb of roads which in turn gets collected in the storm water drains.

The project site is divided into five catchment zones. The contributory area for each drain has been worked out separately and the catchment details are provided below

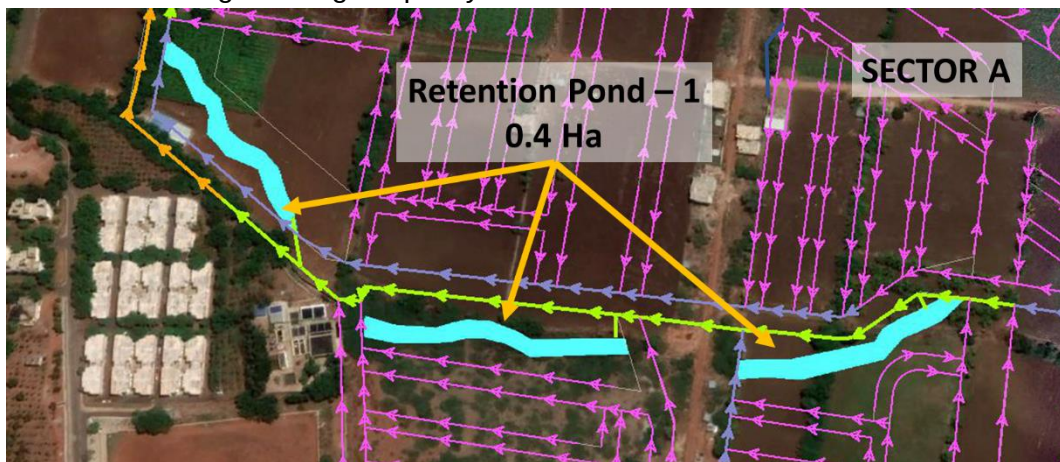
Sl. No.	Catchment Zones	Internal Catchment Area (HA)	External Catchment Area (Ha)	Total Area (Ha)
1	Zones-1	99.88	0	99.88
2	Zones-2	263.32	0	263.32
3	Zones-3	73.88	0	73.88
4	Zones-4	124.23	72.70	196.93
5	Zones-5	193.93	38.30	232.23
	Total	755.24	111.00	866.24

3.7.2. Description of the works

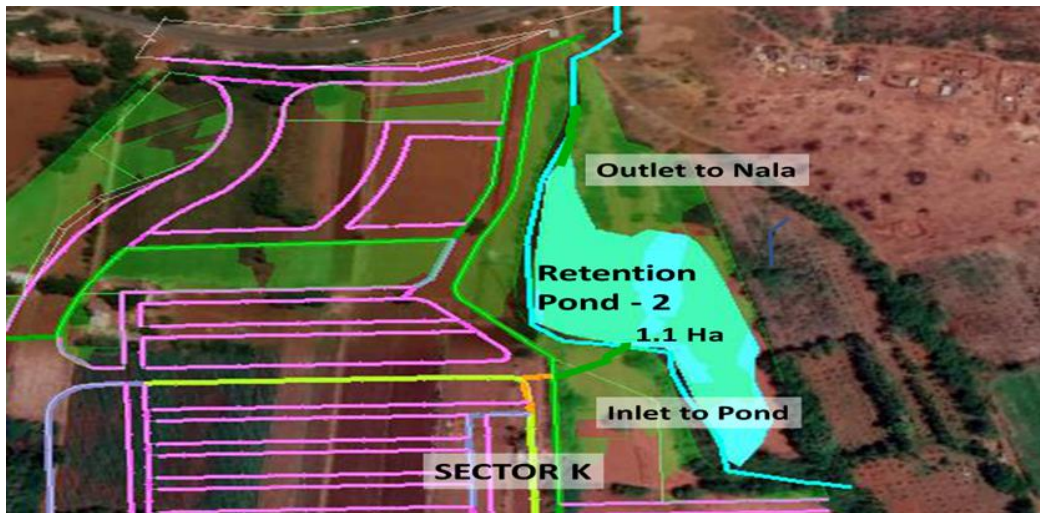
3.7.2.1. Storm Water Drainage water system

Storm water drains adjacent to the existing and proposed roads (under this Contract) shall be sized for a rainfall intensity, allowing for 100% runoff. Drains adjacent to roads shall be in reinforced concrete of M20 grade minimum and cover slab shall be of minimum M25 grade. The storm water drainage system shall also be designed to cater to the run-off from the existing plot areas and structures, if necessary, depending upon the site topography. The work involves, Hydraulic design of storm water collection system including Parcel connections. Remodeling / integration of the existing collection system to the possible extent with suitable rehabilitation works.

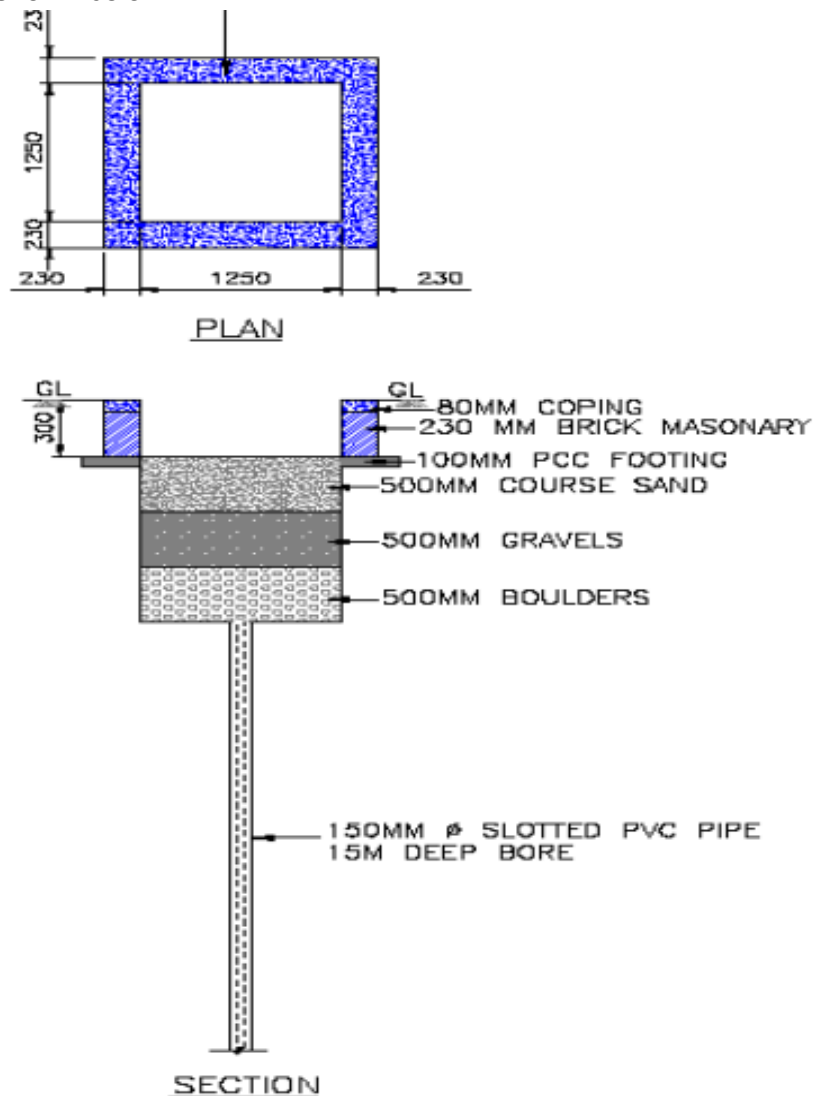
- Construction of RCC storm water drains of 376.5 KM for the entire project area.
- Construction of Grit chambers along the roads of 0.5m X 0.5m X 0.5m depth for roads width more than 12 m wide RoW roads (a total of 13540 numbers).
- Construction of four Primary drains for a length of 8.23KM including earthwork excavation, RCC side walls with earthen bottom and chain link fencing inside the project area.
- Construction of 3 Primary Drains of 14 Kms including the necessary CD works, i.e., Earth work, Excavation, RCC drain walls with earthen bottom and chain link fencing.
- Dismantling and construction of new RCC Box drain in the existing APMC area – 2 Numbers of 350m each.
- Construction of Earthen retention pond in sector A along the primary drain/ canal of 0.42 ha having a storage capacity of 12.60ML



- Construction of Earthen Retention Pond in an area of 1.10 ha having a storage capacity of 33.50 ML



- Construction of ground water recharge structures along with silt trap – 100 numbers at suitable locations as per the directions of Engineer In charge and as per the drawings shown below



3.7.3. Catchments

Project area is divided into 5 major catchments, each catchment comprises of various small sub-catchments. The outfalls are proposed considering the topography of the Area, availability of government land, location of natural drain etc.

Storm water generated from Catchment-1, Catchment-2 and Catchment 3 will contribute to outfalls connecting to existing Muchkundi Nala and Catchment-4 and Catchment 5 connects to Shigikeri nala present outside the project area. The above details are tentative in nature and are subjected to changes by the operator during his detailed engineering phase.

3.7.4. Design Criteria

- **Computation of Design Flow:** Rational formula $Q_p = CIA/360$ shall be used
- Frequency of Storm / Return Period
 - **For bridges:** 25year return period
 - **For road side drains, residential and commercial:** 2 year return period restricting the velocity to 3m/s but analysed for 5 year return period
- **Depth-Duration of Rainfall:** Past 30 year rain fall data collected from the nearest Rain Gauge Station (From IMD station) shall be used
- **Time of Concentration:** The empirical formula, (Kirpich) shall be used
- **Co-efficient of Runoff :** CPHEEO / as per the Surface drainage design Manual, US department of Transportation)
- **Method of Computing Flow:** Manning's formula.
- **Co-efficient of Roughness:** as per Relevant IS / International standards
- **Rainfall Intensity**

The past 30 years rainfall data from the **Bagalakote rain gauge station** has been considered for formulating IDF curves. IDF curve details are provided in below table.

IDF Curve Details

Return period (T in Years)	Rainfall Intensity (mm/hr) for duration in minutes (tc)									
	5	10	15	30	45	60	90	120	150	180
2	56	52	49	41	35	31	24	20	17	15
5	72	67	62	52	44	39	31	26	22	19
10	82	76	71	59	51	44	36	30	25	22
25	95	88	82	69	59	51	41	34	29	26
50	105	97	91	76	65	57	45	38	32	28
100	114	106	99	82	71	62	49	41	35	31

- Other Design Parameters

The design parameters for the drainage system shall be followed as per the following table.

Design Parameters

Sr. No	Design Parameter	Value	
1	System	Gravity system	
2	Minimum and maximum velocity	As per CPHEEO manual	
3	Time of Concentration	As per CPHEEO manual	
4	Coefficient of Run off	As per CPHEEO manual	
5	Manning's 'n' value	As per CPHEEO manual	
6	Minimum Free Board	Drain Width (m)	Free Board (m)
		< 0.3	0.1
		0.3 to 0.9	0.15
		0.9 to 1.5	0.3
		>1.5	Depends on discharge

3.7.5. Main drain/ Canal:

The summary of the Main drain length within the project is provided below

Sl. No.	Primary Drain	Length (m)	Width (m)
1	P1	2157	6
2	P2	626	10
3	P3	355	10
4	P4 – Muchkundi Canal	2710	3.5
5	P5 – GRBC Canal	2475	5.5
	Total	8323	

3.7.6. Primary Nala:

The summary of Primary Nala outside the project area which as to be executed Package-1 is provided below:

1. Muchkundi Nala - 7.80 Km
2. Shigikeri Nala - 3.10 Km
3. Keradi Hospital Drain - 2.30 Km
- Total - 13.20 Km**

3.7.7. Roadside drain

The summary of the Road drain length is provided below

Sl. No.	Packages	Drain Length, km
1	Package-1 (Sector B, C & D)	74.93
2	Package-2 (Sector A & E)	91.38
3	Package-3 (Sector F, G & H)	109.37
4	Package-4 (Sector I, J & K)	115.29
	Total, Storm water drains	390.97

3.8. INFORMATION AND COMMUNICATION TECHNOLOGY

3.8.1. General Requirements:

The scope of work covers the design, engineering, supply, installation, testing & commissioning of all the Control, Instrumentation and Automation equipment/system as specified for Upgradation of Sewage Pumping System (SPS) along with required accessories. The offer shall comply with the latest applicable codes and standards as prevailing on the date of submission of the bids.

Adequate instrumentation, control & automation facilities shall be envisaged for the proposed system, with a view to achieve safe, reliable & trouble-free operation of the equipment and safety of the operating personnel through user-friendly man-machine communication.

All the field-mounted transmitters shall be 'Smart' type. The instrumentation system shall be based on 4-20 mA DC signals, generally working on two-wire signal system with superimposed digital signal as per HART protocol. In addition to required measurements and controls, adequate sequential and safety interlocks, monitoring and display of all process parameters shall also be provided. All the signals/contacts between field & automation equipment shall be connected by suitable cables. The instrumentation & control equipment to be provided shall be suitable for continuous duty & for round-the-clock operation of the plant throughout the year.

Any equipment/accessories not explicitly indicated in this specification but considered essential for proper functioning of process shall be included in Bidder's scope of work and supply.

3.8.2. Scope of Work:

Bidder's scope of work & supply shall include, but not limited to, the following:

- a) Design, engineering, supply, storage, erection, testing and commissioning of all the field instruments, control room & automation equipment.
- b) Design, engineering, Construction and maintenance of ICT Duct (7way Multi duct) for optical fibre for a length of 463.48 Km; for roads with less than or equal to 12m RoW, one pipe shall be laid on both sides of the road and for roads with more than 12m RoW, two pipe shall be laid on both sides of the road and one in the median.
- c) Design, engineering, Construction and maintenance of RCC Manholes / Chambers of 1.0m x 1.0m (Clear dimension) in size with 15cm wall thickness along with cover slab designed to with stand Class AA loading designed as per relevant IS codes at every 50m intervals and at every change in alignment and at junctions i.e., about 7,822 numbers.
- d) Pkgewise length of 7-way multi duct (OFC pipe ducts) and chambers are provided below;

Packages	Length of OFC Pipe Ducts (m)	Access Chambers (Nos.)
Package-1	94.92	1,508

Packages	Length of OFC Pipe Ducts (m)	Access Chambers (Nos.)
Package-2	115.22	1,913
Package-3	120.03	2,085
Package-4	133.31	2,316
Total	463.48	7,822

- e) Bidder shall execute complete Instrumentation & Control package on turnkey basis to the satisfaction of Engineer. Bidder shall comply with all the requirements of scope of work and supply.
- f) All field instruments (gauges, sensors, transmitters, switches, flow meters, Analysers) as required for monitoring /control / alarm/ interlocking functions shall be provided.
- g) All hardware and accessories like branch cable trays from field sensors to Junction boxes & from junction boxes to PLC cabinets, impulse tubes with fittings & accessories, drain/vent valves, root valves, cable glands, structural frames/supports, expander & reducer etc. as required for complete & proper installation of the instrumentation & control equipment, are included in bidder's scope of supply & work.
- h) PLC based control system complete with cabinets, processor modules, I/O modules, power supply modules, communication modules & networks and other associated hardware. PLC based automation system shall be designed using adequate redundancy features. HMIs along with PLC panel & other peripherals shall be installed in the control room.
- i) Central Control Room equipment to be installed with all required Hardware & Software. All the Pumping System SCADA to be connected through GSM/GPRS gateway. Necessary High speed internet connection to be arranged by contractor at Central SCADA Room end and Pumphouse end for connecting all the SPS HMI to main control room SCADA.
- j) Central Control Room will be under Surveillance of CCTV Camera. 2 Nos. of CCTV Camera with all accessories for storing data will be provided by bidder. The room should be protected from unauthorised accessing and required Access Control System to be provided for this purpose.
- k) Supply of UPS of adequate capacity, with battery backup (SMF Lead-Acid batteries) of minimum one (1) hour. AC/DC power distribution with adequate number of wired spares (minimum 20% after commissioning) breakers and 230V AC/ 24V DC converters (redundant) for I&C Equipment and System.
- l) Supply, laying & termination of Instrumentation, Control, Power & any other special cables as required for entire system shall be under Bidder's scope. Scope shall also include preparation of engineering documentation like cable schedule and Inter- connection schedule.
- m) PC, consoles & other peripherals shall be of industrial grade & of latest available configurations.

- n) Electronic earth pits, as per applicable standard & also meeting automation vendor's requirement and including supply & laying of earthing cables with required accessories shall be under Bidder's scope.
- o) Bidder's scope shall also include supply of spares & consumables for successful commissioning and establishment of performance guarantee of the offered plant equipment & system.
- p) Submission of drawings & documentation as specified in this bid document.
- q) Bidder shall arrange for training of Purchaser's personnel for automation & special instrumentation items at manufacturer's works and at site and shall be included in his scope. Details & modalities of which will be mutually discussed and finalised later.
- r) Bidder's scope also includes arranging visits by respective instrumentation & automation equipment manufacturer's competent representatives at site, as & when required, during erection & commissioning.
- s) It is not the intent to completely specify all details of design and construction herein. Nevertheless, the Instrumentation & Control system shall conform to high standard of engineering, design and workmanship in all respects and shall be capable of performing satisfactorily in continuous commercial operation under the specified environmental conditions.
- t) Bidder shall include all necessary and supplementary items & equipment in his proposal, required for completeness, safe & efficient operation of the offered system, even though these may not have been mentioned in this specification.

3.8.3. Design basis:

- a) The monitoring and control system for the proposed plant shall be designed & implemented through a Programmable Logic Controller (PLC) based automation system, covering the total functional & operational requirements of the system involving measurement, control, alarm & interlocking functions. All the process & electrical parameters shall be monitored in SCADA system. PLC system selected shall be OPC compatible.
- b) Centralized SCADA System shall be provided for interconnecting all SPS data, in which the automation equipment will be installed. PLC system shall be provided with hot redundancy features, one no. of Engineering-cum-Operator station (ES-cum-OS) along with a printer, peripherals & accessories, as required. PLC based automation system shall be of latest industrially available configuration.
- c) The PLC system shall be provided with hot redundant, fault-tolerant features, redundancy in processor, power supply modules, communication modules (I/O bus as well as HMI bus) and communication network, bump less switchover from the active system to the standby system in the event of a fault.
- d) The PLC I/O modules shall be hot swappable, i.e. card changeover, card wiring removal or communication cable change shall be possible on-line (PLC running) without causing any process interruption, bump or nuisance trip or any loss of fidelity during such action. In case of hot swap of I/O card or card wiring removal, the interruption shall be limited to the subject card

related I/Os only. Online PLC programme modification shall be possible without stopping the processor.

- e) All analog cards shall be differential type. The cards and processors shall be of same family and series. I/O modules shall have 3 levels of Isolation- a) Channel to Channel Isolation, b) Channel to power Isolation & c) Channel to Ground Isolation.
- f) Channel level diagnostic features shall be available in HMI. The engineering station forms the focal point of the control system design and acts as container of the complete control system application.
- g) The operation & status monitoring of the motorized valves shall be performed from the PLC.
- h) Local instruments like pressure gauges, pressure switches, temperature gauges, level gauges, level switches etc. shall be provided as per the process requirement for proper functioning of the plant.
- i) All the instrumentation & automation equipment and their accessories shall be supplied from approved manufacturers, whose successful performance has been established by record of satisfactory operation in process plants.
- j) Separate electronic earthing system with dedicated earth pit shall be provided by the bidder for ICA equipment. Bidder shall also be responsible for the laying of the network of electronic earthing cables including all the applicable accessories.
- k) Bidder shall be responsible for engineering, selection and connection of all components and sub systems to form a fully complete system whose performance is in accordance with functional, parametric and other requirements of this specification. It is not the intent to specify all individual system components since the bidder has full responsibility for engineering and furnishing of a complete system meeting the monitoring and control requirements of all equipment associated with the system.
- l) Bidder shall support for spares & services for PLC including HMI software and operating System for at least next fifteen (15) years from the date of commissioning.
- m) The tagging, numbering & colour philosophy shall be as per as per ISA standard.
- n) Instrumentation, Control & Automation (ICA) system shall be designed, manufactured, installed and tested to ensure the high standards of operational reliability. Instruments mounted in field and on panels shall be suitable for continuous operation. All electronic components shall be adequately rated and circuits shall be designed so that change of component characteristics shall not affect plant operation.
- o) All ICA equipment shall be suitable for continuous operation. Unless otherwise specified, all instruments shall be tropicalized. The outdoor equipment shall be designed to withstand tropical rain. Wherever necessary, space heaters, dust and waterproof cabinets shall be provided. Instruments offered shall be complete in all respect with all the necessary mounting accessories.
- p) Unless otherwise specified, the normal working range of all indicating instruments shall be between 30% and 70% of the full-scale range.

- q) Unless otherwise stated, degree of protection for field mounted electrical and electronic instruments shall be IP 65. All instruments of submersible type shall be protected to IP 68.
- r) Unless otherwise stated, overall accuracy of all measurement systems shall be $\pm 1\%$ or better of the measured value.
- s) Dual redundant SMPS shall be used for powering 24 V DC Instrumentation, Control & Automation equipment.
- t) For all the field mounted transmitters, output signal shall be 4-20 mA DC isolated with HART Protocol (version 6 & above) and field transmitters shall be provided with the back lit LCD/LED display.
- u) Lockable & tamperproof enclosure shall be provided for all the field mounted instruments.
- v) FRP Canopy shall be provided for all the field instruments to protect the instruments from rain, sunlight and weather conditions.

3.8.4. General Design Requirements

- a) Instrumentation, control & automation (ICA) system shall be designed, manufactured, installed and tested to ensure the high standards of operational reliability. Instruments mounted in field and on panels shall be suitable for continuous operation. All electronic components shall be adequately rated, and circuits shall be designed so that change of component characteristics shall not affect plant operation.
- a) Electronic instruments shall utilize solid state electronic components, integrated circuits, microprocessors, etc., and shall be of proven design.
- b) All digital outputs from the instruments shall be volt free. The relay/switch contacts shall be rated for the voltage of the circuit in which they are to be wired.
- c) All analogue displays shall be of digital type with no moving parts.
- d) Zero and span adjustments shall be provided for all instruments.
- e) After a power failure, when power supply resumes, the instruments and associated equipment shall start working automatically.
- f) The instruments shall be designed to permit maximum inter-changeability of parts and ease of access during inspection and maintenance.
- g) The field instruments i.e., the instruments mounted outside the control panel shall be mounted at a convenient height of approximately 1.2 meters above grade platform.
- h) The instruments shall be designed to work at the ambient conditions of temperature, humidity, and chlorine contamination that may prevail. The instruments shall be given enough protection against corrosion and all the wetted parts of the instruments shall be non-corrosive.
- i) All field instruments and cabinets/panel mounted instruments shall have tag plates/name plates permanently attached to them.
- j) The performance of all instruments shall be unaffected for the $\pm 10\%$ variation in supply voltage and $\pm 5\%$ variation in frequency simultaneously.
- k) Unless otherwise specified, SS 304 double compression glands with PVC shroud shall be used for glanding the cable in field instruments and instrument control panel.

3.8.5. Detail Scope of Work:

The objective of this work is to design/ upgrade the sewerage collection system by introduction of different Field Instrumentation and Automation equipment in sewerage system and central monitoring of Sewerage pumping system operation. The sewerage supply system includes Different SPS. Process automation system based upon utilization of an industrial grade PLC and PC systems including all the network instruments is proposed for sewerage system.

The sewage pumping station automation system will include Field Instruments, Programmable Logic Controller (PLC), based control panels for the pumping stations. The reliable instruments connected to PLC assure real time monitoring of the main technical parameters of sewage Pumping System. The data acquired by PLC will communicate to Central SCADA system (Supervisory Control and Data Acquisition) represent the support for optimization of the process and data driven Decision Support System. The PLC System at Pump House uses HMI to ensure the process supervision and remote-control functions based on wireless communication components for GSM / GPRS data transfer. The sewage pumping system includes complete SCADA system with one central control SCADA system .. Central SCADA station that communicates with PLCs installed at pumping stations in throughout the pumping system According to the requirements of the condition, the pressure, flow, level transducers are installed in pumping stations.

3.8.6. Benefits of Up-gradation of Sewage Pumping System:

1. Centralized Mentoring of Pumping System Data and Status for Alarm Generation and Maintenance activity scheduling.
2. Real Time Measurements of Process Parameters from Central location

3.8.7. Broad Scope of Work

- 1) Instrumentation & Automation of Sewage Pumping Station Pumping System at Pumping locations.
- 2) Data communication from SPS to Central SCADA System
- 3) Supply, Installation, Testing & Commissioning of CCTV system (which includes Camera, NVR, Desktop) at SPS.
- 4) CCTV Data communication from SPS to Central Monitoring System

3.8.8. Detail of SPS Pumping System has been briefed in below table-

The scope for sewerage pumping stations includes the following:

Quantity of the supplied items will be as per the priced BoQ of the tender document-

- Supply, Installation, Testing & Commissioning of Full bore type Electromagnetic Flow Meter with necessary accessories at common delivery header of the Sewage Pumps as per Tender BoQ.
- Supply, Installation, Testing & Commissioning of Pressure Transmitter with necessary accessories at common delivery header of the Sewage Pumps as per Tender BoQ.
- Supply, Installation, Testing & Commissioning of Level Transmitter with necessary accessories at Sump of the Sewage Pumps as per Tender BoQ
- Supply, Installation, Testing & Commissioning of Pressure Switch with necessary accessories at individual delivery header of the Sewage Pumps as per Tender BoQ
- Supply, Installation, Testing & Commissioning of Pressure Gauge with necessary accessories at individual delivery header of the Sewage Pumps as per Tender BoQ

- Supply, Installation, Testing & Commissioning of PLC at pumping station with necessary Hardware, Software, UPS, Cables etc.
- Establishment of communication of PLC System to central SCADA system by installing wireless communication system with necessary hardware and software at sewage pumping station end and Central SCADA end.
- Supply, Installation, Testing & Commissioning of CCTV system (which includes Camera, NVR, Desktop) at SPS.
- Establishment of communication of CCTV System to central Monitoring system by installing wireless communication system with necessary hardware and software at sewage pumping station end and Central Monitoring system end.

The details of sewerage pumping station SCADA system is as per below table:

SPS Nos	Zone s	Elevatio n (Groun d) (m)	Peak Flow (Total Out) (MLD)	Diameter and depth of Wet Well (m) for ultimate flow		Invert Level of Wet Well	pump for Intermedi ate stage	Dia of Pumping main for sewer up to STP	Head (m)	Length in KM
				Diamet er	Depth					
SPS-1	North zone	529.5	10.36	6	6.6	522.9	2W+1S	400	20	1.630k m-From SPS 1 TO SPS 2
SPS-2		532.32	30.17	10	9.01	523.31	2W+1S	600	24	2.335K M -From SPS 2 TO STP
SPS-3	South zone	538.64	18.87	7.5	7.96	530.68	2W+1S	600	25	5.320K M-From SPS 3 TO STP
SPS-4		538.43	5.777	3.5	7.72	530.71	2W+1S	300	18	0.442 KM- From SPS 4 TO Ridge manhol e
SPS-5		546.14	0.18	1.5	3.15	542.99	2W+1S	140(HDPE outer dia)	12	0.133K M-From SPS 5 TO Ridge manhol e

SPS Nos	Zone s	Elevation (Ground) (m)	Peak Flow (Total Out) (MLD)	Diameter and depth of Wet Well (m) for ultimate flow		Invert Level of Wet Well	pump for Intermediate stage	Dia of Pumping main for sewer up to STP	Head (m)	Length in KM
SPS-6		542.79	4.34	3.5	6.79	536	2W+1S	300	25	0.557km From SPS 6 TO J-5 of
SPS-7		530.81	22.79	7	8.63	522.18	2W+1S	600	28	4.905 km From SPS 7 TO STP

Typical Measurement & Control Philosophy of Sewage Pumping Station (SPS) is briefly described in below section. Contractor to follow the same as a guidelines and accordingly consider items in their offer.

- a) Measurements required to be made are-
 - a. Flow at the common discharge header of pumps
 - b. Pressure at the Common header of pumps
 - c. Local Pressure at the discharge side of individual pump.
 - d. Sewage Water Level of sewage sump
- b) Instrumentation required to be installed-
 - a. Electromagnetic flow meter at the common header of the pumps
 - b. Pressure transmitter at the common header
 - c. Pressure switch at the discharge of individual pump.
 - d. Pressure gauge at the discharge of individual pump
 - e. Ultrasonic Type level transmitter at the Lifting Well

Control system will continuously monitor the flow, pressure and level value.

3.8.9. Starting, Running & Tripping condition for Pumps

3.8.9.1. Pump Starting Condition:

Following Process and Electrical Parameters will be checked from Control system prior to Start of Pumps

- a) Sewage Water level in the lifting well is above low set point
- b) Pump is not in Running Condition
- c) Control Signal healthy feedback from MCC

3.8.9.2. Pump running & Tripping Condition:

After receiving above feedback signals Pump Start command triggers from PLC for starting the Pump. During Pump Run, following Process and Electrical Parameters shall be continuously checked from PLC.

- a) Discharge Pressure is below High Set Point feedback
- b) Sewage Water level in the lifting well is above low set point
- c) Control Signal healthy feedback from MCC
- d) Pump Running feedback from MCC

In absence any of the above-mentioned feedback signals PLC shall immediately Initiate Trip Signal to Stop the Pump for protecting pumping machineries.

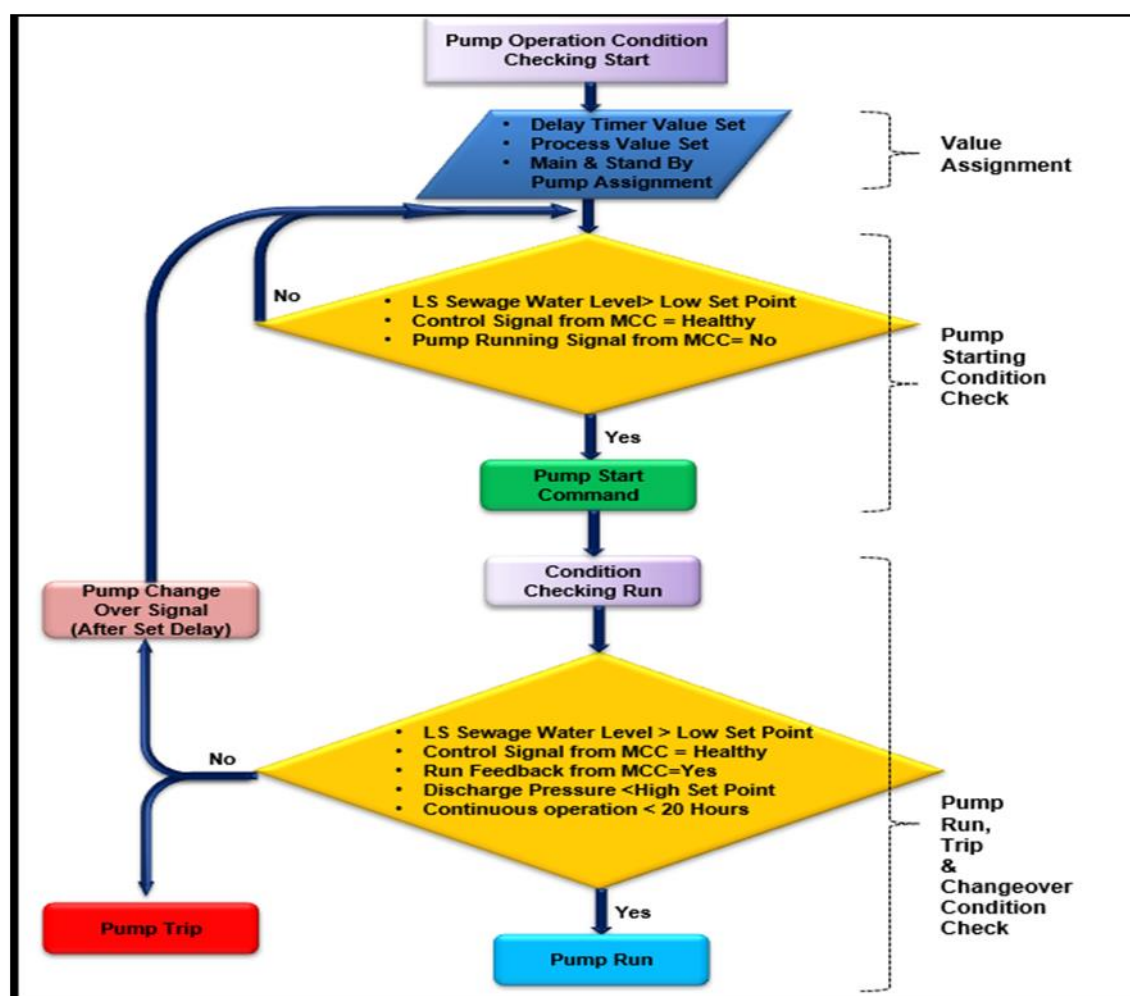
3.8.9.3. Condition for change over between running and stand by pumps.

The changeover between running and standby pumps shall be automatically performed in the pumping system due to following conditions

- Pump not started after Start Command received from PLC
- Pump is not running/ tripped
- Running Pump completed continuous operating hours

PLC shall initiate changeover signal to start the Standby pump after checking all Starting conditions mentioned earlier in this section.

Below Flow Chart shows brief conditions for Starting, Running, Tripping and Changeover condition for pumps at Sewerage Pumping Station.



Condition Checking Flow Chart for Pumping Station

Level readings shall be continuously displayed at Panel Mounted HMI at pumping station. Low-Low & High-High level alarms shall be enunciated at HMI. The pump shall operate in level & timer-based auto mode i.e. start at set high level and stop/close at set low level or at set times as finalized during detailed engineering. The working and standby pump shall be selected by operator at HMI or shall be determined by operating hours of pump such that pump with minimum operating hours shall start first & so on and in case of pump trip, pump

with maximum operating hours shall stop first and so on. Operating hours of pump shall be logged in PLC.

Dedicated Non-Redundant PLC System with HMI Module has been proposed for Pumping Station Location for Monitoring and Control of the pumping system.

- a) During any AUTO operation, control system shall continuously monitor all the parameters and process. These parameters shall be displayed on Main SCADA & Pump House HMI.
- b) Normal Mode: -In Normal mode control system will continuously monitor the Level of the sewage water at the Main SCADA and HMI in Pumping Station, the level of the lifting station well, pressure at the common header and the flow at the common header of the pump.

Level instrument will measure the level of sewage water in the Lifting well and its Sewage water level low alarm shall be shown in Main SCADA & Pump House HMI.

Electromagnetic flow transmitter shall continuously measure the flow at the outlet of the pumping station and shall be shown in the Main SCADA & Pump House HMI

Pressure transmitter shall continuously measure the pressure of the common header & will be shown in the Main SCADA & Pump House HMI

There shall be a standalone PLC System which shall communicate through GPRS with the Main SCADA System in the control room.

3.8.10. Data Communication & Control Philosophy of Proposed Scheme

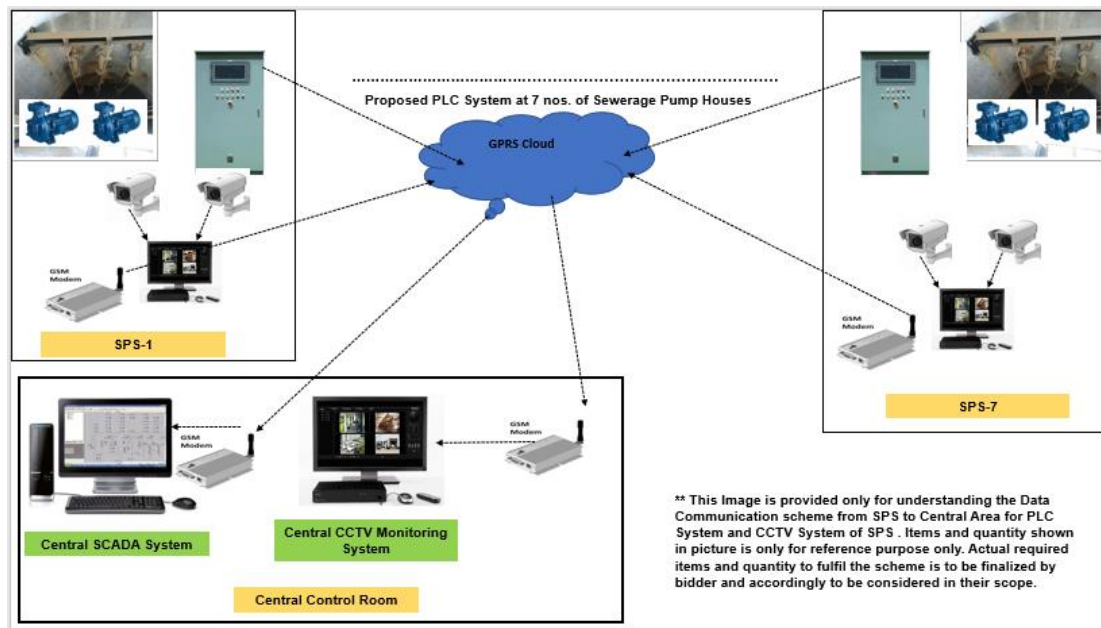
Independent Non-Redundant PLC Systems with HMI are proposed for following areas for monitoring and control of corresponding system as described in previous sections of this document.

- a. SPS-1, (North)
- b. SPS-2, (North)
- c. SPS-3, (South)
- d. SPS-4, (South)
- e. SPS-5, (South)
- f. SPS-6, (South)
- g. SPS-7, (South)

Central SCADA is proposed at Central Control room. All the PLC Systems of different areas are proposed to be connected to Main SCADA system through Wireless GPRS connectivity.

3.8.11. Proposed Automation System Architecture

Below Figures has been provided for Understanding the Basic System Configuration of Automation and only for reference purpose. Final System Architecture on the basis of the same is to be provided by Bidder in their Technical Offer



Proposed Automation System Architecture

Note: This Image is provided only for understanding the Data Communication scheme from SPS to Central Area for PLC System and CCTV System of SPS . Items and quantity shown in picture is only for reference purpose only. Actual required items and quantity to fulfil the scheme is to be finalized by bidder and accordingly to be considered in their scope.

3.8.12. Data Communication & Control Philosophy of Proposed Scheme

Main SCADA is proposed to be installed at Central Control room. All the RTU and PLC System of SPS at different locations are to be connected to Main SCADA system through Wireless GPRS connectivity.

Necessary Data Acquisition and related Software shall be installed at Central SCADA system .

The functions and features specified herewith are the minimum acceptable requirements for the successful implementation of proposed Monitoring System. The provided system shall meet or exceed each requirement as specified by Engineer in charge.

CCTV Camera Works at Sewage Pumping System:

Quantity of the supplied items will be as per the priced BoQ of the tender document-

The basic purpose of providing CCTV cameras at each sewage water pump house is to provide a secure environment & monitors the various activities which are planned within this area.

- IP based Fixed Outdoor Bullet cameras shall be installed at all the entry , exit and storage points of pump houses and open store. Activities inside Pump House and Open Store shall be monitored Locally.
- The IP cameras within the Pump House and Store area will be installed along with field equipment such as Power supply unit and other required accessories. Power Supply Adaptor should be installed in a junction box with IP 65 protection class for Outdoor installation.
- Data from Local NVR data shall be transmitted through Wireless GPRS technology and shall be viewed from Central Location.

Reference Specifications and Standards

All ICA equipment shall comply with all applicable international and local laws regulations and standards, as mentioned in the bid document.

3.8.13. Instrumentation Design & Drawings to be submitted by bidder

- With Technical Bid
 - Basic Engineering write up of Overall Instrumentation & SCADA work, Data Acquisition & Interconnectivity work
 - Proposed Basic SCADA, Data Communication System Architecture drawing
 - List of Items proposed for the system
 - Proposed power supply requirement and UPS sizing with Calculation
- After award of Contract for approval
 - Operation & Control Philosophy of Overall Instrumentation, SCADA & Interconnection Work
 - Proposed Detail SCADA, Data Communication System Architecture drawing
 - Vendor Datasheet & QAP for all Instrumentation Items
 - PLC Panel Wiring Drawings
 - Cable Schedule
 - Instrument Hook up Diagram
 - Operation & Maintenance Manual

Notes-

- The List of Drawings & Documents furnished above is for information only. Eligible Bidder to submit Detail List of Drawings and Documents required for the project after award of the job for approval of Engineer-in-charge. Submission of Drawings and Documents after the award of contract will be as per the approved list of Drawing and Documents

3.9. ELECTRICAL SYSTEM

3.9.1. General Requirement

- This scope of work covers design, manufacture, supply, testing at Manufacturers works, packing and forwarding, delivery to site, inland transit insurance, unloading at site, handling and safe storage of materials at site, cleaning/ lubricating, touch up painting installation, testing and commissioning of Electrical system / Equipment for the proposed Electrical works. Contractor shall supply the equipment in accordance with the Specification, Data sheets. Preliminary drawings are attached for reference only and Detail engineering and good for construction drawings are in scope of Contractor. The offer shall comply with the latest applicable codes and standards as prevailing on the date of submission of the bids.
- Development of an integrated effective underground network plan including distribution and energy efficiency improvement shall be envisaged for the proposed electrical system. This will aims to provide quality power supply throughout the year, under all weather conditions and helps to maintain the continuity of supply. Radial network with minimum standby facilities through interconnection should be adopted for unit III of BTDA.

- Any equipment/accessories not explicitly indicated in this specification but considered essential for proper functioning of process shall be included in Bidder's scope of work and supply.
- Contractor shall furnish all relevant catalogues relevant to the equipment required in the proposed 220kV, 110kV, 11kV & 0.433kV Distribution network for Electrical Installation Works.
- The design standards followed should be generally in compliance with the latest Indian Standards, HESCOM requirements, KERC standards, KPTCL regulations and technical manuals, standards and code of practices already established in the country. All electrical installations shall conform to the latest Indian Electricity Acts and Rules.
- The Constructional details, operational requirements and safety requirements of all the equipment and accessories proposed for this project shall minimum comply with the latest specifications and requirements of HESCOM & KPTCL.
- All the Quality Control plans, testing & Inspection requirements of 220KV & 110KV sub stations equipment shall be as per KPTCL/KERC guidelines and 11KV & 0.433KV distribution network equipment shall be as per HESCOM specification and guidelines.
- The bidder should maintain the electrical safety clearance for various voltage class lines in the proposed layout during execution of the work as per Central Electricity Authority (CEA)/ Indian Electricity (IE) Rules

3.9.2. Scope of work for Electrical components:

The Scope of work shall include complete design & engineering, supply, installation, testing and commissioning, performance demonstration and handing over of the following systems, equipment and their associated accessories/ software and complete civil works associated for successful commissioning as per technical specification, data sheets.

The scope of work for establishment of Unit-III of Navanagar under BTDA regarding KPTCL work is defined under following heads viz.

- Establishing 2X100MVA, 220/110/11KV Sub-Station at Navanagar Unit-3 in Bagalakote by Construction of 220kV DC LILO Line on MC Mono pole towers from existing 220KV ADPH-Bagalakote DC line to the proposed 220/110kV substation at Navanagar Unit-3
- Establishing 3 nos of 3X10MVA, 110/11KV Conventional Sub-Station at BTDA Unit-3 Navanagar: Sub-station-1 (Near Bajaj Showroom), Sub-station-2 (Near Maruthi showroom) & sub-station-3 (Near sigikeri) along with Construction of 110KV DC line on mono pole towers from proposed 220KV R/S to respective proposed 110/11KV Sub-Station.

3.9.3. HESCOM Works

Bidder's scope of work & supply shall include, but not limited to the following for HESCOM works duly taking sanction to the estimates from HESCOM and brief of work involved in Package-1 is as below:

- Complete design, engineering, supply, storage, erection, testing & commissioning of 11 kV type compact RMU (1 Incomer + 3 Breakers + 1 Outgoing), 11 kV VCB enclosed in a close vessel having SF6 as insulating medium along with Load Break Isolator, Earth switch, 11kV Bus and other associated equipments as per required.
- The design materials and manufacture of the RMU shall be of the highest order to ensure continuous and trouble-free service over the years.
- All the ratings, indications, protections, annunciation & accessories indicated in SLD/Datasheet/specifications are minimum requirements & Contractor to provide any additional accessories / components / ratings to suite the actual requirements & for successful commissioning of 11 kV RMU System.
- Complete design, engineering, supply, storage, erection, testing & commissioning of 100 KVA, 11kV/433V, Single pole mounted Distribution Transformer on 11.0mtr. Spun pole with 3 GOS system.
- Complete design, engineering, supply, storage, erection, testing & commissioning of LT Feeder Pillar Box with Porcelain Rewireable Cutout and & 1 No of 630 Amps Load Break Switch with Copper Busbar Necessary suitable size bus bar as per the drawing with necessary platform all complete.
- Complete design, engineering, supply, storage, erection, testing & commissioning of HT & LT XLPE UG Cable using Conventional laying with excavation in soil, in existing cable duct, and horizontal drilling with 6" Bore Size (wherever

necessary), including cost and conveyance of all materials, curing, loading and unloading with all leads and lifts, labour, hire charges of machinery and equipments etc... compete and all incidental charges .All the items shall be executed as directed by the Engineer in charge of work.

- Scope shall also include preparation of engineering documentation like cable schedule and Inter- connection schedule.
- Obtaining approval including load sanction/ release from HESCOM, No Objection Certificates from HESCOM, Electrical Inspector, relevant government agencies, and statutory authority, as applicable is included in BIDDER scope. All necessary legal fees required for various applications to HESCOM, relevant government agencies, statutory authorities shall be paid by the PURCHASER.
- Tender BOQ and drawings, if provided, are for reference purposes only which are the minimum requirements; BIDDER shall ensure that design & equipment ratings shall be as per specification requirements.
- The BIDDER shall prepare design calculations based on parameters/ design criteria indicated in the specifications. The BIDDER shall carry out detailed engineering and prepare construction purpose drawings to make his/ her own estimate of ratings & quantities in accordance technical data sheets, other relevant details provided in the specifications. All documents shall be submitted to PURCHASER for approval before execution.
- BIDDER shall take due care of the site Seismic conditions while designing all equipments/ components used in entire electrical systems covered in this specification. BIDDER shall furnish list of additional design parameters considered in design to fulfil the above requirement.
- Design and detailed engineering of the materials procured by BIDDER is included in scope. BIDDER shall submit each document/ calculation of system which is included in scope to PURCHASER/ CONSULTANT for final review/ approval. All design documents/ calculations prepared by BIDDER shall be duly signed by BIDDER and stamped. Design documents/ calculations prepared by sub-BIDDERS shall be approved by BIDDER and stamped copy of approval along with no-deviation sheet from sub-BIDDER shall be submitted by the BIDDER to PURCHASER/ PURCHASER's Representative for final review/ approval.
- Manufacturer's supervision for sub-BIDDER supplied material shall be provided by BIDDER and shall be included in offer.
- CONTRACTOR shall be solely responsible for any shortages or damages in transit for his supply scope, handling and/ or in storage of any materials and erection of the equipment, supply of erection tools at site. CONTRACTOR shall ensure that it will not affect any activity or project schedule. Any demurrage, wharfage and other such charges claimed by the transporters, railways etc. shall be to the account of the CONTRACTOR.
- Equipment Sizing calculations with assumptions made; General Arrangement; Equipment Data sheet indicating compliance to all the requirement as asked for in the specifications; Type test certificates as required for the key tests like SC test, Internal arc test, Temperature rise tests, IP Protections tests; Foundation Drawings with calculations; Cable Schedules; Interconnection Schedule; and other construction drawings shall be provided.

- Providing and Fixing marking stones of size 200 x 200 x 1000 mm, with approved marks including painting above the ground level and Yellow Lettering and the direction of incoming line and outgoing lines are to be clearly marked on the top with red colour. If the distance between two anchor points is more than 1 km, one more directional stone is to be fixed. So also, for the road crossing, railway crossing and nala crossing for all on both the sides.
- Complete design, engineering, supply, storage, erection, testing & commissioning of Rod type of earthing using 40 mm Dia, 3 Mtr long MS rod as ground rod, in earth pit of 300 mm width and 3300 mm depth and using 50x6 mm flat welded to ground rod as terminal & connected to equipment ground terminal using PVC Al wire as specified
- Nothing in this specification shall be construed to relieve the BIDDER of his/ her responsibilities towards following best engineering practices established in the country.
- The BIDDER's scope shall also include measurement of soil resistivity at site by Wenner's four electrode method as per IS: 3043 – 1987 (Reaffirmed in 2006 or its latest version) at minimum 30 locations at site. The earthing system shall be designed for the actual mean soil resistivity value obtained.
- Submission of Detailed Consolidated report on the surveying work done appending all approved draft reports including all relevant information collected during survey, calibration certificates of the instruments used for the work, photos taken at site and submitting soft copies of all documents and reports in 6 sets. The detailed report shall contain following approved draft reports. Preliminary report/ Detailed Survey Report/ Soil Resistivity Report/ Soil Classification report with location wise/ Tree Schedule/ Line Schedule/ Land Schedule/ Burgies details/ Digitized contours/ Digitized village map geo referenced and super imposed on the line corridor
- Even if all components of a system included in this specification are not explicitly identified and/ or listed herein, these shall be supplied under this contract to ensure completeness of the system and facilitate proper operation and easy maintenance of the plant. Any and all other works not indicated above but necessary/ required to complete the job in all aspects, are included in the BIDDER's scope.
- The BIDDER shall indicate and include start up spares, essential spares, recommended spares and a set of special tools necessary for operation, routine maintenance of equipment supplied for a period of five years.
- Whether specifically called for or not, all accessories required for normal and satisfactory operation (as deemed by the PURCHASER) of the equipment shall be considered to be a part of the BIDDER's basic scope of supply and/ or work and no claims whatsoever, for extra payment on these grounds, will be accepted.
- BIDDER should visit site and get himself/ herself ascertained regarding the scope of work for the complete Electrical works before submission of quote/ offer.
- BIDDER's scope shall also include all civil works and structural works required for installation of all electrical equipment/ systems such as equipment foundations, indoor & outdoor trenches, equipment support structures and all excavation works including those for lighting, earthing, cabling systems etc.

- It is not the intent to completely specify herein all details of design and construction of the equipment and systems. Nevertheless, the Electrical system shall conform to high standard of engineering, design and workmanship in all respects and shall be capable of performing satisfactorily in continuous commercial operation under the specified environmental conditions.
- The conversion of existing overhead line to underground cable laid in trench/RCC duct shall be in the scope of BIDDER. All necessary approval, coordination shall be in the scope of the BIDDER. All necessary legal fees required for various applications to HESCOM, relevant government agencies, statutory authorities shall also be in the scope of BIDDER.
- Upon completion of installation, laying and commissioning of Underground system, Thirty (30)-days trial testing period will start to check the adequacy of the installed underground system. The issue of completion certificate to the CONTRACTOR is subject to successful testing and approval of HESCOM.
- The clearance for carrying out dismantling works of existing overhead system shall be given only after successful completion of trial testing period of 30 days and approval from HESCOM.

3.9.4. Street lighting works

Bidder's scope of work & supply shall include, but not limited to the following for street lighting works:

- The scope for lighting system includes LED Luminaires, Street Light Poles, Cables, Feeder Pillars with Astronomical timer, civil works like earthwork excavation & foundation and other accessories required for successful operation of street lighting system.
- Establishing street lighting arrangement with energy efficient LED fixtures for the proposed roads of project area. The street light positioning, arrangement and rating are based on the ROW of the roads and the volume of traffic. Thus, the streetlight for 9, 12 & 18 mtrs ROW is on both side of the road with staggered lighting arrangement, whereas for 24, 25 & 30 mtr ROW is on the median.
- Complete design, engineering, supply, storage, erection, testing & commissioning of Street Light Timer Automatic On/Off Control Box as per Data Sheet indicated in technical specification. Thyristor based Smart street light control and Monitoring system, remotely control and monitorable smart street light system by using web or mobile application.
- Supplying, fixing and wiring Electronic Trivector Meter (ETV) 5 to 20Amps single phase & 5 to 32/63 Amps three phase 4 wire Class-1 Accuracy with Temper Proof Energy Meter for lighting.
- Complete design, engineering, supply, storage, erection, testing & commissioning of 3Mtrs (Top 70mm and bottom 94mm dia 5 mm thickness), 7 mtrs (Top 85mm and bottom 176mm dia 5 mm thickness), 9 mtrs (Top 85mm and bottom 216mm dia 7 mm thickness) long Glass Reinforced Plastics (GRP) Lighting Pole or Reinforced Thermosetting Plastic Pole (FRP) Conical- Embedded Type) including Double Arm Brackets having made out of Polyester Resin with Glass Fibre by CNC Machines wherein Programmable Logic Control (PLC) is used in a close loop control circuit to control machine movements.

- Complete design, engineering, supply, storage, erection, testing & commissioning of 12Mtrs/12.5Mtrs (Top 100mm and bottom 310 mm dia) long polygon high mast with Single / Multiple telescopic sections having, (minimum overlap distance of 1.5 times of top section) thickness as per BSEN 10025 grade S 355 JO /ASTM A572-50 steel sheet plate for shaft suitable to withstand a wind velocity of 47 m/sec as per IS 875 part 3 for junction lighting.
- Complete design, engineering, supply, storage, erection, testing & commissioning of Decorative median poles comprising of 3 mtr height centre pole along with 2 nos. of 11 mtrs bent at side of centre pole. The centre pole is housed with colour changing LED visible from all side along with a 7watt LED bulb at the top.150 watt flood light are proposed for each 11 mtr bent.
- Providing and Fixing marking stones of size 200 x 200 x 1000 mm, with approved marks including painting above the ground level and Yellow Lettering and the direction of incoming line and outgoing lines are to be clearly marked on the top with red colour. If the distance between two anchor points is more than 1 km, one more directional stone is to be fixed. So also, for the road crossing, railway crossing and nala crossing for all on both the sides.
- Latest version of related IS Standards, NBC and National Lighting Code (NLC) shall be referred for designing Illumination for different areas.
- Lighting design shall be performed using latest version of DiaLux Software/ Original Equipment Manufacturer (OEM) validated software. The Validation Report along with software and data files shall be acceptable to PURCHASER/ PURCHASER's representative.
- The lighting system design shall comply with the acceptable norms and the best engineering practices. The lighting layout shall be designed to provide uniform illumination with minimum glare. The layout design shall meet all the statutory requirement, local rules etc.
- Bidder to submit lighting CAD drawings, generating the contours using appropriate software and submission of 6 sets of blueprints and one tracing sheet (original) and one soft copy etc. Complete.
- Detailed General arrangement drawing, data sheet, catalogues of proposed street light poles, high mast poles, decorative poles, LED light fixtures, automatic ON/OFF street light timer, lighting cables and other accessories shall be submitted by bidder and shall be acceptable to PURCHASER/ PURCHASER's representative.
- Surveying of cable route excavation trial holes as per field requirements, preparation of cable route profile, drawings for cable laying, final route alignment, marking lines and grades, preparation of final cable route, drawings after laying and energizing for preparing bill of materials will be under bidder scope.

Package wise HESCOM works, the minimum quantities are mentioned below:

Sl. No.	Description	Package-1	Package-2	Package-3	Package-4
1	HT Cable - SS TO OD (2R X 3C x 240 Sqmm) in Mtr	3300	3000	4800	4500

Sl. No.	Description	Package-1	Package-2	Package-3	Package-4
2	240 Sqmm Termination Kit - Outdoor in Nos	24	20	32	30
3	240 Sqmm Termination Kit - Indoor in Nos	24	20	32	30
4	Compact RMU 11 kV Class SF6/VCB Type (1 OD) in Nos	12	10	16	15
5	HT Cable - OD TO RMU (3C x 240Sqmm) Mtr	14570	18850	23750	20750
6	Providing Compact RMU 11 kV Class SF6/VCB Type (1 Incomer + 3 Breaker + 1 Outgoing)	18	13	22	27
7	240 Sqmm Indoor Termination Kit-(OD+I/C+O/G)	54	48	66	81
8	95 Sqmm Indoor Termination Kit (3-VL-O/G)	54	48	66	81
9	Compact RMU 11 kV Class SF6/VCB Type (1 OD) in Nos	5	13	16	12
10	240 Sqmm Termination Kit - Indoor in Nos	5	13	16	12
11	HT Cable RMU TO TC 3C X 95Sqmm UG Cable in Mtrs	29730	39790	54550	49111
12	100 KVA Transformer	230	288	377	425
13	LT UG Cable TC TO LTFB 3.5C X 95Sqmm	72937	88695	112233	114834
14	8 Way-LT Feeder Pillar Boxes	853	992	1327	1518
15	11KV of 100 KVA Transformer Structure for Existing layout	35	35	40	40

Package wise Street Lighting work details are provided below:

Description		Package-1	Package-2	Package-3	Package-4
NMT CORRIDOR	3 Mtr Pole	152	54	70	93
	25W LED	152	54	70	93
	Timer Boxes-Single Phase	3	2	3	3
	2C X 16 Sqmm	3959	1403	1831	2429
	HDPE Pipe	3599	1276	1665	2208
9 MTR ROW	7 Mtr Pole	656	727	1226	1411
	25W LED	656	727	1226	1411
	Timer Box-3Phase	9	10	16	18
	4C X 16 Sqmm	17820	19690	33110	38500

Description		Package-1	Package-2	Package-3	Package-4
12 & 18 MTR ROW	HDPE PIPE	16200	17900	30100	35000
	9 Mtr Pole	647	930	589	540
	90W LED	647	930	589	540
	Timer Box-3Phase	9	12	7	7
	4C X 16 Sqmm	16892	24286	15346	14106
ROW>18MTR	HDPE PIPE	15357	22078	13951	12823
	11 Mtr Tuskar Pole	269	244	273	303
	150W LED	538	488	546	606
	Timer Box-3Phase	3	3	4	4
	3.5C X 25 Sqmm	7024	6355	7138	7889
JUNCTION	HDPE Pipe	6386	5777	6489	7172
	12 Mtr HiMast Poles	9	6	10	9
	200W LED	54	36	60	54
	Timer Box	9	6	10	9
	3C X 25 Sqmm	900	600	1000	900
JUNCTION	HDPE Pipe	900	600	1000	900

Work is to be carried out as per the requirement of KPTCL/ HESCOM with prior approval/ sanction from KPTCL/ HESCOM duely inspecting the Material/ Equipments by TAQC of KPTCL/ HESCOM before procurement.

After completion and commission of the work the job is to be handed over to KPTCL/ HESCOM.

In the scope of work, attempt has been made to cover all the items of work and accessories, however, in case mention of any equipment and accessories is left out, which may be necessary to complete the work in full manner and commission the job successfully, there the same has to be treated as part of the scope of the work

If actual length of Power Cable & Controle Cable is less as in the KPTCL / HESCOM estimate, proportionate amount will be deducted. If it is more there will be no extra payment.

The scope of work is not limited to, scope defined in this document / BOQ, but includes all the work to which are necessary to complete the work in full manner, commission of the job successfully & smooth functioning of the work. Also, in any case mention of any scope of work, equipment & accessories are left out which may be necessary to complete the work in full manner, the same has to be treated as part & parcel of the scope of the work and need to be carried out as per the directions of Engineer-in-charge within the contract amount.

3.10. MISCLANEOUS WORKS (PARK / OPEN SPACE DEVELOPMENT)

3.10.1. Scope of work- Boundary fencing for parks

3.10.1.1. Design and Construction of Chain Link Fencing and Gate

Designing and Construction of G.I. chain link fabric fencing of required width in mesh size 50 x 50 mm including strengthening with 2 mm dia wire or nuts, bolts and washers as required (Made of G.I. wire of dia 4 mm) and M.S. Rectangular poles made out of 2 equal angles of 65x65x6 mm welded together and fixed in CC (1:2:4) with 2 nos. 16mm dia M.S. hold fast rods each of length 25 cms. Including cost of all materials cutting, bending, scaffolding wherever necessary, nicely finishing the welded joints with all lead lifts, earthwork, foundation, PCC.

Designing, fabricating, fixing M.S. Gate as per the approved drawing of size 1.5m x 2.5m, designing the gate with minimum of 32 kg per sqm and fixing 2 nos. of gate for each park or CA site including cost of all materials, scaffolding, earth work, foundation, fabricating, welded joints, providing 2 coats of approved quality paint over one coat of shop painting, etc.

3.10.1.2. Tree Planting

Planting of trees by the Roadside, Parks and CA Sites in 0.60 m dia holes, 1 m deep dug in the ground, mixing the soil with decayed farmyard/ sludge manure, planting the saplings, backfilling the trench, watering, fixing the tree guard and maintaining the plants for one year complete as per specifications of Karnataka Forest department, MORTH Specification No. 307, including weeding around the plants (Pits) to a radius of 60 cm on monthly basis, watering to the seedlings / plantations/ trees at 50 liters/plant during maintenance period and complete.

Package wise Tree plantation, Sector Boards and RCC Cross road boards are provided below;

Sl. No.	Packages	Tree Plantation, Nos.	Sector Board, Nos.	RCC Boards, Nos.
1	Package-1 (Sector B, C & D)	2,401	30	325
2	Package-2 (Sector A & E)	2,041	20	329
3	Package-3 (Sector F, G & H)	2,768	30	455
4	Package-4 (Sector I, J & K)	2,790	30	563
	Total	10,000	110	1,672

3.11. DETAILED LIST OF DESIGN REPORTS & DRAWINGS TO BE SUBMITTED BY CONTRACTOR

The list of design reports & drawings to be submitted by the contractor including the following: the following list is indicative in nature, the contractor has to submit all the design reports & drawings required and take the approval from the concerned Engineer In charge before the start of execution.

I. Site Investigation Report

1. Topographical survey of entire project area including external roads for utility connections, Storm water drainage connectivity
2. Geotechnical investigations for the structural locations as per the relevant IS Standards

3. Soil Investigations for pavement designs as per relevant IRC standards
- II. Boundary fencing and Tree Plantation:**
 4. Design, Drawings, Location plan details of Chain Link Fencing, RCC Signs boards & Sector Boards
 5. Location Plan details of Tree Plantation
- III. Road works**
 6. Design Reports such as Horizontal Alignment, Vertical Profile extracted from Civil-3D/ MX Roads
 7. Pavement Design Report (Rigid, Flexible and Interlocking concrete paver blocks)
 8. Junction / Intersection (minor & major) design and drawings
 9. Earthwork quantity report from the design software (Civil 3D/ MX Roads)
 10. Report on Treatment for Black cotton soil (Stabilization or Replacement)
 11. Design & Test Report of Borrow soil
 12. Design Mix Report for GSB, WMM, PQC, PCC, DBM, BC, etc.,
 13. Centre line layout Plan with Road Coding/ Numbering
 14. Plan & Profile for all ROW roads
 15. Cross Sections with utility mapping & Pavement crust details for all ROW roads at regular interval of 100m and additional cross sections at critical locations, junction, etc.,
 16. Drawings (Plan & Sections) of road furniture items including Traffic Sign boards, Road/ lane markings, Tabletop crossings, entry/exit ramps, concrete bollards, kerbs, studs, bicycle stand hoops, seating benches, crash barriers, etc.,
 17. Drawings Plan & Sections of Bus bays, Parking lanes, etc.,
 18. Plan & Sections of Utility chambers (ICT, Water supply, cable cross ducts, etc.,)
 19. Design & Specifications of Cycle track coloured cold plastic paint Drawings of road plan and profile including horizontal alignment, vertical profile, and typical and detailed/working cross sections
 20. Drawings of cross drainage works
 21. Drawings of landscaping and horticulture
 22. Standard and miscellaneous drawings
- IV. Water supply system**
 23. Potable water supply distribution network including the valve and bulk meter locations
 24. Layout of potable water feeder mains including the longitudinal plan and profiles
 25. Pipe encasement details
 26. Valve and chamber details
 27. Property connection details
 28. Thrust blocks and Anchor blocks
 29. Crossing details of natural drains / Canal system/ railway lines
 30. Locations, plan and section of HDD (trench less technology) locations with details
 31. Drawings of Ground Service Reservoirs for all 4 locations including the compound wall and layout planning (for Phase 1 & Phase 2 development)
- V. Sewerage network**
 32. Sewerage collection network

33. Layout of sewerage Network
34. Bedding and backfilling details
35. Manhole details
36. Scraper manhole
37. Drop manhole
38. RCC vent shaft/ vent cowl
39. Pipe encasement details
40. Valve and chamber details
41. Property connection details
42. Thrust blocks and Anchor blocks
43. Details of Sewage pump stations for all 7 locations including the layout plan, site grading, internal roads, storm water drains and streetlighting facilities along with the location maps, compound wall, etc
44. Details of Sewage pump stations for all 7 locations including the civil, electrical, Mechanical, instrumentation systems including the collection chamber, screening arrangement, security cabin, twin operators' quarters building with necessary water sewage and power supply arrangements
45. Layout of Wastewater pumping mains including the longitudinal plan and profiles
46. Crossing details of natural drains / Canal system/ railway lines
47. Locations, plan and section of HDD (trench less technology) locations with details

VI. Sewage Treatment Plant

(A) General and Process

48. Narrative Description of the Works
49. Plant Operation and Control Philosophy
50. Sizing and Design Calculations covering all Major Unit Processes and components of the Works
51. List of all structures (basins, tanks, channels, buildings, etc.) including dimensions and freeboards
52. Complete Equipment List
53. All Equipment Catalogues and selection chart (with all relevant manufacturers' documentation).
54. Major Piping Schedule to include service (process stream), installation type (e.g., buried, exposed, submerged, etc.), size, material, coating, lining, joint type(s), gauge/thickness, pressure rating, testing protocol, design standards
55. Major Valve Schedule to include service (process stream), installation type (e.g., buried, exposed, submerged, etc.), size, type, material, joint type(s), pressure rating, differential pressure rating, testing protocol, design standards, operator/actuator type, and whether Open/Close or Modulating
56. Major Gate Schedule to include service (process stream), installation type (e.g., buried, exposed, submerged, etc.) size, type, differential head, seating or unseating, testing protocol, design standards, operator/actuator type, and whether Open/Close or Modulating
57. Plant Layout.
58. Hydraulic Profile.
59. Process Flow Diagram.

- 60. Piping and Instrumentation Diagrams (P&IDs)
- 61. Electrical Load List & Power Consumption Chart.
- 62. List of Chemical Consumption on Daily/ Monthly Basis.

(B) Mechanical

- (i) To-scale dimensional layout and/or installation drawings for the following Equipment, at a minimum:
 - Major gates
 - Fine Screens
 - Grit removal equipment
 - Fine Bubble Diffusers
 - Process Air Blowers
 - Secondary Clarifiers
 - Return activated sludge pump sets
 - Gravity Sludge Thickeners
 - Thickened sludge pump sets
 - Sludge Dewatering Centrifuges
 - Chlorination system
 - Plant Water Pumps
 - Plant Drain Pumps
- (ii) Graphs for all major pumps and blowers (including but not limited to Return Activated Sludge Pumps, Thickened Sludge Pumps, Centrifuge Feed Pumps, Process Air Blowers)
 - Pump Performance Curves: Q vs H, speed, P, Efficiency, and NPSH
 - ISO-efficiency curves of the pump model proposed

(C) Electrical

- (i) Equipment layout
- (ii) Earthing layout
- (iii) Cable routing layout
- (iv) Lighting and power layout
- (v) Electrical Load List
- (vi) Electrical Single Line Diagram
- (vii) Sizing Calculations for Transformers and DG Sets
- (viii) Specific Energy Consumption
- (ix) Technical Schedules for Electrical Works duly filled in
- (x) Instrumentation SCADA
- (xi) Construction schedule

(D) Instrumentation, Control & Automation

- I) P&IDs for the complete process indicating all the local & remote /panel mounted measurements & controls, alarm & interlocking functions, using ISA symbols.
- II) Consolidated instrument list (Instrument Index) indicating description, application, location, type, quantity, accuracy, process parameters, measuring ranges, etc.
- III) Tentative instrumentation power (UPS & Non UPS) & air requirements, as applicable.
- IV) Automation system configuration diagram along with a write up explaining the system functions, redundancy features, interfacing with other systems, etc.

- V) Broad bill of materials for the Instrumentation & Automation equipment & peripherals.
- VI) Tentative I/O list.
- VII) Control Room Layout indicating disposition of various panels, cabinets, consoles, etc. with dimensional details (approx). Heat load in the control room shall be furnished.
- VIII) List of spares and consumables with details and quantities.

(E) Operating and Maintenance Manuals

The Contractor shall supply to the Engineer 5 (five) copies each of the drawings and design calculations for the process and sizing of all components of the System including architectural, structural, mechanical, electrical and instrumentation equipment, supported by flow diagrams and general arrangement drawings, operation & Maintenance Manuals of overall plant and all electro-mechanical Equipments for approval.

(F) Safety

The Contractor shall prepare a Safety Plan and submit the same to the Engineer for approval within 30 days of receiving the Notice to Commence.

The Safety Plan shall be followed at all times by the Contractor and shall contain adequate control measures, in accordance with the relevant protection of property and local laws and regulations as well as internationally accepted good practice, for the prevention of accidents, fires and public nuisance.

The Safety Plan shall be implemented properly and diligently throughout the execution of the Works and during the operations and maintenance period.

The Contractor's Safety Plan shall make safety provision for, among other things:

- Deep excavations and collapsing sides in trench excavations,
- Scaffolds and overhead working,
- Working in confined spaces,
- Working in water,
- Contractor's Equipment, especially cranes,
- Hand held power tools,
- Electrical equipment,
- Hazardous chemicals, gases and fuels,
- The use of protective clothing, and
- The provision of first aid facilities.

The Safety Plan shall be developed to ensure zero fatal accidents and zero hazardous incidents/occurrences in all construction works. The Safety Plan shall include descriptions of the company's standard policies and procedures regarding its site organization and procedures, methods and frequency of conducting safety audits at the Site(s), record keeping and reporting, providing safety training for its personnel (including subcontractors), issue and mandatory use of safety equipment, and details of the qualifications and experience of the Bidder's proposed safety officers to be deployed at the Site(s). The Contractor shall provide separate descriptions in its Safety Plan covering the construction phase and the subsequent operations and maintenance phase.

The Contractor shall appoint a Full Time Safety Manager for the Works having experience in this field, who shall be responsible for implementing the Safety Plan. He shall be supported by at least two safety officers who are qualified for such safety works.

The Contractor shall ensure that his staff and labour and his Subcontractors are all fully trained in and aware of good and safe working practices.

The Contractor shall ensure that all precautions are taken to safeguard the general public and construction/operating staff from any danger.

All temporary and partially completed works shall be protected by way of barriers, lights, notices and the like.

All excavations and the like are to be protected by barriers at all times and adequately illuminated at night.

Warning and diversion signs concerning roadwork shall be suitably placed to give motorists ample warning. During the movement of heavy vehicles across roads or onto roads, men, bearing red flags, shall be in attendance to warn other road users and to generally control traffic in a safe manner.

The Safety Plan shall also consider requirements for warning and protection for other risks including overhead and underground cables, pipes or obstructions, or voids, openings, pits and trenches. The Contractor shall ensure that all appropriate measures are implemented.

The Safety Plan shall include a policy statement signed by the CEO or equivalent authority of the Organization declaring that safety and loss prevention shall be given the highest practicable priority in all aspects of the Contract. The Safety Plan shall be updated as necessary to cover the activities to be undertaken for operations and maintenance.

VII. Storm water drainage system

- 63. Drawings of Storm water drainage network
- 64. Layout of Roadside storm water collection network system including the culvert details
- 65. Drawings of primary Storm water drainage network including L-section and cross sections at every 30m intervals
- 66. Catch pit details
- 67. Details of Rainwater harvesting pits including silt traps
- 68. Details of Recharge ponds.

VIII. ICT system

- 69. Drawings of ICT piped ducting system including the chamber locations
- 70. Details of ICT systems in all SPS locations including CCTV camera locations

IX. Electrical system

- 71. Drawings of Electrical utility network system
- 72. Drawings of Electrical streetlighting system
- 73. Drawings of Utility/Services ducts for ICT network, power supply network, and other networks including structures
- 74. Drawings of project facilities
- 75. Drawings of miscellaneous works for parks and open spaces
- 76. SCADA, Instrumentation / Automation systems for Sewerage pumping stations
- 77. Any other drawing requested by Employer's Engineer for execution of project work

3.12. INTERFACE MATRIX

The Contractor must coordinate with multiple Departments and Agencies during carrying out the execution work on site. Contractor shall be purely responsible for the coordination, taking approval of different stake-holding departments.

The Contractor shall Coordinate with Various Government Authorities/ Agencies, State Electricity Board (Karnataka Power Transmission Corporation Limited), Gas Authority, ICT Consultant, ICT Contractor.

The Contractor should coordinate with other contracting agencies and Consultants appointed by the employer to carryout different activities such as underground utility shifting, Gas lines, pipes lines etc.

The Contractor should carryout the additional utility shifting works such as shifting of electrical poles/ lines, watersupply lines, UGD lines and any other public utilities and coordinate with different government agencies for finalizing the Drawings, Implementation Schedule, shifting and Alignment of Utilities for Proper Execution of works. All the Statutory Charges/ depository charges/ Fees. etc. payment for the same shall be paid based on the prevailing SR rates/department rates to the particular works of the concerned department. However, same shall be reimbursed by BTDA after submission of proof. The works shall be carried out to the satisfaction of Engineer in charge/ Line department.

The Contractor shall follow the Interface matrix in order to coordinate with departments for smooth flow of work.

Interface Matrix is given as a Guideline to the Contractor; however, it is in the scope of the Contractor to coordinate with all Relevant Authorities for Proper Execution and Completion of Works.

Sl. No.	Description	Coordination
1	For Design & implementation of various Roads as per detail scope as mentioned in Tender document	Owner of the road (Bagalakote Municipal Council, PWD/ NHAI), Traffic Police department, Police
2	Traffic management and Traffic Signals	Traffic Police Department
3	For all Statutory/ planning /Designing/ Safety/ Environmental norms	With Relevant departments.
4	Assessment of Power Requirement, Location and Space required for supply & installation of Power Equipment's	Karnataka Power Transmission Corporation Limited
5	For storm water collection pits	Owner of the road (Bagalakote Municipal Council, PWD / NHAI), Traffic Police department, Karnataka Urban Water supply and Drainage Board
6	For utility trench proposal & implementation at proposed location	Owner of the road (Bagalakote Municipal Council, PWD/ NHAI), Traffic Police department, Police, Karnataka Urban Water supply and Drainage Board

Sl. No.	Description	Coordination
7	Shifting of Required Utilities	Bagalakote Municipal Council, PWD/ NHAI), Traffic Police department, Karnataka Urban Water supply and Drainage Board, HESCOM and KPTCL
8	Power supply for street light feeder pillars	Karnataka Power Transmission Corporation Limited. HESCOM
9	Utility trench for laying cables and pipelines in Trench	Karnataka Power Transmission Corporation Limited, Bagalakote Municipal Council
10	Water Supply works	Bagalakote Municipal Council, Karnataka Urban Water supply and Drainage Board
11	Gas Lines	Coordination with Bagalakote Municipal Council, Concerned Department
12	Underground Drainage (Sewerage facilities) works-	Coordination with Bagalakote Municipal Council, Karnataka Urban Water supply and Drainage Board
13	Telecom Poles	BSNL and other private Telecom Service Providers.
14	Electricity related Works	Karnataka Power Transmission Corporation Limited, Bagalakote Municipal Council, HESCOM
15	Street Lighting related Works	Karnataka Power Transmission Corporation Limited, Bagalakote Municipal Council, HESCOM
16	Tree Cutting and Shifting	Forest Department

4. OPERATION AND MAINTENANCE:

4.1. MAINTENANCE REQUIREMENTS

4.1.1. General

- a) The Contractor shall, at all times maintain the Project Components in accordance with the provisions of this Agreement, Applicable Laws and Applicable Permits
- b) The Contractor shall repair or rectify any Defect or deficiency set forth in (Repair/Rectification of Defects and Deficiencies) of this section within the time limit specified therein and any failure in this behalf shall constitute non-fulfilment of the Maintenance obligations by the Contractor. Upon occurrence of any breach hereunder, the Employer shall be entitled to effect reduction in monthly lump sum payment as set forth in this Agreement, without prejudice to the rights of the Employer under this Agreement, including Termination thereof.
- c) All materials works and construction operations shall conform to the Specifications for Road and Bridge Works (Fifth Revision, April 2013), issued by the Ministry of Road Transport & Highways (MoRT&H) and the relevant IRC publications. Where the Standards and Specifications for a work are not given,

Good Industry Practice shall be adopted to the satisfaction of the Employer's Engineer.

- d) All relevant materials, works and construction operations shall confirm to CPHEEO Manual on Operation and Maintenance of water supply systems, 2005, MoUD, GOI and Good Industry Practice to the satisfaction of Employer's Engineer for Potable water supply rising mains and distribution networks, Reservoirs, House Service Connections, including valves, specials, flow meters etc.
- e) All relevant materials, works and construction operations shall confirm to CPHEEO Manual on Sewerage and Sewage treatment systems 2013 Part-B; Operation and Maintenance and Good Industry Practice to the satisfaction of Employer's Engineer for pumping mains and networks, Sewer pumping mains and networks, House service connections including manholes, flow meters etc.
- f) All relevant materials, works and construction operations shall confirm to CPHEEO Manual on Sewerage and Sewage treatment systems 2013 Part-B; Operation and Maintenance and Good Industry Practice to the satisfaction of Employer's Engineer for storm water drain networks and outfalls.
- g) Maintenance of street lighting is inclusive of all roadway illumination equipment. The equipment consists of poles, luminaires, brackets, photocells, lamps, relays, conductors, ducts, hand-wells, vaults, and associated hardware.

During Construction period, the Contractor shall comply with the requirements set forth in this Project Milestones and the **Scheduled Completion Date**. Within 15 (fifteen) days of the date of each Project Milestone, the Contractor shall notify the EMPLOYER of such compliance along with necessary particulars thereof

4.1.2. Repair/Rectification of Defects and Deficiencies

The obligations of the Contractor in respect of Maintenance Requirements shall include repair and rectification of the Defects and deficiencies specified in **Appendix E-I of this section** within the time limit set forth therein

4.1.3. Other Defects and Deficiencies

In respect of any Defect or deficiency not specified in Appendix E-I of this Schedule- E, the Employer's Engineer may, in conformity with Good Industry Practice, specify the permissible limit of deviation or deterioration with reference to the Standards and Specifications, and any deviation or deterioration beyond the permissible limit shall be repaired or rectified by the Contractor within the time limit specified by the Employer's Engineer.

4.1.4. Extension of Time Limit

Notwithstanding anything to the contrary specified in this Schedule-E, if the nature and extent of any Defect or deficiency justifies more time for its repair or rectification than the time specified herein, the Contractor shall be entitled to additional time in conformity with Good Industry Practice. Such additional time shall be determined by the Employer's Engineer and conveyed to the Contractor and the Employer with reasons thereof

4.1.5. Emergency Repairs/Restoration

Notwithstanding anything to the contrary contained in this Schedule-E, if any Defect, deficiency or deterioration in the Project Components poses a hazard to safety or risk of

damage to property, the Contractor shall promptly take all reasonable measures for eliminating or minimizing such danger

4.1.6. Daily Inspection by the Contractor

The Contractor shall, through its engineer, undertake a daily visual inspection of the Project Components and maintain a record thereof in a register to be kept in such form and manner as the Employer's Engineer may specify. Such record shall be kept in safe custody of the Contractor and shall be open to inspection by the Employer and the Employer's Engineer at any time during office hours.

4.1.7. Pre-Monsoon Inspection / Post-Monsoon Inspection

The Contractor shall carry out a detailed pre-monsoon inspection of all bridges, culverts and drainage system before [1st June] every year in accordance with the guidelines contained in IRC: SP35. Report of this inspection together with details of proposed maintenance works as required on the basis of this inspection shall be sent to the Employer's Engineer before [10th June] every year. The Contractor shall complete the required repairs before the onset of the monsoon and send to the Employer's Engineer a compliance report. Post monsoon inspection shall be done by [30th September] and the inspection report together with details of any damages observed and proposed action to remedy the same shall be sent to the Employer's Engineer.

4.1.8. Repairs on Account of Natural Calamities

All damages occurring to the project components on account of a force majeure event or default, or neglect of the employer shall be undertaken by the employer at its own cost. the employer may instruct the contractor to undertake the repairs at the rates agreed between the parties.

Appendix E I – Repair / Rectification of Defects and Deficiencies

The Contractor shall repair and rectify the Defects and deficiencies specified in this Appendix E-I of Schedule-E within the time limit set forth in the table below.

Defects and Deficiencies		
Nature of Defect or Deficiency		Time Limit for Repair / Rectification
ROADS		
(a)	Carriageway and Paved Shoulders	
(i)	Breach or blockade	Temporary restoration of traffic within 24 hours; permanent restoration within 15 (fifteen) days
(ii)	Roughness value exceeding 1,800 mm in a stretch of 1km (as measured by a calibrated bump integrator)	120 (one hundred and twenty) days
(iii)	Potholes	24 hours
(iv)	Any cracks in road surface	15 (fifteen) days
(v)	Any depressions, rutting exceeding 10 mm in road surface	30 (thirty) days
(vi)	Bleeding/skidding	7 (seven) days
(vii)	Any other defect/distress on the road	15 (fifteen) days

Nature of Defect or Deficiency		Time Limit for Repair / Rectification
(viii)	Damage to pavement edges	15 (fifteen) days
(ix)	Removal of debris, dead animals	6 hours
(b)	Granular Earth Shoulders, Side Slopes, Drains and Culverts	
(i)	Variation by more than 1 % in the prescribed slope of camber/cross fall (shall not be less than the camber on the main carriageway)	7 (seven) days
(ii)	Edge drop at shoulders exceeding 40 mm	7 (seven) days
(iii)	Variation by more than 15% in the prescribed side (embankment) slopes	30 (thirty) days
(iv)	Rain cuts/gullies in slope	7 (seven) days
(v)	Damage to or silting of culverts and side drains	7 (seven) days
(vi)	De-silting of drains	24 hours
(vii)	Railing, parapets, crash barriers	7 (seven) days (Restore immediately if causing safety hazard)
(c)	Roadside Furniture Including Road Sign and Pavement Marking	
(i)	Damage to shape or position, poor visibility or loss of retro-reflectivity	48 hours
(ii)	Painting of km stone, railing, parapets, crash barriers	As and when required/Once every year
(iii)	Damaged/missing road signs requiring replacement	7 (seven) days
(iv)	Damage to road mark ups	7 (seven) days
(d)	Road Lighting	
(i)	Any major failure of the system	24 hours
(ii)	Faults and minor failures	8 hours
(e)	Trees and Plantation	
(i)	Obstruction in a minimum headroom of 5 m above carriageway or obstruction in visibility of road signs	24 hours
(ii)	Removal of fallen trees from carriageway	4 hours
(iii)	Deterioration in health of trees and bushes	Timely watering and treatment
(iv)	Trees and bushes requiring replacement	30 (thirty) days
(v)	Removal of vegetation affecting sight line and road structures	15 (fifteen) days
(f)	Other Project Facilities and Approach Roads	
(i)	Damage in approach roads, pedestrian facilities, truck lay-byes, bus-bays, bus-shelters, electrical, water, sanitation and service roads	15 (fifteen) days
(ii)	Damaged vehicles or debris on the road	4 (four) hours

Nature of Defect or Deficiency		Time Limit for Repair / Rectification
(iii)	Malfunctioning of the mobile crane	4 (four) hours
	BRIDGES / Culverts	
(a)	Superstructure	
(i)	Any damage, cracks, spalling / scaling Temporary measures Permanent measures	within 48 hours within 15 (fifteen) days or as specified by the Employer's Engineer
(b)	Foundations	
(i)	Scouring and/or cavitation	15 (fifteen) days
(c)	Piers, Abutments, Return Walls and Wing Walls	
(i)	Cracks and damages including settlement and tilting, spalling, scaling	30 (thirty) days
(d)	Bearings (Metallic) of Bridges	
(i)	Deformation, damages, tilting or shifting of bearings	15 (fifteen) days Greasing of metallic bearings once in a year
(e)	Joints	
(i)	Malfunctioning of joints	15 (fifteen) days
(f)	Other Items	
(i)	Deforming of pads in elastomeric bearings	7 (seven) days
(ii)	Gathering of dirt in bearings and joints; or clogging of spouts, weep holes and vent-holes	3 (three) days
(iii)	Damage or deterioration in kerbs, parapets, handrails and crash barriers	3 (three) days (immediately within 24 hours if posing danger to safety)
(iv)	Rain-cuts or erosion of banks of the side slopes of approaches	7 (seven) days
(v)	Damage to wearing coat	15 (fifteen) days
(vi)	Damage or deterioration in approach slabs, pitching, apron, toes, floor or guide bunds	30 (thirty) days
(vii)	Growth of vegetation affecting the structure or obstructing the waterway	15 (fifteen) days
	Water Network	
(a)	Transmission mains / Rising mains	
(i)	Bursts in the transmission mains / rising mains of water supply system	6 hrs from occurrence
(b)	Distribution Network	
(i)	Bursts in the distribution network pipelines	4 hrs from occurrence
(ii)	Flushing of distribution network pipelines	Once in 6 months
(c)	Sluice Valve/Air Valve/Reflux Valve	

Nature of Defect or Deficiency		Time Limit for Repair / Rectification
(i)	Faults and minor failures	6 hrs
(ii)	Faults and major failures	24 hrs
(iii)	Preventive maintenance for valves	Once in 6 months
(d)	Property Connection	
(i)	Leakages in pipeline	2 hrs
(ii)	Faults and major failures	6 hrs
	Ground level Storage Reservoir	
(i)	Leakages	6 hrs
(ii)	Paint	Once in a year
(iii)	Cleaning and Disinfection	Once in 2 months
	Sewerage Network	
(a)	Sewerage Network	7 (seven) days
(i)	Leakages in network pipeline	2 hrs
(ii)	Faults and minor failures	8 hrs
(iii)	Flushing of sewerage network (where velocity is < 0.6 m /seconds for present flow)	Once in 15 days
(b)	Man-Holes	
(i)	Damages to Man-Holes	24 hrs
(ii)	Overflow of Manholes	2 hrs
(iii)	Cleaning of manholes	Once in 3 months
(c)	Rising main	
(i)	Leakages in network pipeline	8 hrs
(ii)	Major damages in pipeline or replace	24 hours
(iii)	Preventive maintenance for valves	Once in 6 months
(d)	Property Connection	
(i)	Leakages in pipeline	2 hrs
(ii)	Faults and major failures	6 hrs
	Street Lighting	
(a)	Pole	
(i)	Leakages current	2 hrs
(ii)	Foundation crack minor	12 hrs
(iii)	Foundation crack major	4 hrs
(iv)	Brackets	8 hrs
	Nature of Defect or Deficiency	Time Limit for Repair /
	Access panel, Junction Box (Street	
(v)	Partition) and its Accessories	4 hrs
(vi)	Damaged Pole requiring replacement	4 days
(b)	Conductor / cable	8 hrs
(c)	Luminaires & its Accessories	

Nature of Defect or Deficiency		Time Limit for Repair / Rectification
i)	LED Luminaire found faulty (such as Flickering, completely not working (Failure), Lux level reduced from the pre-defined level, luminaire having moisture / water drops, etc.), complete luminaire to be replaced with original make / model and not to be repaired	4 hrs
ii)	Driver	4 hrs
iii)	Reflecting element	4 hrs
iv)	Housing	4 hrs
(d)	Control & Protection	
i)	Street Lighting Gateway - SLG & its Accessories	4 hrs
ii)	Street Lighting Controller – SLC & its Accessories	4 hrs
iii)	Central Management System - CMS & its Associated Components	2 hrs
iv)	Communication failure a) between CMS and/or SLG/SLC b) between SLG and SLC c) between SLC and LED Luminaire's Driver	4 hrs
(e)	Power	
i)	Supply (Lighting Distribution Board Onwards)	2 hrs
ii)	Fault	2 hrs
iii)	Lighting Distribution Board – LDB & its Accessories	2 hrs
(f)	Earthing	
i)	Any fault related to Earthing Units and its Associated Components	8 hrs

General Preventive Maintenance Checks Suggested for Maintenance of Project Components

	General Preventive Maintenance Checks
(a)	The following checks to be performed daily by the Contractor's personnel
(i)	Whether there is a change in the sound of a running pump / motor, abrupt changes in bearing temperature and seal leakage?
(ii)	The pump / motor capacity, pressure, power consumption and vibration level to check if outage is required to address deterioration of specified performance values.
(iii)	Rise in temperature of bearings in motor, in moving parts and other units, etc.
(iv)	Working of gauges, sensors and other flow measuring devices
(v)	Average power factor, kWH consumed

	General Preventive Maintenance Checks
(b)	The following checks to be performed weekly by the Contractor's personnel
(i)	Pipeline, valve and flow meters leakage
(ii)	Functioning of non-return valve
(iii)	Tightness of all electrical connections of all unit panels etc.
(iv)	Tightness all cable connections
(v)	Temperature rise due to loose connections
(vi)	Operation of valves and sluice gates
(vii)	Current and voltages in all electrical equipment
(viii)	Average power factor, kWH consumed
(ix)	Lights on/off
(x)	Leakage current for all power distribution
(c)	The following checks to be performed monthly by the Contractor's personnel
(i)	Battery voltage, battery charger, topping of distilled water, tightness of terminations etc.
(ii)	Gland packing
(iii)	Wear and tear of moving parts
(iv)	Adoption of Electrical energy conservation methods and energy consumption
(v)	Electrical contacts
(vi)	Motors
(vii)	Meggering of electrical equipment
(viii)	Watering of earthen pits
(d)	The following checks to be performed quarterly by the Contractor's personnel
(i)	Relay testing and calibration if possible of meters, gauges, instruments
(ii)	Speed of motors
(iii)	Level gauges and flow meters signals
(iv)	Cleaning, checking/tightening of L.T. Circuit / Panel
(v)	Auxiliary DB, Capacitor bank
(vi)	Battery and Battery charger
(e)	The following checks to be performed bi-annually by the Contractor's personnel
(i)	Free movement of stuffing box glands, gland bolts to be cleaned & lubricated and packing to be inspected to determine whether it requires replacement.
(ii)	Pump / motor alignment should be checked and corrected if necessary.
(iii)	Grease lubricated bearings should be checked to see that they contain the correct amount of grease and that it is still of suitable consistency
(f)	The following checks to be performed annually by the Contractor's personnel
(i)	Vibration should be reviewed. If the pump / motor is tending

	General Preventive Maintenance Checks
	towards unacceptable vibration levels:
	The bearing should be removed, cleaned and examined for flaws and wear The bearing housing should be carefully cleaned Rolling element bearings should be examined for scratches and wear Immediately after cleaning, rolling element bearings that are considered acceptable for reinstallation should be coated with grease.
(ii)	Shaft sleeve and shaft should be examined for wear.
(iii)	When coupling halves are disconnected for an alignment check, the vertical shaft movement of a pump with sleeve (journal) bearing should be checked at both ends with packing or seals removed. Any movement exceeding the original design clearance should be investigated to determine the cause. Endplay allowed by bearings should also be checked. If it exceeds that recommended by the manufacturer, the cause should be determined and corrected.
(iv)	Stuffing boxes should be repacked and the pump & motor should be realigned and Reconnected
(v)	Overhauling requirement of all equipment
(vi)	Improvement required if any in operation of plant
(vii)	Testing and Calibration of all instruments as per the OEM recommendations
(viii)	Transformer cleaning, checking silica gel, oil checking filtering/replacing, checking buchholz relay, checking pressure release valve, checking winding temperature indicator's sensor and NO/NC contacts, checking oil temperature indicator's sensor and NO/NC contacts.

4.2. OTHER MAINTENANCE REQUIREMENTS

4.2.1. DEFINITION OF MAINTENANCE

Maintenance covers all the techniques and systems which, by means of regular monitoring of equipment and scheduled maintenance procedures, prevent failures and, in the event of problems, enable repairs to be carried out with minimum disruption of the process. Maintenance is therefore a combination of technical, administrative, and management activities. Maintenance consists of preventive and corrective procedures.

4.2.2. PREVENTIVE MAINTENANCE

Preventive maintenance consist of all the regular work carried out in order to sustain the conditions necessary or smooth operation of the plant and to keep the performance of the equipment as close as possible to its original performance level. Its purpose is to reduce the probabilities of failure or deterioration of equipment of the plant. In simple terms, preventive maintenance involves the elementary operations such as lubrication, mechanical servicing, electrical and instrumentation servicing.

4.2.3. CORRECTIVE OR REMEDIAL MAINTENANCE

Corrective or remedial maintenance consists of all work needed to re-establish the conditions necessary for an apparatus or set of equipment to operate properly subsequent to failure or deterioration of the results produced by the equipment. It includes the following operations,

- Dismantling or equipment,
- Replacement of parts
- The work may be scheduled for the short or medium term in accordance with the checks carried out as part of the preventive maintenance procedure, the number of hours an apparatus has been operating, or an alarm factor (abnormal noise, repeated cut-out, weakening of the insulation, etc), or may be dictated by an unexpected breakdown.
- Maintenance work
 - The work consists of inspection work and maintenance work as mentioned below:
 - Inspection work includes physical appearance, inspection and measurement with testing equipment to verify and survey that the entire infrastructure components' performance operation is normal or not.
 - The inspection work shall be daily executed by each technical specialist as a routine and / or regular inspection and shall be recorded every each time. The evaluation on the collected data shall be immediately reviewed by the chief operational engineer to instruct the staff member for operation on the same day and /or make a plan of detail inspection and/or make repair schedule to make sure continuous plant operation without any problem.
 - Maintenance work, for which main task-work shall include activities, such as lubrication, overhaul, replacement of parts, repair, adjustment, detail examination and test, cleaning, to maintain the system in a good condition, performance consistent and low-cost operation based on a regular and preventive maintenance schedule including attending sudden Equipment breakdown and to achieve high operational efficiency.

4.2.4. SPECIFICATIONS

The specification of materials used for repairs shall be the same as used in the original work. Specifications for any materials which were not used during construction shall be approved by the Engineer prior to commencement of the maintenance period and must be incorporated in the O&M manual. Without being limited by this clause, during Maintenance period the Contractor shall use appropriate material for repairs even if material required for such repairs has not been approved earlier, and no delay in making such repairs shall be subjected to such limitation. However, subsequent to use of such material the Contractor shall submit proposals for the approval of specifications of such material. The approved material will subsequently form a part of the O&M manual. The comprehensive information as detailed in Table shall be submitted to the Engineer.

List of Execution Schedule

Items	Description
Maintenance of facilities	List of unit process, infrastructure components, Capacity of Plant,

	equipment machineries etc, Method / Frequency of maintenance.
Counter measure against accident and risk management	Damage prediction, Simulation of public relations, Method of recovery, Contact address, Rescue activity and emergency team.
Renewal	Replace of pipes, Replace of equipment & Facilities.
Organization and administration	Executive organization chart, Segregation of duties, List of staff member, Experience, Health certificate of staff member, type of insurance, Criminal record, Personnel name of taking record and make soft data, method of data control, Operation and maintenance cost.

4.3. ACTIVITIES DURING MAINTENANCE PERIOD

4.3.1. General

Within the framework of the Contractor's responsibilities given above, the Contractor shall carry out the following activities. However, these shall not limit the requirement for other activities which otherwise are required as per the terms and conditions of Contract or to fulfill the Contractor's responsibilities or are essential as per good industrial practices. The Contractor shall be responsible for, but not limited to, the following:

- Providing the required staff, but not less than the minimum specified numbers / level, during maintenance period and additional staff as per requirement during periodic maintenance and in emergencies.
- Providing all required spares, tools, tackles & Equipment and consumables required for functioning of plant and equipment.
- Maintenance of 33kV/433v substations, etc., at the pump house, administrative buildings etc. (all works constructed in this Contract) in neat and clean condition.
- Entering into AMC contracts with system / equipment suppliers such as Pumps, Hoists and cranes, Valves and actuators, and all proprietary equipment and others as necessary. The AMC contract shall include preventive maintenance and emergency corrective maintenance programmers, so that breakdowns can be kept to absolute minimum in frequency and duration.

Establish work control procedures including preventive and corrective maintenance so that the entire system shall work in automatic mode and/or semi-automatic at all times.

- Maintenance of the lighting fixtures and the lighting system of all areas and replacement of all non-functional lighting fixtures within 24 hours.
- Maintaining;
 - Repair history of all Civil, mechanical, electrical and instrumentation control equipment, and communication instruments;
 - Logbooks through PLC system;

- Daily log of operations of all the important equipment such as pumps, electrically actuated valves, etc., with time tag;
- Daily / hourly consumption data, (monitoring and recording) of potable water system including assessment of initial UFW.
- Daily list of alarms with time tag;
- Logbook format and the data to be included in the logbook shall be decided during commissioning in consultation with department;
- Last periodic maintenance done for all equipment/buildings of the system;

In addition to maintenance of above logbooks, the Contractor is required to maintain one inspection book. The complaints entered in the complaint register must be investigated and remedial measures must immediately be taken.

- Providing required spares, special tools and test equipment and maintaining adequate inventory of required accessories or equipment itself for repair of equipments. The Contractor may use spares and tools and tackles supplied with the Contract as required by him. However at the end of the Contract the Contractor shall hand over the full spares, tools and tackles as supplied with the Contract by replacing the used items with fresh supplies of the same specifications.
- Providing manpower for the required repairs of all facilities along with the manpower and materials for repair of the roads, buildings and project area utilities etc.
- Maintaining the drinking water supply, waste collection system, Drainage system, ICT infrastructure systems facilities in the entire Project area.
- Maintaining stores for the electrical, mechanical and instrumentation and control equipment. The maintenance of stores will include but shall not be limited to:
 - Loading / unloading of materials received and issued for works;
 - Proper arrangement of material in stores to ensure its safety and easy availability;
 - Maintaining store areas in a neat and tidy condition;
 - Keeping records and accounting for the incoming materials,
 - Keeping records and accounting for the consumed materials.

The Contractor shall be solely responsible for the safety and security of the goods in the store and will be responsible for any loss or damages in stores for any reason. He may opt for insurance cover against the value of the goods to be stored without any additional costs on the Department.

- Periodic routine maintenance of structures/buildings and others built in the Contract. Such maintenance must ensure adequate cleanliness, ventilation, illumination and structural safety. In addition to this, the general hygienic standards must be maintained and adequate plantation, horticultural activities must be taken up to maintain the total environment of the area.
- Updating and periodic submissions of the operation and maintenance manual as defined in specifications for O&M works. The Contractor shall take up all periodic maintenance works provided in the approved O&M manual.
- Submission of monthly report.

- Co-ordination with other contractors and/ or agencies responsible for the maintenance of the system.
- The Engineer shall be entitled to audit any aspect of the system and the contractor shall ensure remedial action as directed.
- Safety reporting: Brief reports of all accidents and hazardous incidents including descriptions of causes, extent of injuries, action taken, and precautions instituted to prevent repetition of such events.
- Insurance: The Contractor shall, without limiting his or the Employer's obligations and responsibilities, insure;
 - The work together with material and plant for incorporation therein, to the full replacement cost (term "cost" in this context shall include profit).
 - The Contractor's equipment and other things brought onto site by the Contractor, for a sum sufficient to provide for their replacement at the site.
 - The insurance shall be in the joint names of the Contractor and the Employer at the Contractor's cost and shall cover the Employer and the Contractor against all losses or damages from whatsoever cause arising from the start of the Maintenance until the date of completion of Maintenance period in respect of the facility or any section or part thereof as the case may be.
 - Any amount not insured or not recovered from the insurer shall be borne by the Contractor.
 - Insurance shall cover for civil works.

4.3.2. Contractor care of plant works

The Contractor shall take full responsibility for the care of the entire infrastructure system and other allied systems during the contract period till it is handed over to the Employer. If any loss or damage occurs to the system, during the period for the contractor is responsible, the contractor shall rectify such loss or damage, at his cost.

Experience & qualification of staff

- Requirements
Maintenance staff shall have best experience, their health condition and education in addition to possessing best knowledge, abilities and skills.
- Knowledge and abilities
 - Knowledge of entire infrastructure system operation and its unit operation;
 - Knowledge of the method, materials, and equipment of system;
 - Knowledge of maintenance, and servicing of pumps and other plant equipment and machinery;
 - Abilities to make repairs and/or adjustments to plant equipment and to keep records and prepare reports;
 - Abilities to read and interpret gauges and recording devices used;
 - Abilities to work efficiently with others.
- Safety and Health
- Electricity
 - All the electrical equipments shall be handled and operated by a trained and authorized person only. All the equipment shall be checked for its proper earthing and loose connections prior to start the equipment.

- Naked wire, loose connections and faulty connections shall be repaired immediately prior to start for operation.
 - Electrical sockets and switch shall not be touched by bare or wet hands. If there is any live wire found naked or on wet ground, main switch shall be turned off first then the wire shall be repaired or moved.
 - For any electrical works proper insulated tools shall be used. Do not try to use tools made for other purpose; it may be hazardous.
- Fall protection
 - Only authorized person shall work at high place, people working at high level shall be very careful and protect himself from fall and injuries. Protective gears such as gloves, safety belts shall be worn and safety belts shall be tied to proper location prior to start the work. If anybody feels dizzy and drowsy he should not work at high and should come down immediately.
 - Wherever possible a ladder shall be used. Ladder shall be in stable condition and proper slope of ladder is 4 vertical and 1 horizontal and it shall be properly secured at base.
 - All the opening shall be secured properly by barrier of hand rail to avoid unauthorized person getting in. Wherever covers are provided for opening those covers shall keep closed all the time, except for maintenance time.
- Entering inside tank
 - If worker should enter inside of deeper manholes or tanks precaution shall be taken.
 - Manholes cover shall be opened first and should wait for fresh air to circulate.
 - Prior to enter - oxygen level inside the tank shall be checked otherwise it may be hazardous. If oxygen is not enough a ventilating fan should be used to supply fresh air inside.
 - Only permitted person shall work inside, while a person is working inside there must be next person watching outside; unless he appoints next person he should not leave from duty. While men working inside manholes must keep open. And manholes shall be protected from outsiders to go inside.
 - If person inside feels drowsy, dizzy or unusual feeling he should come out immediately. He should rest and take a fresh air.
 - If the worker is collapsing inside, do not immediately enter inside for rescue him as you may be next victim of accident. Prior to rescue make sure that oxygen is enough inside, report immediately to person In-charge. Try to rescue the person from outside
- Health check up
 - Water can be scrapped and become a carrier of water borne disease if it is handled by an ill person. That's why personal health is an important factor to keep the water potable. Any person not feeling well shall report to their superior and shall go through proper health checkups.
 - All workers should go through medical check up, and the result of check up shall be reported to the Engineer.
- General personnel's cleaning

- Persons working shall maintain a high level of personal hygiene. This includes clean work clothes, skin, fingernails, and hair. They should wash their hands properly by using soap and clean water prior to handling the works.
- Uniform
- All workers at site work shall wear helmet, safety shoes, regular uniform to avoid any accident by rotating equipments.

4.3.3. Lubrication

The Contractor, in the operation and maintenance manuals, shall furnish a complete schedule of recommended oils and other lubricants. The number of types of lubricants shall be kept minimum. In case of grease lubricated bearings for electric motors, lithium base grease is preferred. The Contractor shall indicate the brand name of indigenously available equivalent lubricants, with their complete duty specifications, in the O&M manual. The Contractor shall also furnish the schedule of quantities for each fill, frequency of filling and annual requirement in O&M manual.

Where lubrication is effected by means of grease, preference shall be given to a pressure system which does not require frequent adjustment or recharging. Frequent, for this purpose, means more than once in a month. Where more than one type of special grease is required, a grease gun for each special type shall be used.

All lubricant systems shall be designed so as not to cause fire or pollution hazard. The Contractor shall supply flushing oil for such lubrication system when an item of plant is ready for preliminary running.

4.3.4. Spare Parts

All spare parts used for the equipment in the maintenance of the system must be from the manufacturer of the equipment or, if the equipment itself has been made with parts from other manufacturers, the parts must be of the same make as used in the equipment supplied and installed. All spare parts shall be packed for long storage under the climatic conditions prevailing at the Site. Each spare part shall be labelled on the outside of its packing with its description, number and purpose and, if more than one spare is packed in a single case, a general description of the case contents shall be shown on the outside and a packing list enclosed. All spare parts required for operation & maintenance shall be purchased by the contractor and spares given by respective OEM's shall be handed over to BTDA after maintenance period.

4.3.5. Operations and Maintenance Manual

The Operation & Maintenance manual shall establish guideline for infrastructure operator to understand the system to operate this system successfully.

The guideline shall also provide basic idea on, how to operate the system so as to manage with less consumption of energy; less cost of maintenance expenses; a long life of equipment; protection against accident and damage of system. The operators have to be well conversant with the manual and the guidelines stipulated therein. In practice, the system operation and unit operation of each component needs to be continuously adjusted and modified. The comprehensive manual shall be submitted to the Engineer before the operation and maintenance period, as specified. It shall be periodically updated to

incorporate the “best practices” experience gained while carrying out the O&M activities, broadly on the principals listed below:

Typical Operation & Maintenance Manual

Items	Description
General	1) Background of project 2) Plan and design condition 3) Planned infrastructure capacities 4) Design pressure (Pipe line) 5) Component of the system (Item, Specification, Quantity, Remarks) 6) Detail of facilities (Name of facility, units, No. structure, capacity, Remarks) 7) Detail of mechanical & electrical (Name, Specification, S.No./Tag No., Quantity, Remarks) 8) Detail of pipe line route (Flow diagram including valves /gates S.No /Tag No., Specification, Quantity, Remarks)
System operation (Civil / Mech/ Elec / SCADA.)	1) Infrastructure System drawings (Plan and profiles of Roads, water supply, Sewage, Storm water system, Plan view of pump house, flow diagram, single line diagram, electrical operation /control flow diagram, location/depth of water level sensor, flow control sensor system, others) 2) Outline of Main facility 3) Concept of operation 4) Concept of selection of facility 5) Operation procedure (photograph with explanation) 6) Preparation before start operation 7) Starting of system operation 8) During regular operation 9) Emergency operation
Component detail and full operation (Civil / Mech/ Elec / SCADA.)	1) Outline of all components 2) Concept of selection of component 3) Concept of auto-manual operation 4) Preparation before start of operation 5) Starting of operation 6) During regular operation 7) Emergency operation
Equipment detail (Mech / Elec.)	1) Outline of all equipment 2) Specification, dimensional drawings, performance curve, dimension of water level sensor 3) Preparation before start of operation 4) Starting of system operation 5) During regular system operation 6) Emergency system operation
Maintenance work summary	1) Inspection (System, Facility, Unit operation, others) 2) Maintenance (System, Facility, Unit operation, others) 3) Replace/repair (System, Facility, Unit operation, others) 4) Modification (System, Facility, Unit operation, others) 5) Troubleshooting(photograph with explanation)

Items	Description
List of data sheet/chart (For daily and /or periodic report)	1) Operational chart (description/number of worker/allocation) 2) Instruction manual for equipment 3) Record of system operation (Pressure, Q, time, rotation, noise) of all components 4) Record of material control 5) List of accessory/spare parts 6) List of Manufacture/supplier 7) List of Contractor/ subcontractors 8) Emergency control (Accident etc) 9) List of key control
Safety & Health	1) Electricity 2) Fall protection 3) Entering inside tank (lack of oxygen/ being filled with gas poisoning) 4) Health check up (staff member/workers) 5) General personnel's cleaning 6) Uniform 7) Site cleaning 8) Security control

- I. Up-dating any changes in the procedures set out in the O&M manual, as deemed necessary based on any limitations observed during the maintenance period, including incorporating additional procedures for maintenance of other repairs / break downs not incorporated in the maintenance manual but faced during O&M period.
- II. Procedures for repair of leaks / burst in different types of pipes must be provided, with supporting drawings. The O&M manual must be updated if any differences are observed during Maintenance period.
- III. Frequency of spares used in maintenance of valves (air-valve, sluice valves and butterfly valves), against corrosion must be recorded for updating the contents of the manual.
- IV. Records of trouble shooting points and details of events causing trouble (breakdowns) during maintenance of pump houses must be maintained and used for updating the contents of the manual.
- V. Records of trouble shooting points and details of events causing troubles (break down's) during maintenance of pumps / motors / measuring equipment(s), / electric panel and accessories there in must be maintained and used for updating the contents of the manual.
- VI. Records of trouble shooting points and details of events causing trouble (breakdowns) during maintenance 33kv/433v sub-station must be maintained and used for updating the contents of manual.
- VII. Records of Inventory used must be maintained and the relevant portion of O&M manual must be updated to list out the inventory requirements for maintaining the system.

- VIII. The provisions in the manual must incorporate every aspect of good practices even if not elaborated here or in other parts of the bid document. The provisions in the approved operation and maintenance document shall be valid and binding for both the parties during operation and maintenance along with the additions and deletions made.
- IX. The manual so prepared must be updated after the end of maintenance, giving effect to the experience gained and the observations made during the maintenance period.
- X. At the time of handing over after completion of Maintenance period, all the Plant and equipment, including standby equipment, must be in good working order to the satisfaction of the Employer.
- XI. Before handing over of the plant to the Employer at the end of Maintenance, the contractor shall submit the following documents:
 - i. Four sets of Operation and Maintenance manuals, together with vendor's manuals, fully updated to take account of the experience gained during the contract.
 - ii. Report summarizing the history of maintenance of the system during the contract, together with details of the optimized methodology for maintaining the system as developed by the contractor during the contract.
 - iii. The inventory of spares and tools etc. held in stock showing that he has replenished the spares and tools consumed during the contract.
 - iv. The proposals, outline of the training modules and programmes, for the training of the Employer's staff.

The contractor shall correct these documents to incorporate any comments from the Engineer and any additional information as required by the Engineer. The final submission of these document shall not be later than 30 days prior to due date of handing over the system to the Employer. 10 days prior to completion of Maintenance works, the Engineer and the contractor shall make a joint inspection of all civil structures, buildings, Plant and Equipment etc at the pump house to assess the condition of these items and agree a list of remedial works and replacements. The contractor shall carry out all remedial works and provide, install and set to work such replacements at his expense to the satisfaction of the Employer as per agreed time schedule.

4.3.6. Facilities To Contractor

The Contractor will be permitted to use the premises developed under the Contract for use by his staff during maintenance period to the extent agreed and approved by the Engineer.

4.3.7. Payments

The Contractor, at the time of bidding, will be responsible to ensure the completeness and adequacy of his Bid Price to fulfil the entire responsibilities as described above. His bid price, in the Schedule of Prices, shall include all costs for carrying out all Maintenance responsibilities.

4.3.8. Format

Suggested formats to be followed for proper maintenance recording are given below. The format can be finalized during execution stage.

4.4. INSTRUMENTATION, CONTROL & AUTOMATION (ICA)

4.4.1. General Maintenance

A comprehensive maintenance program is critical to attain long-term reliable performance of SCADA Systems / ICA systems. Periodic device calibration, preventive maintenance, and testing allow potential problems to be identified before they can cause mission failure. Prompt corrective maintenance assures reliability by minimizing downtime of redundant components.

The contractor has to enter in to AMC contracts with system / equipment suppliers of ICA, as necessary.

4.4.2. Preventive Maintenance

- I. The SCADA system should be part of the overall preventive maintenance (PM) program for the facility. Preventive maintenance schedules for SCADA components and subsystems should be coordinated with those for the mechanical / electrical systems they serve to minimize overall scheduled down time.
- II. Many components of SCADA systems, such as dead-bus relays, are not required to function under normal system operating modes. For this reason, the system should be tested periodically under actual or simulated contingency conditions. These tests should approach as closely as possible, the actual off- normal conditions in which the system must operate. For example, SCADA for Dual Redundant system should be tested by interrupting the utility source as far upstream of the normal service as possible.
- III. Periodic system testing procedures can duplicate or be derived from the functional performance testing procedures.
- IV. The SCADA software maintenance should include timely updates of any new versions from the supplier and testing to verify proper installation on the SCADA computer. In addition, software antivirus updates should be maintained. This should be performed any time after the computer is connected to the Internet or the antivirus patch should be downloaded as and when the updates are available. Normal operation requires that the SCADA computer not be connected to the Internet.

Faulty Instruments, sensors, transmitters, communication modules, computer hardware should be replaced with new components. Repair of the failure items would not be accepted. Instruments, modules would have to replace with a new instruments and components.

4.4.3. Concurrent Maintenance

Concurrent maintenance is defined as testing, troubleshooting, repair or replacement of a component or subsystem while redundant component(s) or subsystem(s) are serving the load. The ability to perform concurrent maintenance is critical to attain the specified reliability / availability criteria for facilities and must be designed into the SCADA system. Where SCADA components are associated with equipment that has redundancy and therefore are not themselves redundant, their maintenance should be scheduled to occur during maintenance of the associated equipment. SCADA components and controllers that are

redundant must be capable of being taken out of service, repaired or replaced and tested without interfering with the operation of the redundant component.

4.4.4. Reliability Centered Maintenance

Reliability-Centered Maintenance (RCM) is an approach for developing an effective and efficient maintenance program based on the reliability characteristics of the constituent parts and subsystems, economics, and safety. RCM provides a logical, structured framework for determining the optimum mix of applicable and effective maintenance activities needed to sustain the operational reliability of systems and equipment while ensuring their safe and economical operation and support.

A significant by product of the application of SCADA systems to the control of facilities is the large amount of operational data made available through the trending and data storage features of the SCADA. This operational data can be used for automated performance monitoring of mechanical and electrical systems that can support a RCM approach.

4.4.5. Maintenance Documentation

The contractor should perform an O&M analysis to determine the O&M data required to support maintenance of the SCADA system. This analysis should be coordinated with Employer to determine maintenance parameters and O&M data that are available. Typical O&M data requirements include but not limited to the following items:

- I. System documentation as defined in FDS, FAT & SAT documents
- II. Minimum spare parts list.
- III. Recommended spare parts list.
- IV. Recommended onsite test equipment.
- V. Recommended O&M training.
- VI. Recommended O&M to be performed by contractor

4.4.6. Spare Parts Stocking

An adequate on-site stock of spare parts is essential to obtain high availability of ICA systems. All spare parts used for the equipment in the maintenance of the system must be from the manufacturer of the equipment or, if the equipment itself has been made with parts from other manufacturers, the parts must be of the same make as used in the equipment supplied and installed. All spare parts shall be packed for long storage under the climatic conditions prevailing at the Site. Each spare part shall be labeled on the outside of its packing with its description, number and purpose and, if more than one spare is packed in a single case, a general description of the case contents shall be shown on the outside and a packing list enclosed.

Minimum recommended stocking levels include the following. These quantities may need to be increased for components which are used in large numbers in the facility:

- I. Manufacturer's recommended spare parts list.
- II. One each of all line replaceable boards or modules.
- III. Six each power and control fuses used in the system.
- IV. Tools required to terminate coaxial or fiber optic cables.

4.4.7. Automation:

- I. Laptop computer loaded with software required to access controllers.
Licenses for all software installed on the system.
- II. Permission to modify program code.

- III. Spare cables for connecting computer to controllers.
- IV. PLC CPU, Power supply module, 1 DI, DO, AI, AO modules, Communication module, protocol converter etc.,
- V. PLC batteries, fuses, etc.

4.4.8. Utilities & Consumables

The contractor has to provide consumables for printers e.g.: Ink cartridges (color & B/W), A4, A3, A1 size of paper, dot-matrix print paper. Downtime of the above system should not exceed more than 2 hours.

4.4.9. Technical Support

The Contractor should specify functional areas of the operating system and/or equipment where a Technical representative will be furnished by the manufacturer for training, test, checkout, validation, or pre-operational exercises. Ongoing Maintenance of SCADA system software may require technical support from the system vendor or from agency technical personnel not located at the facility. Commercial SCADA software typically has provisions for remote modem access that permit this type of support from the vendor's location or an agency central engineering group. Such remote access provisions represent a vulnerability to "hacking" and must be used with great caution. They should be monitored when in use and physically disconnected when not in use. Password protection policies for all SCADA systems, including PLC's, shall be in compliance with Established policies and to be agreed with the employers representative. These policies require that the default password that came from the control supplier be changed when placed into operation at the facility.

4.5. SEWERAGE

4.5.1. Maintenance Requirement

The system shall be maintained upto the Satisfaction of the Engineer In charges as per relevant standards. Suitable number of personal shall be deployed as per the standards. Periodic maintenance shall also be carried out for normal wear and tear.

4.6. INFORMATION AND COMMUNICATION TECHNOLOGY MAINTAINENCE

4.6.1. General

This section applies to carry out maintenance of the facility in meeting its objective. The section pertains to the specifications of infrastructure component and equipment including materials used for maintenance, the workmanship, during period for maintenance, maintenance of records, and responsibilities during maintenance period. The Contractor shall be responsible for providing continuous improvement in the infrastructure system operation, instrumentation system, communication system, SCADA, Plant and Machineries, all ancillary buildings, project area and to prevent any further sudden failure or breakdown through maintenance works on operation.

4.6.2. Duties and Responsibilities

The Contractor shall maintain the works on regular and systematic basis in compliance with maintenance requirements set forth in this document.

- Client will provide administrative support. Rest all Responsibility lies with the Contractor.
- The contractor shall ensure satisfactory maintenance of the whole works so that the entire infrastructure system operation provides reliable, consistent performance and is economical at all times.

4.6.3. Definition of Maintenance

Maintenance covers all the techniques and systems which, by means of regular monitoring of equipment and scheduled maintenance procedures, prevent failures and, in the event of problems, enable repairs to be carried out with minimum disruption of the process. Maintenance is therefore a combination of technical, administrative, and management activities. Maintenance consists of preventive and corrective procedures.

4.6.4. Preventive Maintenance

Preventive maintenance consist of all the regular work carried out in order to sustain the conditions necessary or smooth operation of the plant and to keep the performance of the equipment as close as possible to its original performance level. Its purpose is to reduce the probabilities of failure or deterioration of equipment of the plant. In simple terms, preventive maintenance involves the elementary operations such as lubrication, mechanical servicing, electrical and instrumentation servicing.

4.6.5. Corrective or Remedial Maintenance

Corrective or remedial maintenance consists of all work needed to re-establish the conditions necessary for an apparatus or set of equipment to operate properly subsequent to failure or deterioration of the results produced by the equipment.

It includes the following operations,

- Dismantling or equipment,
- Replacement of parts

The work may be scheduled for the short or medium term in accordance with the checks carried out as part of the preventive maintenance procedure, the number of hours an apparatus has been operating, or an alarm factor (abnormal noise, repeated cut-out, weakening of the insulation, etc), or may be dictated by an unexpected breakdown.

Maintenance work

The work consists of inspection work and maintenance work as mentioned below:

- Inspection work includes physical appearance, inspection and measurement with testing equipment to verify and survey that the entire infrastructure components' performance operation is normal or not.
- The inspection work shall be daily executed by each technical specialist as a routine and / or regular inspection and shall be recorded every each time. The evaluation on the collected data shall be immediately reviewed by the chief operational engineer to instruct the staff member for operation on the same day and /or make a plan of detail inspection and/or make repair schedule to make sure continuous plant operation without any problem.
- Maintenance work, for which main task-work shall include activities, such as lubrication, overhaul, replacement of parts, repair, adjustment, detail examination and test, cleaning, to maintain the system in a good condition,

performance consistent and low cost operation based on regular and preventive maintenance schedule including attending sudden Equipment breakdown and to achieve high operational efficiency.

4.6.6. Specifications

The specification of materials used for repairs shall be the same as used in the original work. Specifications for any materials which were not used during construction shall be approved by the Engineer prior to commencement of the maintenance period and must be incorporated in the O&M manual. Without being limited by this clause, during Maintenance period the Contractor shall use appropriate material for repairs even if material required for such repairs has not been approved earlier, and no delay in making such repairs shall be subjected to such limitation. However, subsequent to use of such material the Contractor shall submit proposals for the approval of specifications of such material. The approved material will subsequently form a part of the O&M manual. The comprehensive information as detailed shall be submitted to the Engineer.

4.7. TRAINING AND ADVISORY REQUIREMENTS

4.7.1. General

The Contractor shall provide comprehensive training for different categories of the Employers operation and maintenance staff. Training shall fall into two main types which are 'off the job' and 'on the job'. Off the job training shall take place in the classroom, on the job training shall be carried out on the site for the entire infrastructure component.

4.7.2. Off the Job Training

The Contractor shall prepare formal training documentation for distribution to the trainees. Visual aids shall be used where possible to illustrate the points being made and to make the training programme as interesting and enjoyable as possible for the participants.

The off the job training shall comprise the following:

a. Off the Job Training Programme for all Trainees

To provide training:

- i. health and safety;
- ii. System safety procedures;
- iii. on the use of the local and central HMI s.

b. Off the Job Process Training Programme for Operators

To provide training:

- i. on operation of individual items of plant and sections of the Works including automatic operation and manual operation in the event of say automatic control failure;
- ii. on day-to-day operation of the Works and procedures;
- iii. on a comprehensive list of 'what if' scenarios dealing with the actions to be taken in the event of potential process problems, alarms, system failures overflows, power failures etc.;
- iv. on first line mechanical maintenance;
- v. safe methods of work general;
- vi. on safety procedures to be followed in operating, maintaining and cleaning the system;
- vii. Special precautions to be followed in the event of Hazards.

- c. Off the Job Training Programme for Electrical Maintenance Staff
To provide training:
 - i. on configuration, construction and operation of the electrical Plant;
 - ii. on electrical maintenance requirements of the Works;
 - iii. on switching and safety procedures to be followed;
 - iv. safe methods of working;
 - v. On fault finding and repair procedures.
- d. Off the Job Training Programme for Control and Instrumentation Maintenance Staff
To provide training:
 - i. on configuration, construction and operation of the Plant;
 - ii. on control and instrumentation maintenance requirements of the Works;
 - iii. on fault finding and repair procedures;
 - iv. safe methods of working;
- e. Off the Job Training Programme for Mechanical Maintenance Staff
To provide training:
 - i. on routine mechanical maintenance requirements of the Works;
 - ii. on lubrication requirements of the Works;
 - iii. on fault finding, repair and overhaul procedures;
 - iv. Safe methods of working.

4.7.3. On The Job Training

The Contractor shall utilize the Operations and Maintenance Manuals as the primary training aid in carrying out the on the job training. Short comings, omissions and errors identified in the O & M Manuals during the training shall be rectified prior to final acceptance of the O & M Manuals.

- a. On the Job Training Programme for all Trainees
To provide training:
 - i. plant familiarisation tour;
 - ii. on use of the local and central HMI s;
 - iii. health and safety;
 - iv. Identify areas where special safety precautions are necessary.
- b. On the Job Process Training Programme for Operators
To provide training:
 - i. Under operational conditions on the operation of individual items of plant and sections of the Works including automatic operation and manual operation in the event of say automatic control failure;
 - ii. illustrate by example day to day operation of the Works and procedures;
 - iii. illustrate by example the actions to be taken in the event of potential process problems, alarms, plant failures overflows, power failures etc.(as identified in the 'what if' scenario off the job training);
 - iv. illustrate by example the first line mechanical maintenance;
 - v. illustrate by example safety procedures to be followed in operation, maintenance and cleaning of the Works.
- c. On the Job Training Programme for Electrical Maintenance Staff
To provide training:
 - i. carry out detail tour of the electrical plant;

- ii. illustrate by example the operation of the electrical Plant;
 - iii. illustrate by example the electrical isolation and maintenance procedures;
 - iv. illustrate by example fault finding and repair procedures;
 - v. illustrate by example switching and safety procedures to be followed;
 - vi. illustrate by example safe systems of work.
- d. On the Job Training Programme for Control and Instrumentation Maintenance Staff
To provide training:
- i. illustrate by example the operation of the Works;
 - ii. illustrate by example the control and instrumentation maintenance requirements of the Works;
 - iii. illustrate by example fault finding and repair procedures
 - iv. illustrate by example safe systems of work.
- e. On the Job Training Programme for Mechanical Maintenance Staff
To provide training:
- i. illustrate by example the routine mechanical maintenance requirements of the Works;
 - ii. illustrate by example lubrication procedures;
 - iii. illustrate by example fault finding, repair and overhaul procedures.
 - iv. illustrate by example safe systems of work.

4.7.4. Training Programme

Off the job training shall be carried out prior to Taking Over of the Works or any section of the Works. On the job training shall be carried out primarily after Taking Over of the Works or any section of the Works. However where it is possible to do so without reducing the effectiveness of the training and with the permission of the Engineer and the Employer on the job training may be carried out prior to Taking Over. On the job training shall be completed as a condition for acceptance of the Works following completion of the Tests after Completion.

The Contractor shall provide a training plan for each category of staff. The training plan shall detail the content and duration of each course. The training plan shall be submitted for the approval of the Engineer at least 120 days prior to the commencement of the Tests on Completion. The duration of training offered for each category of staff shall not be less than that detailed in the following table.

Category of Staff	Off the Job (Minimum days duration for each course)	On the Job (Minimum days duration for each course)
All staff	1	1
Operator	3	5
Electrical technician/electrician	2	2
Control/instrument technician	10	5
Mechanical technician/fitter	2	2

The training day shall be assumed to be not less than 6 hours split into two sessions. The off the job training rooms shall be provided by the Employer at the Site in the existing buildings. The Contractor shall provide facilities for training which shall include inter alia tables and chairs, projectors, white/black boards, training aids etc.

Where trainees of a given category can all be released from their Works operational duties simultaneously, they may be trained together. Where this is not possible, the Contractor shall repeat the complete course for those who could not attend.

4.7.5. Training Personnel

The Contractor shall provide suitably qualified trainers to carry out the off the job and on the job training. The trainers are to be experienced in infrastructure management, operation and maintenance in their relevant discipline and in training of skilled and unskilled staff. The Contractor shall submit the curriculum vitae of the nominee's to the Engineer for approval. The training expert shall be fluent in both English and Kannada or the Contractor shall provide the services of an interpreter during the training periods.

4.7.6. Operation and Maintenance Manual

This Operation & Maintenance manual shall be provided by the contractor to establish guideline for system operator to understand and operate the system efficiently and successfully. The guideline shall be provided to the training personnel, on how to operate the system so that they shall be able to manage; with less consumption of energy; with less cost of maintenance expenses; providing a long life of equipment; protection against accident, safe working methods and protecting systems from damages.

The system operation and unit operation of each component needs to be adjusted and modified depending on situational requirements and the required data are collected during the training program as well as operation and maintenance period.

The contractor shall train the BTDA personnel about system operation knowledge, abilities and skill as follows:

- a. Capacity Building
 - i. Knowledge;
 - System flow and unit operation, maintenance, pumps, other plant equipment and machinery;
 - Basic maintenance period and work sheet;
 - Avoiding any chance of accident, and
 - Basic safety and health;
 - ii. Abilities;
 - Make repairs and/or adjustments to system and to keep records and prepare reports;
 - Make repairs and/or adjustments to each equipment and to keep records and prepare reports;
 - Handling safety valves and its pipeline;
 - Read and interpret gauges and recording devices;
 - Usage of safety Equipment in case of Emergency.
- b. Tasks of Maintenance works shall include:
 - i. Make minor repairs and adjustments to machinery, equipment, pipes and other materials pertinent to the operation of the system;
 - ii. Work on troubleshooting including bulk flow control as well;

- iii. Maintain maintenance records;
- iv. Cleaning of machinery, equipment and civil structure, building, loading and unloading of materials properly;
- v. General maintenance of the system, including, but not limited to, painting, general custodial work, maintenance of equipment, etc;
- vi. Assist in repairing flow meters and pipe line including valves in inactive time and /or operation time;
- vii. Assist in the inspection of all necessary equipment.
- viii. Information to be covered in the Operation and Maintenance Manual

The operation and maintenance manual shall include but not necessarily be limited to the following;

- Background of project;
- Plan and design condition;
- System operation indices and unit operation indices;
- Outline of system operation (Civil, Mechanical & Electrical);
 - 1. Summary
 - 2. Table of facilities
 - (Tag number, Type, Number, Nominal bore, capacity, motor rating, and weight)
- c. Outline of component and its aim (Civil & Mechanical);
 - i. Normal operation
 - ii. Emergency operation
 - iii. Selection of facility
 - iv. Selection of Auto/Manual mode
 - v. Notice of danger/peril/hazard
- d. Verification items of system operation mode (Civil & Mechanical);
 - i. Before start of system operation
 - ii. Start of system operation
 - iii. During regular operation
 - iv. Set value of level sensors and safety pressure on safety devices
 - v. Position of plant/equipment on the selected mode
 - vi. Remove potential danger/peril/hazard
- e. Detail of facility/equipment component (Civil & Mechanical);
 - i. Summary
 - ii. Specification
 - iii. Outside dimension
 - iv. Weight, quality of material
 - v. Outside drawing
 - vi. Graph, charts, performance curve, table
 - vii. Photo after installation
 - viii. Notice of danger/peril/hazard
- f. Verification items of component operation (Civil & Mechanical);
 - i. Preparation before the operation
 - ii. Starting operation flow
 - iii. Normal operation
 - iv. Set value of level sensors and safety valves
 - v. Emergency maintenance
 - vi. Notice of danger, peril, hazard

- g. Outline of component and its aim (Electrical);
 - i. Verify income power Hz, Kwh
 - ii. Verify output from cogeneration Hz, Kwh
 - iii. Ordinary line or Emergency line operation
 - iv. Detail and full operation procedure
 - v. Select standby generator
 - vi. Emergency operation
 - vii. Selection of facility
 - viii. Notice of danger/peril/hazard
- h. Verification items of system operation mode (Electrical);
 - i. Before start of system operation
 - ii. Start of system operation
 - iii. Set value of level sensors and protection
 - iv. Select Auto/Manual mode on central control panel
 - v. Remove potential danger/peril/hazard
- i. Detail of facility component (Electrical);
 - i. Summary
 - ii. Specification
 - iii. Single line diagram
 - iv. Panel dimension
 - v. Weight, quality of material
 - vi. Outside drawing
 - vii. Graph, charts, performance curve, table
 - viii. Photo after installation
 - ix. Notice of danger/peril/hazard
- j. Facility verification items (Electrical);
 - i. Preparation before the operation
 - ii. Select Normal operation or Emergency operation
 - iii. Select equipment operation mode/switch by Auto /manual
 - iv. Before start of system operation
 - v. Start of system operation
 - vi. Set value of level sensors and protection
 - vii. Remove potential danger/peril/hazard
 - viii. Notice of danger/peril/hazard
- k. Standard;
 - i. Emission control
 - ii. Noise and vibration
- l. Fire/explosion protection
- m. Frequency of sampling, analysis and evaluation;
 - i. Regulated pollutants
 - ii. Operation index
 - iii. Water temperature
 - iv. Water pressure
 - v. Water quality
- n. Maintenance schedule (Mechanical & Electrical);
 - i. Routine work
 - ii. Regular work
 - iii. Manufacturer recommendation
- o. Maintenance schedule (Civil);

- i. Routine work
 - ii. Regular work
 - iii. Manufacturer recommendation
- p. Troubleshooting guide (Phenomenon/action/comments);
 - i. Mechanical equipment
 - ii. Electrical equipment
 - iii. Case study or/and previous experiences (Normal troubleshooting)
- q. Operation / test data
 - i. Operation index
 - ii. Mechanical site inspection data
 - iii. Electrical site inspection data
 - iv. Noise and vibration
 - v. Water temperature
 - vi. Power consumption
 - vii. Operation cost during training period
 - viii. Consumables, spare parts and its list
 - ix. Photo of inspection (evidence)
- r. List
 - i. Equipment control
 - ii. Operation record formats
 - iii. Maintenance record formats
 - iv. Material control
 - v. Inventory
 - vi. Spare parts
 - vii. Safety and Health

5. REPLACEMENT OF DEFECTIVE PARTS AND MATERIALS:

In case, contractor fails to attend to the defects during guarantee /warranty period, employer may, on giving the contractor Seven (7) days notice in writing of his intentions to do so, proceed to get the defective parts replaced or repairs carried out at the cost of the contractor and recover the same from the security deposit or any amount due to him.

6. PROJECT FACILITIES

6.1. CAMP AND OFFICE FACILITIES

The Contractor shall construct and maintain to the Employer's satisfaction a camp to provide living accommodation for all contractor's staff and operatives who have no other local accommodation. The Contractor's camp shall be located close to the Site at a location approved by the Employer

Responsibility for providing all services to the living quarters and compliance with all sanitary laws and other laws and regulations shall be borne by the Contractor. Security and the fencing of these areas shall be the responsibility of the Contractor.

A separate office for the sole use of the Employer's Engineer, his staff and Consultant shall be provided by the Contractor at the plant site to the satisfaction of Employer. The Contractor shall provide, erect, furnish, clean, maintain and subsequently transfer the office

and associated furniture / items to the Employer after the completion of works. The carpet area of the office shall be of 100 to 150 Sq. Meter.

6.2. LATRINES AND WASHING FACILITIES

Throughout the period of construction of the Works the Contractor shall provide, maintain and cleanse suitable and sufficient latrines and washing facilities for use by his employees. He shall ensure that his employees do not foul the Site but make proper use of the latrines. Where practicable the latrines shall be connected to the nearest sewer, or if this is not practicable the Contractor shall provide an adequately sized septic tank and soak away.

The Contractor is also to provide separate latrines to the above requirements for the entire Employer's Engineer staff. After Completion of the works, the latrines and washing facilities shall be removed, all ground disinfected and the surface reinstated to the satisfaction of the Employer.

7. TESTS ON COMPLETION

7.1. SCHEDULE FOR TESTS

The Contractor shall, no later than 30 (thirty) days prior to the likely completion of construction, notify the Employer's Engineer and the Employer of its intent to subject the project components to Tests, and no later than 10 (ten) days prior to the actual date of Tests, furnish to the Employer's Engineer and the Employer detailed inventory and particulars of all works and equipment forming part of Works.

The Contractor shall notify the Employer's Engineer of its readiness to subject the project components to Tests at any time after 10 (ten) days from the date of such notice, and upon receipt of such notice, the Employer's Engineer shall, in consultation with the Contractor, determine the date and time for each Test and notify the same to the Employer who may designate its representative to witness the Tests.

7.2. TESTS

Visual and physical test: The Employer's Engineer shall conduct a visual and physical check of construction to determine that all works and equipment forming part thereof conform to the provisions of this Agreement.

Riding quality test: Riding quality of each lane of the carriageway shall be checked with the help of a calibrated bump integrator and the maximum permissible roughness for purposes of this Test shall be 1800 (Eighteen Hundred) mm for each kilometre.

Water Tightness test: All hydraulic structures, such as water lines, sewer lines network, joints, manholes etc. or any other liquid containers shall have to be tested for water tightness. The water tightness test shall be conducted as specified in IS: 4127-1967.

Water Tightness test for Manhole: The entire height of the manhole shall be tested for water tightness as per CPHEEO Manual, by closing both the incoming and outgoing ends of the sewer and filling the manhole with water and the drop in water level not more than 50 mm per 24 hours shall be permitted.

Hydraulic Test: Fill the pipeline with water after it has been laid; bleed off any trapped air. Subject the lowest element in the system to a test pressure that is 1.5 times the design pressure and check for any leakage. When, in the opinion of the engineer, local conditions require that the trenches be backfilled immediately after the pipe has been laid, apply the

pressure test after backfilling has been completed but not sooner than a time which will allow sufficient curing of any concrete that may have been used. Typical minimum concrete curing time are 36 hours for early strengths and 7 days for normal strengths.

Water Tightness test for GSR: The contractor shall be fully responsible for the water tightness of the tank, the tank shall be taken as watertight if the depression in water level after filling the tank to full supply level not more than 12.20 mm in 24 Hrs. and no leakages are observed.

Visual and physical test for Street lighting system covering pole, luminaire, power supply, grounding, communication between luminaire to control panel and central control system. Installation testing including lighting performance verification.

Other tests: The Employer's Engineer may require the Contractor to carry out or cause to be carried additional tests, in accordance with Good Industry Practice, for determining the compliance of the project components with Standards and Specifications.

Environmental audit: The Employer's Engineer shall carry out a check to determine conformity of the project components with the environmental requirements set forth in Applicable Laws and Applicable Permits.

Safety Audit: The Employer's Engineer shall carry out, or cause to be carried out, a safety audit to determine conformity of the project components with the safety requirements and Good Industry Practice.

7.3. AGENCY FOR CONDUCTING TESTS

All Tests set forth in this Schedule-K shall be conducted by Contractor or such other agency or person as it may specify in consultation with the Employer's Engineer/Employer.

7.4. COMPLETION CERTIFICATE

Upon successful completion of Tests, the Employer's Engineer shall issue the Completion Certificate in accordance with the provisions of this document.

7.5. CIVIL (TESTS ON COMPLETION)

7.5.1. Hydraulic Testing of Liquid Retaining Structures

In addition to the structural test of structures, the liquid retaining structures shall also be tested for water tightness test at full supply level as described in 12.1.1 and 12.1.2 of latest revision of IS 3370 (Part I).

On completion of the structure and before its commissioning, the contractor shall carry out water tightness test for the maximum water head condition i.e. with the water standing at Full Supply Level (FSL). This test shall be carried out preferably in dry season in accordance with the procedure given below:

The water tightness test shall be carried out when the construction of liquid retaining structure is completed and when it is possible to fill the structure and ensure that uniform settlement of the structure as a whole or as directed by the Engineer. Before the filling operations are started the structure shall be inspected by the Engineer and the Contractor's Representative and the condition of surfaces of walls, contraction joints shall be noted and it shall be ensured that the jointing material filled in the joint is in position and all openings are closed. The Contractor shall make necessary arrangement for ventilation and lighting of the structure by way of floodlights, circulators etc. for carrying out proper inspection of the surfaces and inner conditions if so desired by the Employer. Records of leakages starting at different levels of water in the reservoir, if any, shall be kept.

The liquid retaining structure once filled shall be allowed to remain so for a period of seven days before any readings of drop in water level are recorded. The level of the water shall be recorded against the subsequent intervals of 24 hours over a period of seven days. The total drop in surface level over a period of seven days shall be taken as an indication of the water tightness of the structure, which for all practical purposes shall not exceed 20 mm. Also, there shall be no indications of the leakages around the opening or on the walls.

If the structure does not satisfy the condition of test and the daily drop in water level is decreasing, the period of test may be extended for a further period of seven days and if the specified limit is then reached the structure may be considered as satisfactory.

The external faces of structure shall not show any signs of leakage and shall remain apparently dry over the period of observation of seven days after allowing a seven-day period for absorption after filling.

In case the drop in level exceeds the permissible level limit and signs of leakage with the stipulated period of test, the Contractor shall carry out such additional works and adopt such measures as may be directed by the Engineer to reduce the leakage within the permissible limits. The entire rectification work that shall be carried out in this connection shall be at the Contractor's cost. The water required for subsequent testing shall be supplied to the Contractor free of cost, if the same is available near the site. Contractor shall have to make arrangement for filling emptying the structure at his own cost.

If the test results are unsatisfactory, the Contractor shall ascertain the cause and make all necessary repairs and repeat the water retaining structures test procedures, at his own cost. Should the re-test results still be unsatisfactory after the repairs, the structure will be condemned, and the Contractor will dismantle and reconstruct the structure, to the original specification, at his own cost.

During testing and during defect liability period the impression marks created due to seepage shall be rectified and made good.

No separate payment shall be made for water tightness test and the cost thereof shall deemed to be covered in the rates quoted for the works.

7.5.2. Hydraulic Testing of pipelines

The testing conditions for the pipelines are summarized as follows:

- Maximum hydrostatic test pressure for HDPE pipes shall be 12.0 Kg/sq cm.
- Maximum hydrostatic test pressure for DI K-9 pipes shall be 12.0 Kg/sq cm.
- RCC and DWC pipes shall be tested as specified in the relevant IS codes
- Pressure test with addition of make-up water
 - Pressure: Test pressure
 - Duration: 3 hrs
- Test criteria for DI/HDPE/DWC/RCC pipes: $Q = 1.0$ litre per km per 10mm of pipe per 30 m test pressure per 24 hrs.

All pressure testing at site should be carried out hydrostatically. The pipes shall be accepted to have passed the pressure test satisfactorily, if the quantity of water required to restore the test pressure does not exceed the amount 'Q', calculated by the above formula.

If it is required to test a section of a pipeline with a free end, it is necessary to provide temporary support against the considerable end thrust developed by the application of the test pressure. The end support can be provided by inserting a wooden beam or similar strong material in a short trench excavated at right angle to the main trench and inserting suitable packing between the support and pipe end.

On completion of satisfactory test any temporary anchor blocks shall be broken out and stop ends removed. Backfilling of the pipeline shall be completed.

7.5.3. Failure to pass the tests

All pipes or joints which are proved to be in any way defective shall be replaced or remade and re-tested as often as may be necessary until a satisfactory test shall have been obtained. Any work which fails or is proved by test to be unsatisfactory in any way shall be redone by the Contractor.

7.6. Mechanical works

7.6.1. Site Acceptance Test Document

Fifty-six (56) days prior to commencement of Tests on Completion the Contractor shall supply a Site Acceptance Test (SAT) Document for approval. This shall comprise four copies of the details of the inspection and test procedures to be carried out in testing the Works.

The SAT Plan shall provide comprehensive details of the tests to be carried out, the purpose of each test, duration of test, tolerance limits, the equipment to be used in carrying out the test and the methods to be adopted in carrying out the tests. The SAT shall provide space within the documentation for results of the tests to be added and for each test and for the SAT as a whole to be signed off by the Contractor and the Engineer.

The SAT shall categorise tests as follows:

- Dry tests;
- Wet tests which can be further sub-divided into:
 - Hydraulic tests;
 - Process tests.

Dry tests are those tests carried out without process fluid being present. Hydraulic wet tests are those tests carried out with water in order to prove the hydraulic capability of the Works. Process wet tests are those tests carried out with water as the feed stock to prove the process capability of the Works. All dry tests and wet tests shall comply with relevant approved International standard / code. It shall be assumed that the co-operation of other contractors in the carrying out of Tests on Completion will not be unreasonably withheld.

7.6.2. Tests on Completion

7.6.2.1. General

The purpose of Tests on Completion shall be to demonstrate and confirm that the Works can fulfil all the mechanical, electrical and process requirements of the Specification. Commissioning Tests which shall be deemed to be the "Tests on Completion" shall be carried out.

Prior to the commencement of Tests On Completion, the Contractor shall submit for approval the following:

- Site Acceptance Test Documents;
- As-Built Drawings;
- Operation and Maintenance Manuals.

Tests on Completion shall not be commenced until the aforementioned documents are approved. The initial charges of oil, grease, generator fuel oil etc. necessary for Tests on Completion shall be kept ready and to be provided by the Contractor.

The cost of chemicals used for the Tests on Completion shall be met by the Contractor. The inspection and tests which will be carried out shall consist of the following:

- Manual Commissioning Tests (Clause i)
- Manual Operation Tests (Clause ii)
- Automatic Commissioning Tests (Clause iii)

All pipe work shall be hydrostatically tested at site to a pressure equal to minimum 1.5 times the maximum working pressure likely to be encountered in the system.

The Contractor shall carry out all tests on the Plant and shall supply four copies of all test results to the Engineer. The test report shall include recordings of power and plant performance/ behaviour pattern. All tests shall be subjected to the approval of the Engineer who may require them to be repeated, prolonged or modified as may be necessary to ensure that any or all items of Plant conform with the Contract.

All measuring instruments used for these tests shall have previously been certified by an independent testing authority like IDEMI/ERTL or as approved by Engineer. For tests on Main Pumps and Main Motors the above certification can be carried out not more than one month prior to the test and to the satisfaction of the Engineer. The Engineer reserves the right to impound any instrument for further verification before approving the test results.

For tests on all equipment, instruments calibration shall comply with the following:

- (a) For companies having ISO certification

The calibration and its validity for the instruments shall be as per the relevant procedures for testing of the company having ISO certification

- (b) For companies not having ISO certification

The instruments used for the test shall be calibrated not more than one year prior to the test. The instrument shall have a valid calibration certificate as on the date of the test.

The Engineer shall be permitted to inspect all Plant which is undergoing tests and may himself conduct tests. Where it is necessary for the Engineer to make arrangements for the supply of water, power, etc., for any testing, the Contractor shall not commence the tests until after these arrangements have been made on or after a date agreed by the Engineer and the Contractor shall make no claim for delay to such testing on this account.

If any item of plant fails during or after testing to achieve its intended duty or otherwise proves defective, it shall be modified or altered or replaced with higher capacity/rating plant

item as necessary and re-tested and re-inspected as required by the Engineer. Vibration/noise level tests shall be carried out at site which will form basis for acceptance of the equipment. If the Contractor is not in a position to meet the requirements given below as per ISO 10816 – 1995, the equipment may either be rejected or the Contractor shall carry out all necessary modifications to keep vibrations within the acceptable limits specified.

Equipment	Noise Level dBA at 1.86 m from Equipment	Velocity of Vibration mm/sec
All rotating equipment not having reciprocating parts with motor kW less than or equal to 15 kW	85	1.12
All rotating equipment having reciprocating parts with motor kW more than 15 kW and less than or equal to 75 kW	85	1.8
All rotating equipment not having reciprocating parts with motor kW greater than 75 kW	85	2.8
All equipment having reciprocating parts	85	-

The Contractor shall have a minimum of two commissioning engineers, one for system and the other for electrical/instrumentation works on site during all tests in order to both demonstrate the system and to correct any faults which may occur.

7.6.2.2. Manual Commissioning Tests

Manual Commissioning Tests shall be such preliminary trials, tests and retests on individual items of system or complete systems as required by the Engineer in order to demonstrate that the system as a whole is ready to undergo the Manual Operation Tests and that these will take place with minimum interruption.

The Manual Commissioning Tests shall demonstrate not only the items of system under normal operation, but also their response to abnormal and emergency conditions. The Engineer will notify to the Contractor which items of system will be tested and the extent to which they will be tested in order to fulfill the requirements of the Specification. Leakage tests at 1.5 maximum working pressure shall be carried out on all erected pipe work prior to the Manual Commissioning Tests. Pump curves shall be available for the Manual Commissioning Tests and all instruments essential for the tests shall have been calibrated.

7.6.2.3. Manual Operation Tests

When the Manual Commissioning Tests have been completed so that the items of system have been demonstrated to the satisfaction of the Engineer, the Contractor shall commence the Manual Operation Tests. These tests shall demonstrate the correct operation of the whole system whilst using the minimum quantity of automatic control and monitoring equipment. Such equipment shall be at least that required both for the maintenance of safety and for the normal mode of operation of the system.

The system will be required to demonstrate satisfactory operation at all design flow rates. The tests shall be of seven consecutive days' duration; if the supply of water should fail or other matters interfere outside the Contractor's control, the tests may be of such number of broken days as the Engineer considers is equivalent. The exact date of commencement shall be subject to the approval of the Engineer and shall be dependent on the following conditions having been met:

- (i) All relevant items of system in approved working order.
- (ii) All items of system correctly identified with labels.

7.6.2.4. Automatic Commissioning Tests

The Automatic Commissioning Tests shall be such preliminary trials, tests and retests on individual items of system or complete system as required by the Engineer in order to demonstrate that the system as a whole is ready to undergo the Tests of Completion and that these will take place with a minimum of interruption.

At least one week before the commencement of these tests, the Engineer will notify the Contractor which items of system will be tested and the extent to which they will be tested in order to fulfil the requirements of the specification.

7.6.2.5. Dry Test Requirements

(i) General

As a minimum requirement the following dry tests shall be carried out as a general requirement:

- check on speed, rotation direction, vibration and noise level.
- general inspection to check for correct assembly and quality of workmanship.
- check on the presence of lubricant, cooling medium, electrolyte, etc.
- check on adequacy and security of Plant fixing arrangements.
- general check to ensure that all covers, access ladders, water proofing, guard railings etc are in place.
- check on damp-proofing, rustproofing and vermin-proofing and particularly the sealing of apertures between building structures, chambers etc and the outside.

(ii) Civil and Building Works

As a minimum requirement the following dry tests shall be carried out on the works:

- check for the presence of foreign bodies in pipe work and structures.

(iii) Mechanical Works

As a minimum requirement the following dry tests shall be carried out

- preliminary running checks as far is permitted by circumstances in order to ensure smooth operation of system

(iv) Electrical Works

As a minimum requirement the following dry tests shall be carried out on the electrical systems:

- Insulation resistance measurement of equipment, accessories, cabling/wiring etc.
- Dielectric tests on equipment, accessories, cabling/ wires etc.
- Phase sequence and polarity
- Voltage and current ratios
- Vector group
- Resistance measurement of winding, contacts etc.
- Continuity tests

- Calibration of indicators, meters, relays, etc.
- Control and interlock checks
- Settings of equipment and accessories
- Checking of accuracy/error
- Checking of operating characteristics, pick-up voltages and currents, etc.
- Operational and functional tests on equipment, accessories, control schemes, alarm/trip/indication circuits, etc.
- Measurement of guaranteed/approved design values including lighting levels, earth resistance measurement, etc.
- Complete commissioning checks of the system

(v) Hydraulic Wet Test Requirements

Hydraulic wet tests shall be carried out on completion of dry tests and shall comply with relevant approved engineering international standard / code. Water shall be used for hydraulic wet tests. The purpose of the tests is to prove as far as practical the hydraulic performance of the Works. In order to demonstrate this, the Contractor shall ensure that each part of the Works is hydraulically loaded to its rated throughput for a period of at least four hours.

In order to ensure a sufficient supply of water to carry out these tests the Contractor shall provide facilities for the disposal off Site in an approved manner not less one third of the Works rated output.

In order to remove doubt, the following tests inter alia shall be carried out:

- pressure testing of all piped systems laid direct in ground in accordance with the relevant standards.
- Fill all structures and check for leaks.
- Running of all pumped systems to check for:
 - correct functionality.
 - absence of leaks.
 - correct running temperatures
 - smoothness of running and absence of undue vibration or stress.
- Check drive running currents.
- Carry out calibration of instruments where appropriate.
- Demonstrate correct functionality of electrical, control and instrumentation systems.
- Check on flow rate, speed, noise, vibration, water hammer, supports of pumps and pipeline.

The Contractor shall simulate where practical the conditions that will prevail when operating as a process in order to demonstrate the correct functionality of process control loops etc. During these tests a check on the performance of system shall be made, as far as site facilities will allow, to compare its site performance with the factory test data and to identify any constraints on performance due to site conditions.

(vi) Safety Audit

After satisfactory completion of hydraulic wet tests and prior to introduction of process fluid to the system a safety audit shall be carried out to ensure compliance

with the necessary requirement for safety and for operation of system. The safety audit shall be documented. The safety audit document shall be approved by the Engineer.

7.7. TAKING OVER

No item of Plant will be certified for Taking Over by the Employer unless it has successfully passed one of the "Tests on Completion". A Taking over certificate for Plant shall not be issued unless 10 copies of the instruction manuals for operation and maintenance of the plant and 10 copies of all completion (As-built) drawings with soft copies of plant and civil structure have been received to the satisfaction of the Engineer. The instruction manual complete including SCADA system for operation and maintenance of plants shall be in two parts:

7.7.1. Part I

It should detail operation of entire system giving sequence of operation, DO's and DONT's very clearly specified. The operation manual shall be user friendly so as to guide the operator faultlessly in operating the system.

7.7.2. Part II

It should deal with maintenance of each component of the system, sub-system etc. in full details giving details of construction, material, manufacturer's item code No., dismantling and assembly procedures, dimensions, routine checks to be carried out, signals and observation by predictive maintenance gadgets that can prompt maintenance, overhauling of sub-systems/systems. The drawings shall give complete details of the systems, sub-systems like dimensions cross-sectional views, assembly details, photos etc. Maintenance schedules as specified by the manufacturers for each component of the system and for entire system shall be furnished.

Taking over Certificate may be issued for sections of the system; these will not be issued for individual items of plant, but only for complete system as the Engineer decides if appropriate. A Taking Over Certificate defines the start of the Maintenance period but its issue does not relieve the Contractor of his obligation to complete commissioning.

The Engineer may be by agreement with the Contractor, agree upon a single commencing date for the commencement of the Maintenance Period for the whole of the Works. The 2nd season Test on Completion shall be carried out in the Maintenance Period. In case of failure of the plant to pass the 2nd test, the Contractor shall carry out all required modifications in the plant in order to achieve the guaranteed performance requirements, at his own cost. The plant shall subsequently be re-tested under the relevant season and the performance confirmed.

7.8. MAINTENANCE PERIOD

The Maintenance Period defined in Contracts Data shall commence from the date of issue of the Taking over Certificate. Notwithstanding the foregoing the Engineer may, by agreement with the Contractor, agree upon a single commencing date for the commencement of the Maintenance Period for the whole of the Works.

7.9. PERFORMANCE CERTIFICATE

The conditions for issuance of a Performance Certificate as detailed in the Conditions of Contract shall inter alia comprise:

- The completion of maintenance of the Works to the satisfaction of the Engineer.
- The O & M Manuals have been updated following operational experience and as approved by the Engineer.
- All defects identified prior to Taking Over and defects identified during the maintenance of the Works have been rectified.
- All Tests After Completion have been completed to the satisfaction of the Engineer.
- All training detailed in the Employer's Requirements has been completed.

7.10. TESTING AT WORK SITE- PIPES

7.10.1. Leakage test before commissioning

After laying and jointing of pipes is completed the pipe line shall be tested at work site as per the following Specifications and as directed by ENGINEER-IN-CHARGE. All equipment for testing at work site shall be supplied and erected by the CONTRACTOR and shall be rectified by him / her to the full satisfaction of ENGINEER-IN-CHARGE. Water used for test shall be removed from pipes and not released to the excavated trenches.

After the joints have been thoroughly jointed and have been checked by ENGINEER-IN-CHARGE and before backfilling the trenches, the entire section of the pipeline shall be proved by CONTRACTOR to be water tight by filling in pipes with water at a Constant Head of 2.5m above the top of the highest pipe in the stretch and heading the water up for the period of one hour. The testing apparatus used for the purpose shall normally be fixed on the upstream end and should be got approved by ENGINEER-IN-CHARGE. CONTRACTOR if required by ENGINEER-IN-CHARGE shall dewater the excavated pit and keep it dry during the period of testing. The loss of water over a period of 30 minutes should be measured by adding water from a measuring vessel at regular intervals (not more than 1 minute) and noting the quantity of water required to maintain the original water level. Any leakage including excessive sweating which causes a drop in the test water level will be visible and the defective part of the work should be removed and made good.

All of results of test and inspection data must be prepared by CONTRACTOR at site so that the ENGINEER-IN-CHARGE shall make decision of "fail or pass" at once. All cost for the inspection shall be borne by the CONTRACTOR.

7.10.2. Sewer Manhole

- The CONTRACTOR, while constructing the manholes, shall suitably provide one or two (one each on either side) DWC pipe piece/s for the house sewer connection to prevent the undue breaking of masonry / side walls, as directed by the ENGINEER-IN-CHARGE.
- The entire height of the manhole shall be tested for water tightness by closing both the incoming and outgoing ends of the sewer and filling the manhole with water and drop in water level not more than 50mm per 24 hours shall be permitted. The CONTRACTOR at his own cost shall arrange the required water for testing and other requirements

7.10.3. Electrical system

The Contractor shall carry out commissioning tests in the presence of the Employer's representative. The evaluation of test results and decision passed by the Employer's representative regarding the test results will be final and binding on the Contractor. Any additional tests or repetition of tests to establish satisfactory operation of any equipment shall be carried out by the Contractor, if so desired by the Employer's representative at no extra cost. The completion checks and commissioning tests to be carried out shall include, but not be limited to, those described in subsequent paragraphs, as applicable to the individual equipment/system. All checks and tests shall be as per the Manufacturer's drawing manuals, relevant codes of installation and commissioning checklists described in subsequent paragraphs. Among other commissioning tests, the following shall be carried out at site after completion of installation. Contractor shall ensure to use calibrated test equipment having valid calibration test certificates from standard laboratories traceable to National Standards / International Standards. All tests to be carried out in the presence of Employer's representatives.

I. Switchboard

- i) Power frequency high voltage test, IR test, operation tests

II. Relays

- ii) Check internal wiring, relay settings

III. Cables

- iii) All new cables shall be megger tested before terminating / jointing. After terminations / joints shall be megger tested by 1000V megger.

- iv) Cable core shall be tested for

- a) Continuity
- b) Absence of cross phasing
- c) Insulation resistance to earth
- d) Insulation resistance between conductors

IV. Earthing System

Continuity of all conductors and joints. The Project Manager's representatives may ask for earth continuity tests, earth resistance measurements and other tests, which in his opinion are necessary, to prove that the system is in accordance with design, specification, code of practice and electricity rules. Earth resistance value should be not greater than one (1) ohm.

V. Lighting System

Commissioning tests stipulated in applicable standards and code of practice covering all lighting system equipment

The Contractor shall carry out insulation resistance tests by a megger of following rating

- a) Control circuits up to 220 V 500 V megger
- b) Power circuits up to 1.1 kV 1000 V megger

VI. General

In general, the following checks shall be carried out on all the equipment/systems, as applicable.

- a) Name plate details according to approved drawings/ specifications
- b) Any physical damage or defect and cleanliness
- c) Tightness of all bolts, clamps and connections
- d) Condition of accessories and their completeness
- e) Clearances
- f) Earthing connections
- g) Correctness of installation with respect to approved drawings/ specifications
- h) Lubrication of moving parts
- i) Alignment
- j) Correctness and condition of connections

VII. Commissioning Tests

The following commissioning tests are to be carried out on all the equipment/systems, as applicable.

- a) Insulation resistance measurement of equipment, accessories, cabling/wiring etc.
- b) Dielectric tests on equipment, accessories, cabling/ wires etc.
- c) Phase sequence and polarity
- d) Voltage and current ratios
- e) Continuity tests
- f) Calibration of indicators, meters, relays, etc.
- g) Control and interlock checks
- h) Settings of equipment and accessories
- i) Checking of accuracy/error
- j) Checking of operating characteristics, pick-up voltages and currents, etc.
- k) Operational and functional tests on equipment, accessories, control schemes, alarm/trip/indication circuits, etc.
- l) Measurement of guaranteed/approved design values including lighting levels, earth resistance measurement, etc.
- m) Complete commissioning checks of the system

Safety Procedure and Practice

Following safety procedure and practice should be provided by electrical Contractor in switchboard room/substation as per latest edition of I.S. 5216.

- a) Rubber matting in front of LT panel
- b) One shock treatment chart in storage room
- c) Caution/Danger Board on LT panel
- d) Sand buckets at storage room
- e) Fire extinguisher at storage room
- f) One set of hand gloves at storage room
- g) Fire Safety
- h) The requirement of hand appliance in composed storage room shall be as per the latest edition of Fire Protection Manual by Regional Tariff Committee.

VIII. Contractor's Licence

The Contractor shall obtain the necessary Licence/Authorisation from the Licensing Board of the locality/State for carrying out the installation work. The persons deputed by the Contractor's firm should also hold valid permits issued/recognised by the Licensing Board of the locality/State in which the work is to be done.

The electrical installation work shall be carried out by licensed electricians only and approved by appropriate authorities. It is the responsibility of Contractor to get approval of complete system from the appropriate authority.

7.11. Manufacturer's Works Acceptance Tests on Instrumentation, PLC, SCADA and Associated Equipment

7.11.1. Instrumentation:

Inspection, Testing and Setting to Work:

General

Each item of plant shall be subjected to the manufacturer's own tests which shall be certified.

Each item of plant and its installation shall be subject to inspection and testing at the place of manufacture.

The Contractor shall be responsible for the provision of all necessary test equipment. The Contractor shall demonstrate to the Employer's Representative, the correct operation of any item of plant and the Employer's Representative may witness any test. Tests which, in the opinion of the Employer's Representative, were failed or not performed correctly shall be repeated.

Calibration tests for field instruments and analytical instruments should be conducted on site after installation and the same should be witnessed by the Employer's Representative.

Before any test is made, the Contractor shall submit to the Employer's Representative a full list of test equipment & test procedures (method statements) to be used. Each item of test equipment shall have a standard of accuracy better than that stated by the manufacturer of the item to be tested. The Contractor shall provide evidence of the condition and performance of any item of test equipment, in the form of test certificates issued by an appropriate authority independent of the Contractor and manufacturer, or as otherwise directed by the Employer's Representative. Test equipment shall be checked frequently during the period of the tests.

The Contractor's staff responsible for supervising and carrying out tests shall be fully conversant with the various items of equipment of other manufacturers and if necessary, the Contractor shall arrange for his personnel to attend suitable training courses on his own expense.

Any fault or shortcoming found during any inspection or test shall be rectified to the satisfaction of the Employer's Representative before proceeding with further inspection or testing of that item. Any circuit previously tested, which may have been affected by the rectification work, shall be re-tested.

Preliminary Inspection and Testing at the Place of Manufacture

Field-mounted instruments

After the successful completion of the manufacturer's own inspection and testing of instruments supplied under the Contract, similar tests shall be carried out in the presence of the Employer's Representative and the Contractor. Such tests shall include a demonstration that an increase or decrease of the measured value at several points over the full range of the instrument produces a corresponding increase or decrease in the instrument output signal. These tests shall include checks on the specified accuracy of the instrument at all points.

Instrument panels, enclosures and mounting boards

The manufacturer shall not present instrument panels, enclosures and mounting boards (assemblies) for inspection and testing until the manufacturer's own tests and inspection has been completed. A preliminary inspection and test of these assemblies may then be witnessed by the Employer's Representative. The Contractor shall give not less than 7 days' Prior notice in writing that he has completed.

His tests and inspection and is ready for the witnessed tests and inspection. Where this notice period is different in the Conditions of Contract this shall take precedent.

The witnessed inspection and testing shall include the following:

- a. A visual inspection of the panel assembly to show that the design, construction and finish are satisfactory and in accordance with the Specification;
- b. A check that equipment is securely mounted, accessible for removal or calibration without damage to or undue disturbance of other components, wiring or piping;
- c. That all engraving and labels are correctly positioned, fixed and designated in accordance with the Specification;
- d. Panel power-distribution circuits have the correct breaker/fuse rating coordination and designation;
- e. Power-isolation facilities meet the Specification;
- f. The main incoming supply voltage, frequency and/or pneumatic supply pressure is within the required limits, these being checked at the beginning and end of the test and the results recorded on test certificates;
- g. The output of all power supply units again at the beginning and end of the testing with results being recorded;
- h. The power supply voltage or air pressure of all component instruments of the assembly(s), these voltages/pressures being recorded on the test certificate;
- i. The insulation resistance of all circuits except sensitive electronic equipment which is liable to damage by application of the test voltage, such circuits being disconnected before making the insulation resistance tests and these tests being carried out in accordance with IEE Wiring Regulations;
- j. That the clean earth bar is isolated from main frame of the panel.

Internal lighting and anti-condensation heaters and associated thermostats, isolators, limit switches and wiring shall be checked for compliance with the Specification.

Spare capacity within the panel(s) shall be checked to see that it complies with the Specification. This shall include future equipment space, spare terminals, space in wiring

trunkings and provision for additional cable entry.

Functional Testing at the Place of Manufacture

General requirements

Once the preliminary inspection and testing is complete to the satisfaction of the Employer's Representative, functional testing shall commence. The purpose of the functional tests is to demonstrate that instrument panels enclosures and mounting boards (assemblies) conform to requirements of the Specification.

Not less than 30 days before the commencement of functional tests, the Contractor shall submit to the Employer's Representative, for approval, two copies of comprehensive test procedural documents detailing each test to be carried out. The document shall include results forms on which the results of each test will be entered. The forms shall include spaces for numerical values, where necessary, and Witness signatures.

All applicable drawings and data shall be provided at the place of inspection by the Contractor.

The Contractor shall provide all test instruments and equipment necessary to test the assemblies in their entirety.

The following is a typical list of the equipment required:

- Switch boxes;
- Indicator light boxes;
- Analogue signal sources;
- Dummy loads;
- Meters;
- Simulators;
- Desk-top computers;
- Programmers for DCS or outstations;
- Insulation test equipment

7.11.2. Programmable Logic Controller (PLC) and SCADA

The Contractor shall carry out specified tests as follows in addition to any tests stated or implied by the foregoing sections of this clause.

The tests shall be carried out on the fully assembled control panel containing the PLC and associated equipment in order to demonstrate correct functional operation of the hardware and software systems.

Factory Acceptance Test (FAT)

The Contractor shall conduct a full programme of tests of the PLC & SCADA system at the Contractor's testing facility in the presence of the Employer's Representative to verify that all features of the system have been provided, are operating correctly and are in full compliance with the Specification. FAT shall include and PLC based control system with panel mounted HMI for SPS with wireless communication system for the all of the above. Unless otherwise specified or agreed by the Employer's Representative, the entire PLC & SCADA system

shall be assembled and tested together as an integrated system, including all master station equipment, all operators' consoles, all outstations and telemetry equipment all instrumentation panels and uninterruptible power supplies included in this Specification. The scheduled date for the factory acceptance test shall be as agreed by the Contractor and the Employer's Representative at least four weeks before the test. FAT shall be conducted with a hardwired simulation panel connected to the PLC based SCADA system. Contractor shall note the importance of the requirement. No software based simulation testing shall be accepted or allowed.

Not less than one month before the scheduled factory acceptance test, the Contractor shall submit to the Employer's Representative for approval two copies of a comprehensive manual detailing each test to be conducted. The manual shall include a results form on which the results of each test will be entered, including spaces for numerical values where appropriate and witness signatures.

Not less than 7 days before the scheduled factory acceptance test, the Contractor shall give written notification to the Employer's Representative that a complete dry-run of the factory acceptance test has been performed successfully and that, in the opinion of the Contractor, the system exhibits stable operation and is ready for the formal factory acceptance test.

The factory acceptance test will be considered successfully completed only when the system has successfully passed all factory tests. The system shall not be delivered to Site until the successful completion of the factory acceptance test is certified by the Employer's Representative or unless otherwise approved by the Employer's Representative. Delay in the delivery of the system due to failure of the factory acceptance test shall not constitute an unavoidable delay. If the system fails the factory acceptance test, the test shall be extended or rescheduled at the discretion of the Employer's Representative.

All hardware to be used in the testing of the system shall have passed an agreed preliminary hardware performance test to ensure known hardware operability before software testing begins.

After successful completion of the factory acceptance test, no software changes shall be made to the system without written authorisation by the Employer's Representative. Any changes to the system which effect the system software documentation, such as input scale modifications or changes to the control logic, shall be entered into the system documentation before delivery of the system to Site. All instruments under IC&A scope has to be tested 100%.

FACTORY ACCEPTANCE TEST PROCEDURES

General

The scope of the tests shall include the proving of every aspect of hardware and software operation and functions as detailed below.

Hardware tests

- a) Verify the correct inventory of hardware including cables and printed circuit boards;
- b) Demonstrate that all spare-memory, disk-capacity and system-expansion requirements have been met;
- c) Demonstrate all hardware and software diagnostics;
- d) Verify all power supply voltages are within tolerance;

- e) Verify proper earth connections and isolation of instrumentation earth for all equipment;
- f) Demonstrate operation of test simulation and indication equipment and its Suitability for adequate functional testing of all system functions.

Software tests

- a) Demonstrate the editing of all system parameters including set-points, timers and the like;
- b) Demonstrate system configuration capabilities including the addition and deletion of input and output points, outstations, and all data base parameters;
- c) Demonstrate the addition, deletion and modification of mimic displays and report formats;

Functional tests

The functional tests shall verify proper operation of every specified system function as an integrated system. These tests shall be conducted in conjunction with functional tests of instrumentation and control panels as specified elsewhere. All failures or discrepancies found shall be documented in the test manual.

Following a failure of any functional test, should software or hardware modifications be required it shall be the decision of the Employer's Representative whether the factory acceptance test is to continue, re-start or be aborted. If testing is allowed to continue, any changes which are required shall be described in a system modification document, signed by both Contractor and Employer's Representative and be incorporated into the final factory acceptance test documentation. The failed test shall be re-conducted and the Employer's Representative may require the retest of functions which may be affected by the modification.

The functional tests shall include, as a minimum, the following:

- a) Demonstration that the system meets the requirements of the Specification for response time and speed of screen update
- b) Verification of the accuracy of all analogue input points in the system. The procedure shall include applying the appropriate signal to each analogue input at a minimum of three points within the range of the input, checking for expected numerical results, and verifying appropriate update of related mimic displays. Proper sensing and action by the system to high and low out-of-range inputs shall also be verified
- c) Verification of the proper logic sense, pulse accumulation and rate computation where appropriate, of all digital inputs and verifying appropriate update of related mimic displays.
- d) Verification of all control and sequencing operations and proper operation of all digital and analogue outputs. The procedure shall include simulation of all related process variables for both normal and abnormal conditions, including instrument and component failure, and demonstration of fail-safe response of the system. System outputs shall be indicated with appropriate lamps and indicators;
- e) Simulation of outstation communications errors and failures and demonstration of error detection and handling, failure detection and handling, and appropriate changes to control actions as designed and specified;
- f) Verification of fault detection and diagnostics by inducing a sufficient variety of fault conditions in the system to ensure that detection processes and fail-safe operation

- are adequately tested;
- g) Demonstration of proper operation of all mimic displays, help pages, reports, operator procedures and historical data accumulation;
 - h) Demonstration of proper operation of all outstations following a simulated master station central processor failure;
 - i) Demonstration of proper operation of all equipment during both a system wide or isolated power failure, and following power restoration. The procedure shall include the demonstration of battery backup of both master station and outstation for the full length of time specified, and proper operation of power fail, low voltage warning and all associated alarms.

Reliability test

After successful completion of the functional tests a 48-hour continuous run of the system shall be performed. The test shall be passed if no system function is lost or no hardware or software failure occurs. Hardware failure is defined for this test as the loss of a major component such as the computer, an outstation, a VDU or a peripheral device. Non-repetitive mechanical failures of loggers, push-buttons and the like are excluded.

During this test, the system shall be exercised with simulated inputs and conditions in a manner which approximates the on-site operational environment. Unstructured testing by the Employer's Representative shall be included during this test. Upon any system failure during this period, it shall be the decision of the Employer's Representative whether the reliability test is to continue or be aborted. If testing is allowed to continue any changes to the system which are required shall be described in a system-modification document, signed by both Contractor and Employer's Representative and the document shall be incorporated into the final factory acceptance test documentation.

Factory acceptance test documentation

As a minimum, the following information shall be included in the factory Acceptance test manual for each test:

- Test identification number;
- Test name and description;
- List of all equipment to be tested including any special test equipment required;
- Description of the test procedure broken down into logical steps;
- Description of the expected system response verifying the completion of each logical step;
- Space for recording the results of the test and the time and date of the test;
- Space for signatures of the Contractor and the Employer's Representative.

In addition, the Contractor shall provide a method for recording and tracing all problems, discrepancies, queries and suggestions regarding the system and software, and for formalised control of any modifications to the system.

Pre-commissioning tests

The Contractor shall perform pre-commissioning, or preliminary, testing of the SCADA system in accordance with that specified for instrumentation. The purpose of pre-commissioning tests is to confirm readiness of the system for commissioning.

The scope of pre-commissioning tests shall be generally as specified for factory acceptance tests but real field inputs and final control elements shall be used wherever practical to provide inputs to the system and to confirm proper outputs.

Where this is impractical, simulation signals shall be injected as near as possible to their ultimate sources so as to include in the tests as much of the cabling system as possible.

Each process system shall be set to work under manual control and the system tested to confirm proper operation. After proper operation of manual control mode has to be verified, tests of automatic controls of each process system shall be conducted wherever practical.

Commissioning

Site Acceptance Tests (SAT)

The Contractor shall submit all relevant draft operating manuals for the PLC & SCADA System to the Employer's Representative for approval prior to commissioning tests.

Any faults or failures of the system detected during the previous tests shall be noted and corrected to the satisfaction of the Employer's Representative before commissioning is allowed to commence.

As part of commissioning, the PLC & SCADA system shall be tested for availability for a continuous period of 60 days. During this period, the system will perform the normal functions according to the procedures described in the SAT documentation approved by the Employer's Representative.

The system shall have passed the SAT if all major components have been free from fault or failure and exhibit full error-free functionality for 100 % of the total duration of the test, unless otherwise agreed by the Employer's Representative. Major components include all master station equipment, outstations, communications facilities and instrument panel components, excluding push-buttons, switches and lamps and any equipment not supplied by the Contractor.

During SAT, no modifications to the system shall be made by the Contractor without the written approval of the Employer's Representative. Erroneous functioning which requires software modifications or re-configuration to correct, other than set-point or parameter changes, shall constitute a failure of the availability test. Any changes to the system which are required and approved shall be described in a system-modification document, signed by both Contractor and Employer's Representative and the document shall be incorporated into the final test documentation. The test shall be restarted after corrections have been made.

7.11.3. Manufacturer's Works Acceptance Tests on Uninterruptible Power Supplies

The Contractor shall carry out further specified tests as follows in addition to any tests stated or implied by the foregoing sections of this clause.

The tests shall be carried out on the fully assembled unit utilising the batteries that are to be supplied with the unit.

The Contractor shall demonstrate the following:

- (1) Change-over from full load with mains present to full load on battery supply
- (2) Carry out a discharge test on the system at full load and for the specified duty bridging time period.
- (3) Carry out recharge test after operation for the specified duty bridging time at full

load. The UPS shall supply the full load during the recharge cycle.

7.11.3.1. Inspection at Site

During erection of the Plant the Employer's Representative will inspect the installation from time to time in the presence of the Contractor's Supervisor to establish conformity with the requirements of the Specification. Any deviations found shall be corrected as instructed by the Employer's Representative.

7.11.3.2. Plant protection on Site

- (i) Factory finished plant shall be adequately protected both before and during installation against damage to finished surfaces, fitted components, and the ingress of dust. It may be necessary for structural finishing operations to be carried out in the vicinity of installed plant before it is taken over and the Contractor shall take this into consideration in complying with the requirement of this clause.

7.11.3.3. Erection staff

- (i) The Contractor shall provide at least two approved senior Gujarati/Hindi/English speaking working erectors to supervise the erection of all Plant in the Contract and in each case to act as the Contractor's Representative as set out in contract of the general conditions of contract.
- (ii) In the case of a foreign firm based overseas the Contractor's Representative shall be thoroughly conversant with the manufacturer's Plant and equipment, and its erection and shall be an expatriate.
- (iii) The Contractor shall also provide sufficient erectors skilled in electrical, mechanical and instrument engineering, with such skilled, semi-skilled and unskilled labor as are necessary to ensure completion of the various sections of the Contract in the time required. The Contractor shall not remove any supervisory staff or labor from the site without the prior approval of the Employer's Representative.
- (iv) The Employer's Representative will give the Contractor at least one month's notice in writing of the date on which the erection staff will be required on site, and the Contractor shall confirm the date of arrival in writing to the Employer's Representative. The Contractor shall make all the necessary arrangements to ensure that sufficient plant has been or is about to be delivered to site, so that there shall be no delay to the start of erection.
- (v) It shall be the responsibility of the contractor to obtain necessary License / Authorization n/Permit for work from the Licensing Boards of the Locality/State where the work is to be carried out. The persons deputed by the Contractor's firm should also hold valid permits issued or recognized by the Licensing Board of the Locality/State where the work is to be carried out.

7.11.3.4. Erection and Building-in

- (vi) The installation work shall comply with the latest applicable Standards, Regulations, Electricity Rules and Safety Codes of the locality where the installation is to be carried out. Nothing in this specification shall be construed to relieve the Contractor of this responsibility.
- (vii) It will be the Contractor's responsibility to obtain approval/clearance from local

statutory authorities including Electrical Inspector, wherever applicable for conducting of any work or for installation carried out which comes under the purview of such authorities.

- (viii) The Contractor shall carry out the complete erection of all plant, including the provision of all necessary skilled and unskilled labor, material, transportation, supplies, power and fuel, Contractor's Equipment and appurtenances necessary, for the complete and satisfactory erection of the Plant.
- (ix) The Contractor shall have a separate cleaning gang to clean all equipment under erection and as well as the work area and the project site at regular intervals to the satisfaction of the employer. In case the cleaning is not up to the employer's satisfaction, he will have the right to carry out the cleaning operations and any expenditure incurred by the employer in this regard will be to the Contractor's account.

Erectors

The Contractor's employees shall include skilled erection staff in sufficient number, who shall arrive on the site on or before the respective dates set out in the approved work programmed and prior to delivery of any item of Plant to the Site. The Employer's Representative will not entertain any claim by the Contractor in respect of delayed erection due to a delay in the delivery of any items of Plant to the site.

Contractor's Equipment, materials and appurtenances

The Contractor shall have available on the Site sufficient suitable equipment and machinery, as well as all other materials and appurtenances required by him, of ample capacity to ensure the proper erection of Plant and to handle any emergencies such as may normally be expected in work of this character.

The Contractor shall be responsible if any installation materials are lost or damaged during installation. All damages and thefts of equipment/component parts, after takeover by the Contractor, till the installation is taken over by Employer shall be made good by the Contractor to the satisfaction of Employer's Representative.

Workmanship

Plant shall be erected in a neat and workmanlike manner on the foundation and at the locations and elevations shown on the approved drawings and other Employer's Engineering documents. Unless otherwise directed by the Employer's Representative the Contractor shall adhere strictly to the aforesaid drawings and no departures there from will be permitted.

All plant shall be correctly aligned, leveled and adjusted for satisfactory operation and shall be installed so that the proper and satisfactory connection can be made readily between the various units and pipe work and equipment installed under the Contract. The mounting arrangements for pump-sets and blowers shall be such that the alignment offset between motors and the driven equipment shall be well within 0.1 mm.

Building-in

Erection of Plant shall be phased in such a manner so as not to obstruct the work being done by other contractors. Before commencing any erection work, the Contractor shall check the dimensions of structures where the various items of plant are to be installed, and shall bring any deviations from the required positions, lined or dimensions to the notice of the Employer's Representative and shall take such measures as are necessary for their

correction.

The Contractor shall take particular care for the correct positioning and alignment of all puddle pipes which are required through concrete structures prior to, and during the pouring of concrete.

The Contractor shall pin and plug in the holes prepared, all small clips, plugs, screws, nails, sleeves, inserts, etc., required for fixing electric wires and conduits, small pipe work and all other apparatus.

The Contractor shall align all equipment and holding down bolts and shall inform the Employer's Representative before proceeding with grouting-in the item or item concerned. The Contractor shall ensure that all equipment is securely held and remain in correct alignment before, during and after grouting-in.

The Contractor shall properly bed in cement grout each item of plant or its supporting base resting on foundations and shall grout-in where required holding down bolts placed in the holes prepared in the foundations. The materials and workmanship used in grouting shall be such as will result in a solid anchoring of foundation bolts and complete filling of the gaps between the Plant or its base and the foundations, without shrinkage or cracking.

During erection of the Plant the Employer will inspect the installation from time to time in the presence of the Contractor's Site representative to establish conformity with the requirements of the Specification. Any deviations and deficiencies found or evidence of unsatisfactory workmanship shall be corrected as instructed by the Employer.

All plant shall be installed in accordance with the recommendations or instructions of the manufacturer, for the particular application. Each mounting position shall be chosen to give correct operation of the equipment, ease of operation, access for maintenance and servicing and freedom from any condition which could have adverse affects.

Precautions

The approval by the Employer's Representative of the Contractor's proposals for rigging and hoisting of any item of plant into its final position shall not relieve the Contractor from his responsibility for avoiding damage to completed structures, parts or members thereof or other installed equipment. He shall at his own cost make good, repair or replace any damaged or injured items whether structural, mechanical, electrical, architectural, or of any other description, promptly and effectively to the satisfaction of the Employer's Representative.

No plant or other loads shall be moved across the floors of structures without first covering the floors with timber of sufficient size so that applied loads will be transferred to floor beams and girders of steel or concrete. If it is required to reduce bending stresses or deflection, the beam and girders shall be provided with temporary supports. Any movement of Plant and other loads over the floor structures shall be subject to the prior approval of the Employer's Representative.

7.11.4. Civil Inspection (Water Leakage Test)

7.11.4.1. All liquid retaining Structures

Water retention test of tanks (Refer - Technical Specification for Civil Works)

7.11.4.2. Field Control Inspection

Contractor shall be conduct periodic field control inspection to prevent any field accident. The Employer's Representative shall joint field inspect or conduct unannounced inspections.

7.11.4.3. Inspection after Erection

- (i) After the erection of any item of Plant and its associated equipment has been completed, it shall be offered to the Employer's Representative for inspection in its static state prior to commissioning the item.
- (ii) Completion of erection and procedure prior to setting to work.
- (iii) The mechanical completion of plant under erection shall be deemed to occur if all the units/systems of the Works are structurally and mechanically complete as noted below:
- (iv) All rotary, static, structural equipment, piping, electrical/instrumentation and other equipment under the scope of the Contract have been erected, installed and grouted and are as per the specifications.
- (v) All systems have been washed/flushed/drained/boxed up where necessary.
- (vi) All system testing including pressure, vacuum and nondestructive tests, no load tests and such other tests are completed with safety valves/relief valves set to operating conditions installed in position.
- (vii) All panels, local control desks erected with power/control cable terminations with all continuity checks, insulation checks and other installation checks are carried out.
- (viii) Prior to pre-commissioning checks, the Contractor shall erect the entire Plant and ensure readiness of civil works to the satisfaction of Employer, so that the Works are physically ready to undergo pre-commissioning checks. Pre-commissioning checks will include checks like no-load running of machinery, checks on instruments and electrical including calibration and loop checks, functional checks, inter-lock checks etc.
- (ix) At the stage of mechanical completion of erection, the Contractor shall ensure that all the physical, aesthetic and workmanship aspects are totally complete and the Plant is fit and sound to undergo pre-commissioning checks.
- (x) The following documentation shall be completed before the Contractor notifies Mechanical Completion of Erection to the Employer
 - (a) All shop inspection records compiled and bound in 4 (four) copies.
 - (b) All erection and commissioning procedures duly approved.
 - (c) All instruction manuals in draft form - with each sheet bearing a stamp to indicate "DRAFT FOR REVIEW ONLY" submitted in 4 (four) copies.

Upon achieving mechanical completion, the Contractor shall notify the Employer of such completion of section/units/systems and readiness for inspection for acceptance of mechanical completion of erection. The Employer/ Employer's Representative shall proceed with inspection of such sections/units/systems within 10 days of such notice.

Consequent to inspection, the Employer will inform the Contractor a list of deficiencies for

rectification and the Contractor shall complete the rectification work within a jointly agreed period prior to start of pre-commissioning tests. The erection period allowed by the Contractor shall include all activities of mechanical completion as noted above.

7.11.4.4. Site Acceptance Test Document

Fifty-six (56) days prior to commencement of Tests on Completion the Contractor shall supply a Site Acceptance Test (SAT) Document for approval. This shall comprise four copies of the details of the inspection and test procedures to be carried out in testing the Works.

The SAT Plan shall provide comprehensive details of the tests to be carried out, the purpose of each test, the equipment to be used in carrying out the test and the methods to be adopted in carrying out the tests. The SAT shall provide space within the documentation for results of the tests to be added and for each test and for the SAT as a whole to be signed off by the Contractor and the Employer's Representative.

The SAT shall categorise tests as follows:

a) Dry tests

Dry tests are those tests carried out without process fluid being present.

b) Wet tests which can be further sub-divided into

(1) Hydraulic tests

Hydraulic wet tests are those tests carried out with potable water in order to prove the hydraulic capability of the Works.

(2) Process tests /System tests

Process wet tests are those tests carried out with raw Sewage as the feed stock to prove the process capability of the Works.

The Contractor shall make his own arrangements for water supply, chemical, electric power, fuel, instrument and labour during hydraulic wet tests.

It shall be assumed that the co-operation of other contractors in the carrying out of Tests on Completion will not be unreasonably withheld.

7.11.5. Tests on Completion

7.11.5.1. General

Prior to the commencement of Tests On Completion the Contractor shall submit for approval the following:

- (1) Site Acceptance Test Documents
- (2) As-Built Drawings
- (3) Operation and Maintenance Manuals
- (4) Site test results / data sheet and photo

Tests on Completion shall not be commenced until the aforementioned documents are approved.

The initial charges of oil, grease, electrolyte, generator fuel / oil, chemical, disposal of cake, etc. necessary for Tests on Completion shall be provided by the Contractor. Raw Sewage and electricity required for Tests on Completion will be provided by the Employer free of

charge. If necessary, Contractor shall create design loading conditions for testing purposes by testing fewer than the total number of installed units of process tanks or equipment at a time. In such cases, multiple tests shall be conducted to ensure that all installed units are tested. In the event that raw sewage/influent wastewater is not available at the plant, the Contractor shall defer testing until such time as sewage becomes available for treatment as described elsewhere in these Bid Documents. The Contractor shall provide adequate notice (this notice period shall be determined by the normal lead time for locally purchased chemicals plus at least 30days) of his chemical requirements prior to commencement of the Tests on Completion involving their use.

The cost of chemicals used for the Tests on Completion shall be met by the Contractor.

The inspection and tests procedure which will be carried out are provided under the general conditions of contract and shall also consist of the following:

a) Manual Commissioning Tests (Clause i)

- (i) Manual Commissioning Tests shall be such preliminary trials, tests and retests on individual items of Plant or complete systems as are required by the Employer's Representative in order to demonstrate that the Plant as a whole is ready to undergo the Manual Operation Tests and that these will take place with a minimum of interruption.
- (ii) The Manual Commissioning Tests shall demonstrate not only the items of Plant under normal operation, but also their response to abnormal and emergency conditions.
- (iii) The Employer's Representative will notify to the Contractor which items of Plant will be tested and the extent to which they will be tested in order to fulfill the requirements of the Specification.
- (iv) Leakage tests at 1.5 maximum working pressures shall be carried out on all erected pipe work prior to the Manual Commissioning Tests.
- (v) Pump curves shall be available for the Manual Commissioning Tests and all instruments essential for the tests shall have been calibrated.

b) Manual Operation Tests (Clause ii)

- (i) When the Manual Commissioning Tests have been completed so that the items of Plant have been demonstrated to the satisfaction of the Employer Representative, the Contractor shall commence the Manual Operation Tests.
- (ii) These tests shall demonstrate the correct operation of the whole Plant whilst using the minimum quantity of automatic control and monitoring equipment. Such equipment shall be at least that required both for the maintenance of safety and for the normal mode of operation of the Plant.
- (iii) The Plant will be required to demonstrate satisfactory operation at all design flow rates.
- (iv) The tests shall be of seven consecutive days' duration; if the supply of water should fail or other matters interfere outside the Contractor's control, the tests may be of such number of broken days as the Employer's Representative considers is the equivalent.
- (v) The exact date of commencement shall be subject to the approval of the Employer's Representative and shall be dependent on the following conditions having been met

- (1) All relevant items of Plant in approved working order
- (2) All items of Plant correctly identified with labels

c) Automatic Commissioning Tests (Clause iii)

- (i) The Automatic Commissioning Tests shall be such preliminary trials, tests and retests on individual items of Plant or complete system as are required by the Employer's Representative in order to demonstrate that the Plant as a whole is ready to undergo the Tests of Completion and that these will take place with a minimum of interruption.
- (ii) At least one week before the commencement of these tests, the Employer's Representative will notify the Contractor which items of Plant will be tested and the extent to which they will be tested in order to fulfill the requirements of the specification.
- (iii) The Tests on Completion as provided under the general conditions of contract shall not be carried out until the completion of the above tests.
 - (1) All pipe work shall be hydrostatically tested at site to a pressure equal to 1.5 times the maximum working pressure likely to be encountered in the system.
 - (2) The Contractor shall carry out all tests on the Plant and shall supply four copies of all test results to the Employer's Representative.
 - (3) All tests shall be to the approval of the Employer's Representative who may require them to be repeated, prolonged or modified as may be necessary to ensure that any or all items of Plant conform to the Contract.
 - (4) The Employer's Representative shall be permitted to inspect all Plant which is undergoing tests and may themselves conduct tests.
- (iv) Where it is necessary for the Employer's Representative to make arrangements for the supply of water, chemicals, power, etc., for any testing, the Contractor shall not commence the tests until after these arrangements have been made on or after a date agreed by the Employer's Representative and the Contractor shall make no claim for delay to such testing on this account except as provided under the General Conditions of contract.
- (v) If any item of plant fails during or after testing to achieve its intended duty or otherwise proves defective, it shall be modified or altered as necessary and re-tested and re-inspected as required by the Employer's Representative.
- (vi) Vibration/noise level tests shall be carried out at site which will form basis for acceptance of the equipment. If the Contractor is not in a position to meet the requirements given below as per ISO 10816 – 1995, the equipment may either be rejected or the Contractor shall carry out all necessary modifications to keep vibrations within the acceptable limits specified.

Equipment	Noise Level (dBA at 1.86 m from equipment)	Velocity of vibration (mm/sec)
All rotating equipment not having reciprocating parts with motor kW less than or equal to 15 kW	85	1.12
All rotating equipment not having reciprocating parts with motor kW	85	1.8

Equipment	Noise Level (dBA at 1.86 m from equipment)	Velocity of vibration (mm/sec)
more than 15 kW and less than or equal to 75 Kw		
All rotating equipment not having reciprocating parts with motor kW greater than 75 kW	85	2.8
All equipment having reciprocating parts viz. compressors, dosing pumps sampling pumps	85	-

- (vii) The Contractor shall have a minimum of three commissioning Employer's Representative, one for process and plant and the other for mechanical/electrical/instrumentation works on site during all tests in order to both demonstrate the Plant and to correct any faults which may occur.

7.11.5.2. Dry Test Requirements

As a minimum requirement the following dry tests shall be carried out as a general requirement:

- (1) A general inspection to check for correct assembly and quality of workmanship
- (2) A check on the presence of lubricant, cooling medium, electrolyte, etc.
- (3) A check on adequacy and security of Plant fixing arrangements.
- (4) A general check to ensure that all covers, access ladders, water proofing, guard railings etc are in place.
- (5) A check on damp-proofing, rust-proofing and vermin-proofing and particularly the sealing of apertures between building structures, chambers etc and the outside.

a) Civil and Building Works

As a minimum requirement the following dry tests shall be carried out on the civil engineering and building works:

- Check for the presence of foreign bodies in pipe work and structures.

b) Mechanical Works

As a minimum requirement the following dry tests shall be carried out on the mechanical systems:

- Carry out preliminary running checks as far is permitted by circumstances in order to ensure smooth operation of Plant.

c) Electrical Works

As a minimum requirement the following dry tests shall be carried out on the electrical systems:

- a. Check phasing and polarity.
- b. Carry out point to point check on all cables.
- c. Check on security of cable terminations.
- d. Check on completeness and adequacy of earthing systems.
- e. Check setting on protection relays, sizes of fuses and motor overload settings.
- f. Carry out checks on cabling systems in accordance with the requirements of

the relevant standards.

- g. Check operation of main circuit breakers by secondary injection methods.
- h. Check rotational direction of Plant.
- i. Check instrument loop integrity, functionality and calibration.
- j. Check operation of standby generator installation and mains / generator changeover procedures; a 4 hour load test (using the normal load of the Works) shall be carried out on the generator when the load is available.
- k. Check plant functionality.
- l. Check functionality of the central MMI and its power supply.

7.11.5.3. Process Plant Item / Equipment

All process plant items / equipment shall be tested to ensure they meet the Employer's Requirements for quality of workmanship, construction and performance.

7.11.5.4. Hydraulic Wet Test Requirements

Hydraulic wet tests shall be carried out on completion of dry tests.

Clear Water shall be used for hydraulic wet tests. The purpose of the tests is to prove the hydraulic performance of the Works. In order to demonstrate this, the Contractor shall ensure that each part of the Works is hydraulically loaded to its rated throughput for a period of at least four hours.

In order to ensure a sufficient supply of water to carry out these tests the Contractor shall provide all required facilities, including but not limited to any temporary facilities that may be required for storage and recycle of Clear Water or facilities for the disposal of the water off Site in an approved manner.

The following tests inter alia shall be carried out:

- (1) Pressure testing of all piped systems laid direct in ground in accordance with the relevant standards.
- (2) Fill all structures and check for leaks.
- (3) Filling of all storage vessels to check for leaks and distortion.
- (4) Running of all pumped systems in order to check for.
 - i) Correct functionality.
 - ii) Absence of leaks.
 - iii) Correct running temperatures.
 - iv) Smoothness of running and the absence of undue vibration or stress.
 - v) Check drive running currents.
- (5) Carry out calibration of instruments where appropriate.
- (6) Carry out valve operation, diversions etc. to fully hydraulically load each process element (or where there is a requirement to withstand an overload), overload each process element.
- (7) Demonstrate correct functionality of electrical, control and instrumentation systems.

The Contractor shall simulate the conditions that will prevail when operating as a process in order to demonstrate the correct functionality of process control loops etc.

During these tests a check on the performance of Plant shall be made to compare its site performance with the factory test data and to identify any constraints on performance due to site conditions.

7.11.6. Safety Audit

After satisfactory completion of hydraulic wet tests and prior to introduction of process fluid to the plant a safety audit shall be carried out to ensure compliance with the necessary requirement for safety and for operation of Plant. The safety audit shall be documented. The safety audit document shall be approved by the Employer's Representative prior to commencement of Plant commissioning.

7.11.7. Co-operation with other Contractors in the Execution of their Tests

The Contractor shall, where required, assist other contractors in carrying out their tests on completion and or tests after completion.

Where this assistance does not constitute part of the Contractors own work associated with Tests on Completion or Tests after Completion the Contractor shall be reimbursed at the rates approved by the Employer's Representative.

8. GUIDELINE FOR HEALTH, SAFETY AND ENVIRONMENT PLAN

8.1. HEALTH, HYGIENE AND CONTAMINATION OF WATER SUPPLIES

The Site shall be an area of 'restricted operation'. Exemptions may be granted at the discretion of the Employer for short term operations involving no risk of contamination.

- (a) All personnel shall be medically accepted.
- (b) Strict discipline shall be maintained concerning personal hygiene.
- (c) Vehicles, plant, tools and protective clothing shall be kept clean and may require regular disinfection.

To obtain medical acceptance, the Contractor shall require his employees and those of his sub-contractors to undergo medical screening, to ensure that they are not harboring waterborne pathogenic organisms, before commencing 'restricted operations'. It will be necessary for all potential employees and supervisors who may have contact with the 'restricted operations' to take a copy of the completed questionnaire together with two color passport size photographs to the Medical Officer for Environmental Health of the District Health Authority where the person resides. The Medical Officer shall consult the person and return the questionnaire to the Contractor. The Contractor shall then forward the questionnaires and photographs of those he wishes to employ to the Employer for approval. Approval in the form of a blue identity card shall be issued in the approved cases. The card is valid for the duration of the Contract or one year whichever is lesser. Contracts of duration greater than one year of 'restricted operations' carried out in the maintenance period will require reassessment of employees.

Should an employee contract any illness, looseness of bowels or gastric disorder he must immediately cease work on 'restricted operations', return his identity card, avoid contact with other employees, undergo medical screening and gain fresh approval before continuing work on the 'restricted operations' site. Works involving both 'restricted' and non-restricted operations shall either require (1) all employees to be medically accepted or (2) separate messing facilities, storage for protective clothing, tools, vehicles and plant for the two types of employees.

8.2. SAFETY AND SECURITY ON SITE

The Contractor shall at all times maintain a safe system of working and shall comply with all enactments, regulations and working rules relating to safety, security, health and welfare of all persons who may be affected by his work.

In particular he shall ensure that only persons who are properly trained for their duties are employed, and that the correct tools and procedures are used.

Nothing which has been written into or omitted from this Employer's Requirements shall be taken to relieve the Contractor from his obligations under this clause. No clause in this Employer's Requirements shall prevent the Contractor from drawing the attention of the Employer's Engineer to any feature of the Works which is not consistent with normal safety practices nor prevent him putting forward proposals at any time which would increase the safety of the installations. Not later than four weeks before work commences on the Site, the Contractor shall submit to the Employer his comprehensive proposals relating to the safety, health and welfare of all his personnel on the Site.

The Contractor shall appoint a suitably qualified representative as Safety Officer who shall be responsible for the implementation of site procedures as per relevant standards which shall include but not be limited to:

- a) safety;
- b) working in hazardous areas;
- c) permit to work;
- d) fire and smoking regulations;
- e) first aid;
- f) warning signs;
- g) trenching scaffolding and other construction structures;
- h) safety barriers;
- i) protective clothing and equipment;
- j) safety training;
- k) safety meetings and inspections;
- l) health and welfare.

The proposals shall be appropriate for all grades of labor and personnel who will work on or visit the Site on behalf of the Employer or Contractor.

The Employer's Engineer shall have the power to stop any activity or work in any area where there is a breach of the published site safety rules such that health or life is put at risk. The Contractor shall, in addition, comply with the Safety Policy of the Employer. The Contractor shall ensure that all other contractors working on the Site are not working in an unsafe manner so as to endanger themselves, the Contractors personnel, other personnel or the Plant. The Contractor shall bring any violation of Site safety rules by others to the attention of Employer in writing.

8.3. FIRST AID AND LIFE-SAVING APPARATUS ON SITE

The Contractor shall provide on the Site such life-saving apparatus as may be appropriate and an adequate and easily accessible first aid outfit or such outfits as may be required in any government ordinances, factories acts, etc., published and subsequently amended from time to time. In addition, an adequate number of

persons permanently on the Site shall be instructed in their use, and the persons so designated shall be made known to all employees by posting of their names and designations in a prominent position on Site

8.4. ELECTRICAL SAFETY ON SITE

The Contractor shall be responsible for the electrical safety of all Plant supplied and installed. Whilst any equipment is being installed or tested, the Contractor shall ensure that all necessary precautions are taken to safeguard personnel working on site. If necessary, this shall include fencing off areas which are considered to pose a risk, and erecting warning notices.

The Contractor shall be responsible for ensuring that the electrical installation is carried out by suitably trained competent personnel and that the work is carried out in a safe manner.

The Contractor shall be responsible for the operation on the Site of a permit to work system during the period of electrical equipment installation and testing. This system shall regulate the installation, the energisation and the use of electrical Plant installed and the method of work adopted.

8.5. NOISE

The Contractor shall ensure that the operations entailed in the construction of the Works do not cause annoyance to others working on the Site or to persons living adjacent to the Site.

8.6. WARNING AND SAFETY SIGNS

During construction of the Works statutory safety signs, shall be adequately provided throughout the Works, both indoors and outdoors. These safety signs shall cover mandatory, prohibition, warning, emergency, fire-fighting and general notices. All signs shall be positioned around the Works at highly visible points. Provision of signs and the positions of signs shall be subject to the Employer's approval. Special attention shall be given to areas designated as hazardous.

8.7. ENVIRONMENTAL PROTECTION

The Contractor shall minimize, as far as practically possible, the effects of all his and his Subcontractors' activities upon the environment and shall implement and monitor measures to prevent:

- (a) Contamination of surfaces, ground, groundwater, surface water and rivers,
- (b) Emissions to air, including smells, gases, smoke, and dust.
- (c) Unsanitary or unsafe storage or discharge to drain, sewer and surface waters,
- (d) Unsanitary or unsafe storage or discharge of solid wastes,
- (e) Noise,
- (f) Visual intrusion, and
- (g) Excessive energy and water consumption.

These requirements shall be met through the constant and careful attention of the Contractor's management of all Site and off-site activities, and by instruction to all staff and labor in these matters. The Contractor shall appoint an Environmental

Control Manager for the Works, who shall be responsible for preparing an Environmental Management Plan and ensuring its implementation by the Contractor after obtaining approval of the Employer.

Implementation shall include for monitoring and reporting on the results of the above measures. Monitoring reports shall be in writing and submitted on a monthly basis as part of the monthly report referred to above. The report shall include a listing and summary of daily monitoring results on all aspects listed above. All potentially affected areas of the Site, other areas used for or affected by the works and all adjacent or affected waterways shall be monitored and where instructed by the Employer tested.

The Environmental Management Plan (EMP) shall identify the potential environmental impacts from various construction and operations and maintenance activities to be undertaken in the Contract and set out in detail the approach he will adopt in mitigating these environmental impacts to ensure that the residual impacts are minor and confined to a short period. The EMP shall consider but not be limited to the following:

- The methods of materials delivery, storage, usage and disposal; equipment usage; and site activities to ensure they have minimal impact on the environment,
- Only environmentally safe products and practices shall be adopted in performing his works, and
- The Contractor shall comply with all of the statutes regarding environmental effects.

The EMP shall provide separate descriptions of its proposals for minimizing any adverse environmental impacts / effects during the construction phase and subsequent operations and maintenance phase. The EMP shall be provided in draft form within 30 days from the Notice to Commence and shall be updated from time to time by the Contractor as agreed or required by the Employer to ensure the objectives of environmental protection are fully met.

8.8. SAFETY PLAN

The Contractor shall prepare a Safety Plan and submit the same to the Employer for review within 30 days of receiving the Notice to Commence. The Safety Plan shall be followed at all times by the Contractor and shall contain adequate control measures, in accordance with the relevant protection of property and local laws and regulations as well as internationally accepted good practice, for the prevention of accidents, fires and public nuisance. The Safety Plan shall be implemented properly and diligently throughout the execution of the Works.

Contractor's Safety Plan shall make safety provision for, among other things:

- (a) The Deep excavations and collapsing sides in trench excavations,
- (b) Scaffolds and overhead working,
- (c) Working in confined spaces,
- (d) Working in water,
- (e) Contractor's Equipment, especially cranes,
- (f) Handheld power tools,
- (g) Electrical equipment,
- (h) Hazardous chemicals, gases and fuels,

- (i) The use of protective clothing, and
- (j) The provision of first aid facilities.

The Safety Plan shall be developed to ensure zero fatal accidents and zero hazardous incidents / occurrences in all construction works. The Safety Plan shall include descriptions of the company's standard policies and procedures regarding its site organization and procedures, methods and frequency of conducting safety audits at the Site(s), record keeping and reporting, providing safety training for its personnel (including subcontractors), issue and mandatory use of safety equipment, and details of the qualifications and experience of the Bidder's proposed safety officers to be deployed at the Site(s). The Contractor shall appoint a Full Time Safety Manager for the Works having experience in this field, who shall be responsible for implementing the Safety Plan. He shall be supported by at least two safety officers who are qualified for such safety works. The Contractor shall ensure that his staff and labour and his Subcontractors are all fully trained in and aware of good and safe working practices. The Contractor shall ensure that all precautions are taken to safeguard the general public and construction / operating staff from any danger.

All temporary and partially completed works shall be protected by way of barriers, lights, notices and the like. All excavations and the like are to be protected by barriers at all times and adequately illuminated at night. Warning and diversion signs concerning roadwork shall be suitably placed to give motorists ample warning. During the movement of heavy vehicles across roads or onto roads, men, bearing red flags, shall be in attendance to warn other road users and to generally control traffic in a safe manner. The Safety Plan shall also consider requirements for warning and protection for other risks including overhead and underground cables, pipes or obstructions, or voids, openings, pits and trenches. The Contractor shall ensure that all appropriate measures are implemented.

The Safety Plan shall include a policy statement signed by the CEO or equivalent authority of the Organization declaring that safety and loss prevention shall be given the highest practicable priority in all aspects of the Contract.

9. CHECK LIST FOR HAND-OVER AT THE END OF CONSTRUCTION PERIOD

9.1. GENERAL

This section applies to procedure(s) on how to transfer the works after the completion of Construction period (after necessary testing and commissioning of the system up to the satisfaction of the Employer) by the Contractor

- a) Internal road network including culverts,
- b) Water supply Transmission and Distribution system including service reservoirs and House Service Connections
- c) Wastewater collection system including Intermediate sewage pumping stations and House Service Connections
- d) Storm water drainage and rainwater harvesting systems including primary drains
- e) ICT – Pipeline infrastructure systems including inspection chambers
- f) Power supply transmission and distribution system including substations

- g) All Mechanical, Electrical systems required for the infrastructure works.
- h) All ancillary buildings in the project area.

The procedure for Handover shall be verified through the final examination by the Engineer. A completion approval Certificate shall be issued after the successful final examination and submission of the completion documents before the contract deadline.

9.2. DUTIES AND RESPONSIBILITIES

- (a) All the Responsibility lies with Contractor:
All cost for examination / test / training, and preparation of any document of the activities shall be the Contractor's responsibility.
- (b) Official certificate:
All test certificates shall be issued by authorized organization with qualified personnel with his signature.
- (c) Receiving inspection
All of equipment and construction material installed in site shall be inspected by the Engineer to verify whether damaged or not. Rejected items shall be replaced by the Contractor at his own cost.
The typical examination shall consist of:
 - i. Appearance test / Visual examination
 - ii. Check on attached invoices
- (d) Conduct first training:
The Contractor shall provide the first training program to client's staff member for one months before acceptance inspection. The typical training program is as follows:
 - i. Study of Operation and maintenance manual
 - ii. Operation skill / technology (Mechanical and Electrical) including normal and emergency operation
 - iii. Maintenance, repair skill / technology (Mechanical and Electrical)
 - iv. Recordkeeping and maintenance of records
 - v. Safety & Health
 - vi. Evaluation of the program (examination)
 - vii. Others requested by the Engineer
- (e) Conduct joint completion inspection:
To verify the plant condition and its performance before operation, joint inspection will be carried out using up-dated Operation and, maintenance manual. The typical inspection items shown table below.
 - i. Submission of the report of completion documents:

The contractor shall submit the completion document after passing the final examination before the deadline on the contract time.

The typical report consists of relevant documents as shown in table below

These data shall be provided in soft and hard copies in proper professional format.

Typical Items to be examined at the End of Construction Period

Items	Description
Appearance test / Visual examination	All Road network, Civil structures, Water and wastewater pipelines, Storm water drainage, building including

(Damage/crack, differential settlement, soil settlement, peel off painting, missing / lost, leakage of water /solution /gas, corrosion, decolonization, condition of maintenance, others)	interior/exterior, fence/gate, stairs, others All Mechanical & Electrical equipment /accessories, others All Pipeline valves and others All SCADA system, Instrumentation and control equipment, others
Performance examination (Selection of operation mode, selection of facilities, flow / water level, overflow, leakage of water, heating, vibration / noise level, speed of rotation, smoothness, accuracy, setting value, condition, others)	Check Sequence, or Manual operation including water level sensors / protections, others Check specification of all Mechanical equipment including pressure gauges, valves, others Operational characteristics of all Electro-Mechanical Equipments in Pump stations etc Check specification of all Electrical equipment, others Check specification of all pipe line including valves, others Check specification of all accrual condition after troubleshooting, others Check for the actual losses in the water transmission and water distribution system. Check for the actual residual pressures in the water distribution system. Working condition of the Waste water collection system including septicity conditions if any. Strom water drainage working conditions, condition of storm inlet arrangements and water stagnations conditions during rainy season. Performance of Culverts / bridges during a storm event and also during heavy vehicular movement.
Verification of rectified works (System, leakage, crack, damage, soil settlement, corrosion, others)	Check a list of all defect items, tendency, repeating, others Check a list of all miss operation and maintenance items, others Check all factors of defect / miss operation, others Verification of action on the take measures, others Verification of all rectified works with the reports and photo, others Check emergency works and its factor, action plan, others Check actual condition after rectified works, others
Operation skill (Staff member, others)	- Format for preparation of daily report and summary reports on O/M activities, time and motion of staff member, others - Interview of Experienced operators in the respective fields regarding troubleshooting, others - Paper test (basic knowledge, safety, others)
5. Spare parts and others	- Check inventory list (parts, others) - Check the quantity of inventory, others - Check maintenance tools and equipment, vehicles, others

9.3. SPECIFICATIONS

The specification of materials suggested for repairs shall be the same as used in the original work. Specifications for any materials which were not used during construction shall be approved by the Engineer prior to HANDOVER. Without being

limited by this clause, the Contractor shall suggest appropriate material for repairs even if material required for such repairs has not been approved earlier, However, subsequent to suggestion of use of such material the Contractor shall submit proposals for the approval of specifications of such material.

9.4. CHECK LIST

9.4.1. General

Within the framework of the Contractor's responsibilities given above, the Contractor shall carry out the following activities. However, these shall not limit the requirement for other activities which otherwise are required as per terms and conditions of the Contract or to fulfill the Contractor's responsibilities or are essential as per good industrial practices. The Contractor shall hand over the components of works in good working condition for the following, but not limited to:

- a) All required consumables required for functioning of infrastructure works with inventory of material.
- b) All Electrical Equipments such as 33kV/11KV/ 433V Transformers, LT Switchgears / MCCs, Control Stations, Cables, Earthing, etc., pumping station, administrative buildings, etc. (all works constructed in this Contract) in neat and clean condition
- c) All required consumables required for functioning of infrastructure works with inventory of material.
- d) All Electrical Equipments such as 33kV/433V Transformers, LT Switchgears / MCCs, Control Stations, Cables, Earthing, etc., pumping station, administrative buildings, fire station unit etc. (all works constructed in this Contract) in neat and clean condition
- e) Lighting fixtures and the lighting system of all areas and replacement of all non-functional lighting fixtures.
- f) Records for:
 - a. Repair history of all mechanical, electrical and instrumentation control equipment, and communication instruments;
 - b. Daily log of operations of all the important equipment such as electrically actuated valves, etc., with time tag;
 - c. Daily list of alarms with time tag;
 - d. Logbook format and the data to be included in the logbook;
 - e. Last periodic maintenance done for all equipment / buildings of the system;
- g) Required spares, special tools and test equipment and adequate inventory of required accessories or equipment itself for repair of Pipeline system (including water and sewage system), electrical, mechanical, instrumentation and control system, pipe and the communication system. However, at the end of the Contract the Contractor shall hand over the full spares, tools and tackles as supplied with the Contract by replacing the used items with fresh supplies of the same specifications.
- h) Repair of the roads, buildings and campus area utilities.
- i) Water supply facilities, Wastewater collection facilities and all its units.
- j) Record of stores for the electrical, mechanical and instrumentation and control equipment. The records will include but shall not be limited to:

- a. Loading / unloading of materials received and issued for works;
 - b. Proper arrangement of material in stores to ensure its safety and easy availability;
 - c. Maintaining store areas in a neat and tidy condition;
 - d. Keeping records and accounting for the incoming materials,
 - e. Keeping records and accounting for the consumed materials.
- k) Structures / buildings of the project areas and others built in the Contract must ensure adequate cleanliness, ventilation, illumination and structural safety. In addition to this, the general hygienic standards must be in acceptable condition and adequate plantation; horticultural activities must be well maintained to give pleasant environment of the project area.
- l) Updated operation and maintenance manual as defined in specifications for O&M works.

9.4.2. Infrastructure System

The Contractor shall hand over all components of the works in good working condition for the following, but not limited to:

- a) Manpower requirement chart along with organizational chart with responsibility matrix for and maintenance of the entire Infrastructure components in the project area.
- b) All required spares for daily maintenance of the road system including road furniture works like bitumen, paints, signals and requisite O&M manual on the traffic management plans, road safety measures, etc.
- c) All required spares for daily maintenance of the water supply system including feeder systems works like pipeline operations and maintenance, UFW reduction programs and requisite O&M manuals, etc. Tools and Equipments required for the routine operation and maintenance of the system
- d) All required spares for daily maintenance of the Wastewater collection system including pumping station works operations and maintenance and requisite O&M manuals, Tools and Equipments required for the routine operation and maintenance of the system.
- e) All required spares for daily maintenance of the Storm water collection system including storm inlet works operations and maintenance and requisite O&M manuals, etc.,
- f) All Pump house facilities including pipes, valves pumps, sluice valves, dismantling joints, nonreturn valves, pressure gauges, flow meters, dewatering pumps, HV/LV switchgear room, PLC control, MCC's, Cables, Earthing, all motors and valves in the system.
- g) PLC, including the hardware, software and all instruments, in good working condition.
- h) Entire control system and instruments as per the manufacturer's recommendations.
- i) Communication cables and power supply cables.
- j) All instruments such as flow meters, pressure transmitters, pressure gauges, level sensors/transmitters, float type level switches, and laboratory instruments along with all other equipment.

- k) Calibration of all measuring /metering equipment or as recommended by the manufacturer. The calibration at manufacturer's works shall be done only in case of major failure/ repairs of the instruments.
Preparation and Submission of daily and monthly customized report formats produced by the local SCADA system
- l) Provision of all required consumables for printing.
- m) Details of all moving parts, steel structures and RCC structures.
- n) Lubrication of all gears of reduction motors, motorized valves, and other parts of the system.
- o) Check all valves for their manual and electric operation. Operation of valves must be checked from local control console, switchgear and through PLC system.
- p) Make good all circuits and buildings all electrical, mechanical and instrumentation equipment, substation equipment, lighting, and earthing system associated works
- q) Painting of the exposed mild steel components of pipeline, ladders, railings etc.
- r) Make good surrounding areas of the works free from shrubs, weeds, grass and other unwanted vegetation.
- s) Ensure safety accessories, e.g. gloves, shoes, first aid box, etc.
- t) Ensuring fire and safety equipment.

9.4.3. Lubrication For Pump Stations

The Contractor, in the operation and maintenance manuals, shall furnish a complete schedule of recommended oils and other lubricants. The number and types of lubricants shall be kept minimum. In case of grease lubricated bearings for electric motors, lithium base grease is preferred. The Contractor shall indicate the brand name of indigenously available equivalent lubricants, with their complete duty specifications, in the O&M manual. The Contractor shall also furnish the schedule of quantities for each fill, frequency of filling and annual requirement in O&M manual.

Where lubrication is effected by means of grease, preference shall be given to a pressure system which does not require frequent adjustment or recharging. Frequent, for this purpose, means more than once in a month. Where more than one type of special grease is required, a grease gun for each special type shall be used. All lubricant systems shall be designed so as not to cause a fire or pollution hazard. The Contractor shall supply flushing oil for such lubrication system when an item of plant is ready for preliminary running.

9.4.4. Spare Parts

All spare parts used for the equipment in the maintenance of the system must be from the manufacturer of the equipment or, if the equipment itself has been made with parts from other manufacturers, the parts must be of the same make as used in the equipment supplied and installed.

All spare parts shall be packed for long storage under the climatic conditions prevailing at the Site. Each spare part shall be labelled on the outside of its packing

with its description, number and purpose and, if more than one spare is packed in a single case, a general description of the case contents shall be shown on the outside and a packing list enclosed.

9.4.5. Electrical System

The Contractor shall hand over the following at the end of the Period

- a) As built drawings based on all modifications suggested. All Electrical Drawings like Single Line Diagrams, Control Circuits Equipment Layout, Cable Layout, and Cable
- b) Schedules, earthing Layouts
- c) Details of Protective Relay Settings and time relay settings including any changes, Details of Oil Changes / Filtration of Transformers, Records of any changes made in the System suggested etc should be maintained.
- d) Equipment wise maintenance record for O&M Period. Motor wise Power consumption Details and over all power consumption detail of plant, equipments etc.
- e) Details of IR Test of all Equipments like HT/LT Panels, HT/LT Motors, Transformers, Switchgears, and Cables etc.
- f) Log book showing details Electrical faults that have occurred in the plant and record of corrective actions taken.
- g) Equipment wise technical data given by equipment supplier, Documents showing Bill of Materials and Operation & Maintenance Manual (hard copy or soft copy).
- h) List of mandatory spares that are to be maintained at stores and their actual availability in plant, if it is below same has to be replenished.
- i) Details of Measurement of Earth resistance, Earth Pit wise and Overall Values during the O&M Period.
- j) Details of Illumination Levels required during the O&M Period along with details of changes, required if any.

9.4.6. Electrical Checks To Be Done During Handover

- a) Contractor to provide a test schedule & format to be approved by engineer before commencing any test.
- b) Checking of all electrical equipment, items etc as per bill of materials. Visual checking and tracing out the circuit based on revised as built drawings.
- c) Visual Operational checks of all Equipment & Protections have to be done.
- d) Transformer oil samples testing have to be done during taking over.
- e) Earth Resistance of individual, Combined Pits for Substations should be checked during Hand over.

9.4.7. Instrumentation, Control and Automation System

The Contractor shall hand over the following documents/drawings/manuals/programs at the end of Construction Period

- a) As built drawings approved by the employer's representative based on all modifications. All ICA Drawings like P&ID, System configuration diagram (PLC & SCADA architecture), Instrument installation drawings, Instrument

cable schedule, and cable layouts should be maintained and should be handed over.

- b) Handing over document / manuals shall include on a minimum 3 sets of softcopies and 3 sets of hard copies. The hard copies shall be spiral bounded clearly indicating the version/revision submitted. All the contents shall be indexed. The contents of handing over document/manual shall be clearly legible and shall include original manufacturer's literature minimum, and incorporate any changes as per site conditions.
- c) Detailed drawing and manual of the PLC installed. Manual shall include the PLC series installed along with complete details on I/O modules, Ethernet switch, Relay modules, and converters (if any).
- d) A complete manual including operating instructions and troubleshooting techniques of the PLC and accessories installed illustrated with examples. This shall be provided along with the standard manufacturer's literature.
- e) A complete manual shall be provided which shall include operating instructions and troubleshooting techniques of the ODMS installed illustrated with examples. This shall be provided along with the standard manufacturer's literature.
- f) A complete manual shall be provided which shall include operating instructions and troubleshooting techniques of the interface control panel to Central Monitoring unit, illustrated with examples. This shall be provided along with the standard manufacturer's literature.
- g) Interoperability testing tool / software shall be provided along with relevant manuals and operating instruction with examples.
- h) Latest PLC program back-up, SCADA software back-up with license, SCADA database backup, reports and alarm back-up, Historical archived data containing reports and alarms and ODMS data and configuration set-up shall be provided.
- i) All software's used under ICA shall be handed over along with their original licenses.
- j) Complete list of database /addresses shall be provided clearly indicating the spare tags for PLC, SCADA and ODMS software's.
- k) List of mandatory spares that are to be maintained at stores for complete ICA package and their actual availability in plant, has to be provided.
- l) Any password's set to access the internal PLC program; interface control panel shall be provided and demonstrated.
- m) All passwords (PLC, Interface control panel & SCADA and other software / hardware) shall be provided in a sealed envelope and addressed to the Engineer In Charge.
- n) PLC, SCADA and ODMS package shall be updated with the latest software version / patch before handing over. The same has to be demonstrated to the Engineer in Charge.
- o) Latest licensed version of windows operating system along with MS –Office or equivalent software which is prevailing at that point of time shall be installed on SCADA machines and other machines installed and integrated with the SCADA and ODMS package. The same shall be demonstrated to the engineer.
- p) Contractor shall conduct a training session for the client's staff which shall include PLC configuration, trouble shooting techniques, SCADA configuration

and troubleshooting techniques, ODMS configuration and troubleshooting techniques, diagnostic techniques and troubleshooting techniques for wireless technology employed for communication.

- q) The training session shall be of duration of minimum Five (5) working days at a stretch.
- r) Manufacturer's literature / Manuals for flow meters, level transmitters, switches, pressure transmitters etc and analytical instruments installed.
- s) Instrument wise, PLC and SCADA wise and ODMS maintenance record during complete O&M Period shall be provided.
- t) A complete and updated list of all manufacturers/system integrators/contractors of ICA with contact numbers shall be provided. The same shall also be made available on site for ready reference.
- u) The latest versions of all drawings of ICA, which will include cable termination details, I/O mapping, database details etc shall be provided in PDF format and editable format and loaded in the operator machine available on site. The same shall be demonstrated to the engineer.

9.4.8. ICA Checks to Be Done During Handover

- a) Contractor to provide a test schedule and format to be approved by the engineer before commencing any of the tests.
- b) Functional Checking of all ICA equipment including flow meters, pressure and level instruments, vibration monitoring instruments, and wireless equipment being used for communication.
- c) Loop checks shall be conducted.
- d) All instrument cabling shall be inspected for continuity. If found faulty, the same shall be replaced and demonstrated.
- e) All instrumentation cable conduits shall be checked for damage. If found faulty, they should be rectified or replaced and sealed to the satisfaction of the engineer
- f) Visual operational checks of PLC panel, SCADA system and interface control panel.
- g) Licensing feature of PLC, SCADA software and hardware, ODMS software and other hardware shall be demonstrated.
- h) Functional check of set points changes at HMI and it's downloading to PLC's concerned.
- i) Hot-standby feature of PLC and hot swappable feature of I/O modules shall be demonstrated. If found to be faulty / non-operational, shall be rectified and if required replaced to normal working condition and demonstrated to the client.
- j) Dual-redundant server feature of SCADA shall be demonstrated. If found to be faulty / non-operational, shall be rectified and if required replaced to normal working condition and demonstrated to the client.
- k) Functional check of ODMS software in conjunction with SCADA shall be conducted.
- l) Functional check of data received / transmitted from remote stations shall be conducted in conjunction with SCADA.
- m) Functional check of interface control panel to Centralised Monitoring station in conjunction with other units shall be conducted.

- Historical archiving of all data shall be demonstrated.
- Availability of memory for smooth operation of PLC, SCADA and ODMS machines shall be demonstrated. If found to be in-adequate, the same shall be rectified / archived and demonstrated.
- If any instruments and automation equipment are found to be faulty during the above tests, the same shall be rectified or replaced as necessary.

9.4.9. Ancillary Works

- a) Make gardeners and plantation in the campus area green, neat and tidy with removal of shrubs, weeds, grass and unwanted vegetation and make pruning, trimming and cutting of old big trees from the Area along with including pumping station locations, office building locations etc as directed by the Engineer.
- b) Make good and in working condition for lighting fixtures and lighting circuits, water supply facilities in project area, offices and other residential buildings.
- c) The Contractor shall carry out ordinary repairs to buildings / pump stations. The repairs may include but not limited to the following items:
 - Easing of doors and windows, monsoon repairs to roofs, attention to drains, rain water spouts, attention to plinth protection.
 - External white or color wash, external or internal painting, internal distemping, renewal of approach roads within the campus.

9.4.10. Wireless Communication System

- a) Make good a wireless communication system to ensure reliable and easy communication to and from all infrastructure components.
- b) Replacement of batteries, faulty sets and all other non-functional equipment to ensure trouble free communication if required.

9.5. OPERATIONS AND MAINTENANCE MANUAL

The comprehensive manual (six sets) shall be submitted at the end of the construction period, as specified. It shall be updated based on the principals broadly listed in O&M section. These manuals shall be made available during both the first and second training module conducted by the contractor.

9.6. PAYMENTS

The Contractor, at the time of bidding, will be responsible to ensure the completeness and adequacy of his Bid Price to fulfill the entire responsibilities as described above. His bid price, as quoted in the Schedule of Prices, shall include all costs for hand-over.

9.7. FORMAT

For proper maintenance and recording of all the infrastructure works, the formats are given in O & M section. All the O & M record should be submitted in soft editable form.

9.8. COMPLETION CERTIFICATE

A joint inspection shall be arranged by the contractor to assess the condition of civil structure, electrical & mechanical equipment and instrumentation equipment. Based on this inspection, a list of remedial, repair and replacement for the components shall be prepared by employer. The contractor shall carryout such remedial works at his own cost. Again, joint inspection shall be arranged by the contractor for certification completeness of remedial work as well as restoring the condition of all civil work to its original appearance.

The contractor shall submit the entire required document to employer for review and comments. The contractor shall resubmit the document incorporating the comment. The employer shall issue a completion certificate to the contractor on his request within 30 days after the take back of the works by the employer subject to the above documents and obligation are met by the contractor before 90 days prior to hand over of the project area.

ADDITIONAL CONDITIONS OF CIVIL WORKS

1. GENERAL

The intent of specification covers the following:

Design, engineering, and construction of all civil works relating to entire job including, delivery chamber etc. All civil works shall also satisfy the general technical requirements specified in other sections of this specification and as detailed below. They shall be designed to the required service conditions/loads as specified elsewhere in this Specification or implied as per National/International Standards.

All civil works shall carried out as per applicable Indian Laws, Standards and codes All material shall be of best quality confirming to relevant Indian Standard and Codes, The Contractor shall furnish all design, (Unless otherwise specified) drawings labour, tools, equipment, materials, temporary works, constructional plant and machinery fuel supply transportation and all other incidental items not shown or specified but as may be required for complete performance of the works in accordance with approved drawings, specifications and direction of department.

The work shall be carried out according to the design/drawings to be developed by the contractor and approved by the Department or supplied to the contractor by the department. For all buildings, structures. Foundations etc., necessary layout details shall be developed by the contractor keeping in view of the functional requirement of the equipment's and facilities and providing enough space and access for operation use and maintenance based on the input provided by the department Certain minimum requirements are indicated in this specification for guidance purpose only. However, the Bidder shall quote according to the complete requirement.

1.1. SITE PREPARATION

The layout and levels of all structure etc. shall be made by the contractor at his own cost from the general grid of the plot and benchmarks given by the Engineer-in-Charge. The Contractor shall give all help in instruments, materials and personnel to the engineer-in-

charge for checking the detailed layout and shall be solely responsible for the correctness of the layout and levels.

1.2. SCOPE

This clause covers the design and execution of the work for site preparation, such as clearing of the site, supply and compaction of fill material, excavation and compaction of back fill for foundation, road construction, drainage, water supply, sewage, electrification, trenches, etc.,

- a) The contractor shall develop the site area to meet the requirement of the intended purpose, The site preparation shall conform to the requirements of relevant sections of this specification or as per stipulations of standard specification.
- b) If fill material is required the fill material shall be suitable for the above requirement, The fill shall be of such a material and the site so designed as to prevent the erosion by wind and water of material from its final compacted position of the in-situ position undisturbed soil.
- c) Material unsuitable for founding of foundation shall be removed and replaced by suitable fill material and to be approved by BTDA.
- d) Backfill material around foundations or other works shall be suitable for the purpose for which it is used and compacted to the density described under Compaction.

1.3. EXCAVATION AND BACKFILL

- a) The scope includes soil investigation to be conducted by the bidder
- b) Excavation and back fill for foundation shall be in accordance with the relevant code.
- c) Whenever water table is met during the excavation, it shall be denatured, and water table shall be maintained below the bottom of the excavation level during excavation concreting and back filling.
- d) When embankments are to be constructed on slopes of 15 or greater benches or steps with horizontal and vertical faces shall be cut in the original slope prior to placement of embankment material. Vertical faces shall measure not more than 1 m in height.
- e) Embankments adjacent to abutments culverts retaining walls and similar structures shall be constructed by compacting the material in successive uniform horizontal layers not exceeding 15 cm in thickness (of loose material before compaction) Each layer shall be compacted as required by means of mechanical tamper approved by the Owner. Builders Rocks larger than 10 cm shall not be placed in embankment adjacent to structures.

1.3.1. Earth embankments of roadways and site areas adjacent to buildings shall be placed in successive uniform horizontal layers not exceeding 20 cm in thickness in loose stage measurement and compacted to the full width specified. The upper surface of the embankment shall be shaped so as to provide complete drainage of surface water at all times.

1.3.2. Compaction

- a) The method and equipment used to compact the fill material shall be suitable to achieve the density that will give the allowable soil bearing pressure required for the foundations, roads etc., in each layer of fill material. Each layer of earth embankment when compacted shall be as close to optimum moisture content as practicable. Embankment material which does not contain sufficient moisture to obtain proper compaction shall be wetted. If the material contains an excess of moisture. Then it shall be allowed to dry before rolling. The rolling shall begin at the edges overlapping half the width of the roller each time and progress to the center of the road or towards the building as applicable. Rolling will also be required on rock fills No compaction shall be carried out in rainy weather.
- b) At all times unfinished construction shall have adequate drainage. Upon completion of the road's surface course. Adjacent shoulders shall be given a final shaping true alignment and grade.
- c) The density to which fill materials shall be compacted shall be as per relevant IS and as per direction of Engineer-in-Charge, All compacted sand filling shall be confined as far as practicable. Back filled earth shall be compacted to minimum 95 of the Standard proctor's density at filling shall be compacted to minimum 95 of the Standard proctor's density at OMC.

1.3.3. Requirement for Fill Material Under Foundation:

The thickness of fill material under the foundations shall be such that the maximum pressure from the footing. Transferred through the fill material and distributed onto the original undisturbed soil will not exceed the allowable soil bearing pressure of the original undisturbed. For expansive soils the fill materials and other protections etc. to be used under the foundation is to be got approved by the BTDA.

1.4. ANTIWEED TREATMENT & SITE SURFACING

1.4.1. Scope of work

The contractor shall furnish all labor, equipment and materials required for complete performance of the work in accordance with the drawing specification and direction of the Engineer in Charge.

1.4.2. General requirement

The material required for site surfacing/gravel filling shall be free from all types of organic materials and shall be of standard approved quality and as directed by the Engineer-in-Charge.

- a) The contractor shall furnish and install the site surfacing to the lines and grades as shown in the drawing and in accordance with the requirements and direction of the Engineer-in-Charge. The soil of the entire switchyard area shall be subjected to sterilization/ anti-weed treatment before placing the site surfacing/gravel fill material strictly as per instruction/requirement of the manufacture of the chemical required for soil sterilization/anti-weed treatment. After all the structures and equipment have been corrected and accepted, and soil sterilization as specified is complete the site shall be maintained to the suitable water sprinkling to form a smooth and compact surface condition which shall be matching with finished ground level of the switchyard area.

- b) After the soil sterilization material is applied and surface prepared compacted to the required slope/grade a base layer of uncrushed/crushed broken stone/pebbles (grouch of 20mm nominal size shall be spread and rolled/compacted by using ½ ton toiler (30m width and 24 dia) with 4 to 6 passes and water sprinkling to form a minimum 50mm layer on the designed finished formation level of the entire switchyard area.
- c) A final surface course minimum 50mm. Uniform layer of encrusted crushed broken stone/pebble (gravel) of 20mm. nominal size as specified shall be spread over the base layer/course. This final surface course shall be applied in all areas exclusive of roadways and shall extend beyond the fenced area as medicated in the drawing This surface course shall ten be compacted by light roller using ½ ton steel roller (width 30 x dia 24) and 4 to 5 passes or any other means with water sprinkling as directed by the Owner Engineer-in-Charge. Water shall be sprinkled in such a manner that bulking does not take place The 20mm nominal size (for both layers) shall pass 100 precent through I.S. Sieve designation 10mm and nothing through 16.0mm I.S. Sieve.
- d) In areas that are considered by the Engineer-in-Charge to be too congested with foundation and structures for proper tolling of the base course material by normal rolling equipment's the material shall be compacted by hand if necessary. Due care shall be exercised so as not to damage any foundation structure or equipment during rolling compaction.

1.4.3. Chemical to be used for Soil Sterilization ANH-Weed Treatment:

The details of quantities and method of application of chemicals used for soil sterilization/anti-weed treatment shall be as per manufacturers recommendations Bidders are required to submit the details of chemicals proposed to be used and recommendation of manufacturer with required guarantee along with their bids for necessary approval of KBJNL. Approval of KBJNL by no means shall relieve the Contractor from their contra actual obligations as stipulated in General and Special conditions of contract.

1.5. SITE DRAINAGE:

- a) Adequate site drainage system shall be provided by the Contractor. The Contractor shall obtain rainfall data and design the storm water drainage system, (culverts. Ditches, drains etc..) to accommodate the most intense rainfall that is likely to occur over the catchments area in one hour period on an average of one per ten years. The surface of the site shall be sloped to prevent the pounding of water.
- b) The maximum velocity for pipe drains and open drains shall be limited to 2.4 m/sec and 1.8m/sec respectively. However, minimum non-silting velocity of 0.6m/sec shall be ensured. Longitudinal bed slope not milder than 1 in 1000 shall be provided.
- c) For design of RCC pipes for drains and culverts. IS:456 and IS: 783 shall be followed.
- d) The Contractor shall ensure that water drains are away from the site area and shall prevent damage to adjacent property by this water. Adequate protection shall be given to site surface, roads, ditches, culverts, etc, to prevent corrosion of material by water.
- e) The drainage system shall be adequate without the use of cable/pipe trenches.

- f) For pipe drains, concrete pipe of class NP2 shall be used. However, for road crossings etc, higher strength pipe of class NP3 shall be provided. For rail Crossings, pipes conforming to railway loading standards or at least NP4 class shall be provided. Manholes shall be provided at every 30m interval at connection points and at every change of alignment.
- g) Open surface drains shall be provided with bricks of class designation 75 in cement mortar 1:4 including 100mm thick bed concrete of grade 1:4:8 and 12mm thick cement plaster 1:4 with a floating coat of neat cement inside the drains. Its top and exposed sides as per design and drawing to be got approved by the KBJNL, For expansive soils, the guide lines of IS: 9451 shall be followed.
- h) In general. Effluent drainage shall be through buried concrete pipes and all storm water drainage shall be designed to drain the road surface as well as the entire free and covered areas etc.
- i) Pipe drains shall be connected through manholes at an interval of max 30m. Effluents shall be suitably treated by the Contractor to meet all the prevalent statutory requirements and local pollution control norms and treated effluents shall be conveyed to the storm water drainage system at a suitable location for its final disposal.
- j) Invert of the drainage system shall be decided in such a way that the water can easily be discharged above the High Flood Level (HFL) outside substation boundary at suitable location and approved by KBJNL. Pumps for drainage of water (if required) shall be provided by Contractor.
- k) All internal site drainage system, including the final connection/disposal to KBJNL acceptance points shall be part of Contractor's scope including all required civil work, mechanical & electrical systems. The Contractor shall connect his drain(s) at one or more points,
- l) The precast manholes shall be preferred against cast-in-situ type. The drainage scheme may either employ open drain system or underground pipe system or a combination of both. A manhole shall be provided at every turn/Corner in case of underground type in addition to the normal requirements.
- m) Suitable pumping arrangement shall be provided by the contractor to pump out the water from sump to the open channel. Automatic float valve type pump shall be provided and installed by Contractor.
- n) The Contractor shall locate the outfall point outside the substation vicinity and the substation storm drainage must be connected to this point.
- o) The drainage scheme and associated drawings shall be got approved.

1.6. ROADS AND CULVERTS:

- a) Roads provided for access to equipment and building are in the scope of bidder. Layout of the roads shall be based on General detail & Arrangement Drawing. Parking areas, shall be provided for site personnel and visitors at convenient locations. Adequate turning space for vehicles shall be provided and bend radii shall be set accordingly. Road to the Transformer/Reactors shall be as short and straight as possible.

- b) All roads be constructed so as to permit transportation of all heavy equipment. The single lane road shall have minimum. 5.5 m black topping with 1.5m wide shoulder on either side of the road.
- c) Finished top (crest) of roads shall be 600mm (min) above the surrounding grade level (Formation level)
- d) Road construction shall be as per IRC standards.
- e) Adequate provision shall be made for road drainage.
- f) All the culverts and its allied structure (required for road/rail. Drain trench crossings etc.) shall be designed for class AA loading and checked for Class A loading as per IRC standard.
- g) All roads shall be designed as per the relevant IRC codes.

1.7. CHAIN LINK FENCES AND GATE

1.7.1. General

Tenderer to furnish the layout for the area and proposal for fencing to the requirement of BTDA for approval.

1.7.2. Areas requiring fencing

Fencing area accommodating the installations such as CA sites, Parks, Jack-well, Nalla/ Primary Drains/ Canal, Pump house, substation, portion of Raising main including the manifold shall be provided with suitable fencing with gate arrangement. It shall be graded/levelled suitably.

Wherever necessary anti-reptile fixtures/arrangement shall be provided along with fencing.

1.7.3. Product Materials

1. The minimum requirements are as follows.:
 - a) Chain link fence fabric in accordance to IS-2721
 - b) Size of mesh :75mm
 - c) Size of coated wire :3.15 mm dia
 - d) Width of chain link : 2400mm
 - e) Class of zinc coating : medium

2. Posts

Angle section	Spacing mm
Intermediate	1.45 x 45 x 6 2500
Straining posts	1.65 x 65 x 6 25000
Stay post	1.45 x 45 x 6 2500

All structural steel shall conform to IS:2062 and shall be painted with a coat of approved steel primer and two coats of synthetic enamel paint.

The chain link fabric shall be fixed to the post at the top and bottom of the fence by welding / fixing 50mm MS flat all through its length.

3. Fencing shall be either of galvanized barbed tape or of galvanized barbed barbed wire, 6 strands barbed tape shall conform to IS:1730 . Barbed wire shall conform to IS:278.

The barbed wire shall consist of two splices per reel. The barbed wire shall be formed by twisting two line wires, one containing the barbs,. The barbed wire shall be of 12 SWG galvanized steel with its weight 155-136 gm/m length of the wire. Distance

between two barbs shall be 75mm. The barbs shall carry four points and shall be formed by twisting two points wires, each two turn tightly round one line wire, making altogether 4 complete turn. The barbs shall be finished in such a way that the four points are set and locked at right angles to each other. The barbs shall have a length of not less than 13 mm and not more than 18mm. The points shall be sharp and well pointed.

4. Above chain link, 3-rows (6 Nos) of barbed tape/wire shall be provided in each arm of the Y shaped barbed arm at top. With barbed tape/wire above the chain link fence, the total fence height shall be minimum 3000mm above finished gravel level.
5. Barbed tape/wire same as intermediate and straining post.
6. Fasteners: single strand aluminum or galvanized steel wire conforming to requirements for fence fabric 4mm diameter.
7. Tension wire: single strand, high tensile, galvanized steel wire 4mm dia.
8. Fittings and hardware: cast aluminum alloy or galvanized steel, malleable or ductile cast iron, turn buckles to be drop forged.
9. For every 50 reels or part thereof samples of the barbed tape/wire and the individual line wires shall be put to tensile test and in case of failure to conform to the tensile properties given below, two additional tests of each kind shall be made on the samples cut from other reels.

1.7.4. Tensile Properties

Breaking load of line wire: Minimum 216 Kg / Maximum 302 kg.

Minimum breading load of complete barbed wire/tape: 444 Kg.

On the results of these additional tests, the whole or portion of the barbed wire/tape shall be accepted or discarded by the BTDA as the case may be.

1.7.5. Installation

- a) Fence shall be installed along lines shown on approved drawings.
- b) Post holes shall be excavated by approved methods.
- c) Intermediate posts shall be spaced 2.5m apart measured parallel to ground surface.
- d) Straining posts shall be installed at equal intervals not exceeding 25.00m.
- e) Straining posts shall be installed at sharp changes in grade, at corners at change of direction and where directed.
- f) All corner post will have two stay post and every tenth post will have a transverse stay post.
- g) Posts shall be set in concrete. Concrete work shall conform to relevant clause. Posts shall be braced and held in plumb position and true alignment and elevation until concrete has set.
- h) Fence fabric shall not be installed until concrete has cured a minimum of 5 days.
- i) Bottom and top of the fence fabric shall be fixed with MS flats of 50 mm x 6 mm (Min)
- j) Fence fabric shall be laid out with barbed edge on top, stretched tightly and shall be fastened to intermediate, gate and straining post with 50 mm x 6 flats.
- k) Fabric shall be secured to tension wires with tie wires at 400 mm intervals. Tie wires shall be given not less than two twists

- l) Barbed tape shall be spliced with standard wire splices.
- m) Barbed tape shall be stretched to have uniform tension.
- n) Barbed tape shall be attached to barbed wire arms with approved metal clips.
- o) Gates shall be installed in locations shown on drawings. Next to the main gate, a men gate (1.24m wide, single leaf) shall also be provided.
- p) Bottom of gates shall be set approximately 40 mm above ground surface and necessary guiding mechanism shall be fitted.
- q) A 345/380 mm thick (one and a half brick size) toe wall of Brick/Rubble masonry or concrete with notches shall be provided below all fencing and shall be minimum 200 mm above and 500mm below finished ground level. All exposed surfaces of brick toe wall shall be provided with 15mm 1:6 cement sand plaster and coated with two coats of water proofing cement paint. In case of rubble masonry is provided suitable pointing shall be done.

1.7.6. Gates

- a) The Gate frame shall be made of medium duty MS pipe conforming to relevant IS with welded joints.
- b) The gates shall be fabricated with welded joints to achieve rigid connections. The gate frames shall be painted with one coat of approved steel primer and two coats of synthetic enamel paint.
- c) Gates shall be fitted with approved quality iron hinges, latch and latch catch. Latch and latch catch shall be suitable for attachment and operation of pad lock from either side of gates. Hinges shall permit gates to swing through 180 degree back against fence.
- d) Gates shall be fitted with galvanized chain hook or gate hold back to hold gates open. Double gates shall be fitted with centre rest and drop bolt to secure gates in closed.

1.8. BUILDINGS- GENERAL REQUIREMENTS

1.8.1. General

The scope includes the design, engineering and construction of building including sanitary, water supply, electrification etc. The tentative layout showing the facilities to be provided for control room building is enclosed. The size and layout of the building may be modified as per requirements of SLD with the approval of the BTDA.

1.8.2. Dimensions

An open space of 1-m minimum shall be provided on the periphery of the rows of panels and equipment generally in order to allow easy operator movement and access as well as maintenance.

1.8.3. Design

- a) The buildings shall be designed:
 - 1) to the requirements of the National Building Code of India and the standards quoted therein.

- 2) for the specified climatic and loading conditions.
 - 3) to adequately suit the requirements of the equipment and apparatus contained in the buildings and in all respects to be compatible with the intended use and occupancy.
 - 4) with a functional and economical space arrangement.
 - 5) for a life expectancy of structure, systems and components not less than that of the equipment, which is contained in the building, provided regular maintenance is carried out.
 - 6) to be aesthetically pleasing. Different buildings shall show a uniformity and consistency in architectural design.
 - 7) to allow for easy access to equipment and maintenance of the equipment.
 - 8) with, wherever required, fire retarding materials for walls, ceilings and doors, which would prevent supporting or spreading of fire.
 - 9) with materials preventing dust accumulation.
- b) suitable expansion joints shall be provided in the longitudinal direction wherever, necessary with provision of twin columns.
 - c) Individual members of the buildings frame shall be designed for the worst combination of forces such as bending moment, axial force, shear force, torsion etc.
 - d) Permission stresses for different load combinations shall be taken as per relevant IS codes.
 - e) All cable vaults shall be located above ground levels i.e cable vaults shall not be provided as basements in the buildings.
 - f) The building lighting shall be designed in accordance with the requirements of relevant section.
 - g) The building auxiliary services like air conditioning and ventilation systems, fire protection and detection systems and all other miscellaneous services shall be designed in accordance with the requirements specified in relevant section or elsewhere in this specification.

1.8.4. Design Loads

Building structures shall be designed for the most critical combinations of dead loads, super-imposed loads, equipment loads, crane load, wind loads, seismic loads and temperature loads. In additions, loads and forces developed due to differential settlement shall also be considered.

Dead loads shall include the weight of structures complete with finishes , fixtures and partitions and should be taken as per IS:1911 (latest revision). Super-imposed loads in different areas shall include live loads, minor equipment loads, cable trays, small pipe racks/hangers and erection, operation and maintenance loads. Equipments loads shall constitute if applicable all load of equipments to be supported on the building frame.

For crane loads an impact factor of 30% and lateral crane surge of 10% (lifted weight + trolley) shall be considered in the analysis of frame according to provisions of IS:875 (latest revision). The horizontal surge shall be 5% of the static wheel load.

The wind loads shall be computed as per IS: 875, seismic co-efficient method shall be used for the seismic analysis as per IS: 1893 (latest revision).

For temperature loading, the total temperature variation shall be considered as 2/3 of the average maximum annual variation in temperature. The average maximum annual variation in temperature for the purpose shall be taken as the difference between the mean of the daily minimum temperature during the coldest month of the year and mean of daily maximum temperature during the hottest month of the year. The structure shall be designed to with stand stresses due to 50% of the total temperature variation.

Wind and seismic forces shall not be considered to act simultaneously.

Floors / slabs shall be designed to carry loads imposed by equipment , cables Piped travel of maintenance trucks and equipment and other loads associated with building. In general, floors shall be designed for live loads as per relevant IS and cable and Piped loads not less than 5 kN/sqm. Hanging from the underside.

In addition, beams shall be designed for incidental point loads of 20 kN to be applied at any point along the beams. The floor loads shall be subject to KBJNL approval.

For consideration of the loads on structure, IS:875 “code of practice for structural safety of building” shall be followed. The following minimum superimposed live loads shall, however, be considered for the design.

- | | | |
|---------------------------|-----------------------|---|
| a. Roof | 150kg/m ² | for accessible roofs |
| | 75 kg/m ² | for non-accessible roofs |
| b. RCC floors | 500 kg/m ² | for offices and minimum 1000 kg/m ² for
Equipment floors or actual requirement, if
Higher than 1000 kg/m ² based on equipment
Component weight and layout plans. |
| c. Stair and balconies | 500kg/m ² | |
| d. Toilet rooms | 200 kg/m ² | |
| e. Cheque-red plate floor | 400kg/m ² | |

1.8.5. Submission:

The following information shall be submitted for review and approval to the KBJNL.

1. Design criteria shall comprise the codes and standards used, applicable climatic data including wind loads, earthquake factors maximum and minimum temperatures applicable to the building locations, assumptions of dead and live loads, including equipment loads impact factors, safety factors and other relevant information.
2. Structural design calculations and drawing (including construction/fabrication) for all reinforces concrete and structural steel structures.
3. Fully, dimensioned floor plans, cross sections, longitudinal section and elevations of each building. These drawings shall be drawn at a scale not smaller than 1:50 and shall identify the major building components.

4. Fully dimensioned drawing showing details and sections drawn to scales of sufficient size to clearly show sizes and configuration of the building components and the relationship between them.
5. Product information of building components and materials, including walls, partitions, flooring, ceiling, roofing, door and windows and building finishes.
6. A detailed schedule of building finishes including colour schemes.
7. A door and window schedule showing door type and locations, door locks sets and latch sets and other door hardware. Approval of the above information shall be obtained before ordering materials or starting fabrication or construction as applicable.

1.9. CONTROL ROOM BUILDING:

Construction including anti termite treatment of control room building for associated switchyard shall be in the scope of the bidder. The control room building shall be of RCC framed structure of concrete M-20 grade. The minimum area required is shown in the drawings enclosed with the specification.

1.10. FINISHING SCHEDULE

The preliminary indicative finishing schedule is given in subsequent clauses. However, at the time of detailed engineering, the KBJNL reserves the right to alter the finishing schedule and specifications and such changes shall have no additional financial implication whatsoever to the BTDA

1.11. FLOORING

Pump House: The flooring shall be with mosaic tiles of superior quality which shall be got approved and executed as per relevant IS specification latest versions.

Flooring in various rooms of control room building shall be as under:

- a) Control room: 2mm thick PVC tiles over under bed of 50mm thick PCC 1:2:4
- b) Battery Room: Acid resistance tiles
- c) Front Lobby: Kota stone
- d) Office, Library etc: Terrazo flooring.
- e) Cable vault: I.P.S Flooring.

For all buildings, suitable arrangement for draining out water collected from equipment below down, leakages, floor washings, firefighting etc., shall be provided for each floor.

1.12. ROOFING

Pump House: The roof of pump house shall be with GI sheets mounted on trusses of superior quality which shall be got approved and executed as per relevant IS specification, latest versions.

1.13. MISCELLANEOUS GENERAL REQUIREMENTS

- a. Dense concrete with controlled water cement ratio preferable 0.45 shall be used for all underground concrete structures such as pump house. Tanks water rating structure, cable and pipe trenches etc. For achieving water tightness.

- b. All joints including construction and expansion joints for the water retaining structures shall be made watertight by using PVC ribbed water stops with general bulb. However, kicker type (externally placed) PVC water stops shall be used for the base slab and in other areas where it is required to facilitate concreting. The minimum thickness of PVC water stops shall be 5mm and minimum width shall be 230mm.
- c. All steel sections and fabricated structures which are required to be transported on sea shall be provided with anti-corrosive paint to take care of seaworthiness.
- d. All mild steel parts used in the water retaining structures shall be hot-dip galvanized, the minimum coating of the zinc shall be hot-dip galvanized. The minimum coating of the zinc shall be 750 gm/sq. for galvanized structures and shall comply with IS: 2629 and IS:2633. Galvanizing shall be checked and tested in accordance with IS:2629. The galvanizing shall be followed by the application of an etching primer and dipping in black bitumen in accordance with BS:3416.
- e. A screed concrete layer not less than 100mm thick and of grade not weaker than M10 conforming to IS:456-1978 shall be provided below all water retaining structures. A sliding layer of bitumen paper or craft paper shall be provided over the screed layer to destroy the bond between the screed and the base slab concrete of the water retaining structures.
- f. Bricks having minimum 75 kg/cm² compressive strength can only be used for masonry work. Bidder shall ascertain himself at site regarding the availability of bricks of minimum 75 kg/cm² compressive strength before submitting his offer.
- g. Monorails, monorail girders and fixtures shall be provided wherever required.
- h. Doors and windows on external walls of the buildings (other than areas provided with insulated metal claddings) shall be provided with RCC sun-shade over the openings with 300mm projection on either side of the openings. Projection of sunshade from the wall shall be minimum 450mm over window openings and 750mm over door openings.
- i. Stairs shall have maximum riser height of 150mm and minimum tread width of 300mm. Minimum width of the stairs shall be 1500mm.
- j. Angles 50x50x6 mm (minimum) with lugs shall be provided for edge protection all around cut outs/openings in floor slab. Edges of drains supporting grating covers. Edges of RCC cable/pipe trenches supporting covers, edges of manholes supporting covers, supporting edges of precise cover and any other place where breakage of corners of concrete is expected.
- k. Anti-termite chemical treatment shall be given to column pits, wall trenches, foundations of buildings, filling below the floors etc, as per IS :6313 and other relevant Indian standard.
- l. Hand-railing minimum 900mm high shall be provided around all floor/roof openings projections/balconies, walk-ways, platforms, steel stairs etc. All handrails and ladder pipes shall be 32mm nominal bore MS pipes (medium class) and shall be galvanized (medium class as per IS:277). All rungs for ladder shall also be galvanized as per IS:277 medium class.

- m. For RCC stairs: Hard railing with 20mm square MS bars. Balustrades with suitable MS flats and aluminium handrails shall be provided.

1.14. INTERFACING:

The proper coordination and execution of all interfacing civil works activities like fixing of conduits in roofs/walls/floors. Fixing of foundation bolts. Fixing of lighting fixtures. Fixing of supports / embedment, provisions of cutouts etc shall be the sole responsibility of the contractor. He shall plan all such activities in advance and execute in such a manner that interfacing activities do not become bottlenecks and dismantling, breakage etc, is reduced to minimum.

1.15. WATER SUPPLY

The contractor shall be overall responsible for supply of water within switchyard for firefighting drinking purpose and other miscellaneous purposes water shall be made available at single point by the contractor by providing at least 1 bore points To scope is also inclusive of supply and erection of all tanks pipes. Fittings etc required for water supply to be taken from the terminal point to the respective buildings A scheme still be prepared by the contractor indicating the layout and details of water supply when shall be got approved by the owner before actual start of work. Any extra boreholes if required shall be within the scope of contractor.

1.16. STATUTORY RULES:

- 1 Contractor shall comply with all the applicable statutory rules pertaining to enquire act (as applicable for the sate). Fire safety rules of Tariff Advisory committees water act for pollution control etc.
- 2 Preventions for fireproof doors of staircases fire separately we plastering on structural members (in fire prone at case) etc., shall be made according to the recommendations of Tariff Advisory Committee.
- 3 Statutory clearance and norms of state pollution control board shall be showed as per Water Act for effluent quality from plant.
- 4 Requirement of sulfate resistant cement (SRC) for sub-structural works should decide in accordance with the Indian Standards based on the findings of the detailed investigation to be carried out by the Bidder
- 5 Foundation system adopted by Bidder shall ensure that relating settlement shall be as per provision in IS: 1904 and other Indian Standards
- 6 All water retaining structures designed as un-cracked section shall also be tested for water tightness at full water level in accordance with clause no 10 of 3370 (part-I).
- 7 Construction joints at the following locations shall be provided.
 - a) At the meeting points of the columns and the raft.
 - b) At the point of contra flexure in the columns.

Additional reinforcements and shear keys shall be provided at the construction joints.

- 8 All underground concrete structures like basements pumps. retaining structures etc. shall have plasticizer cum water proofing cement addition conforming to IS: 9103. In addition. Limit an permeability as given is IS: 2615 shall also be met with. The concrete surface of these structures in contact with earth shall also be provided with two coats of bituminous painting for water/damp proofing. In case of water leakage in the above structures. Injection method shall be applied for repairing the leakage.

SECTION - 7

DETAILED TECHNICAL SPECIFICATIONS

Attached seperately

SECTION – 8

DRAWINGS

DRAWINGS ARE ATTACHED SEPARATELY

SECTION - 9

Bill of Quantities

Name of Work: Design and Construction along with Operation & Maintenance for a Period of 05 Years for (1) Layout development and Infrastructure works consisting of Roads, Water Distribution, Ground Service Reservoirs, Sewer Network, Storm Water Drains , Power Supply System (HESCOM), ICT infrastructure system works, Chain link fencing for Parks / open areas, Tree plantation for Sector B, C & D and (2) Primary drains outside Unit-3 area, along with Sewage Pumping Stations (SPS) (including pumping machineries & pumping mains for all sectors) works for Navanagar- Unit 3 Area- Bagalakote- under Lumpsum Turnkey Contract

Sl. No.	Particulars	Unit	Qty
A	Chain Link Fencing, Tree Plantation, RCC Signs & Sector Boards		
1	Chain Link Fencing for Parks & CA site: Design and Construction including Carrying out necessary survey, Investigations, of Chain Link fencing for boundaries of Parks & Civic Amenities sites with 1.5m height, MS Poles at regular intervals, including fixing (2 numbers for each parks / open space) of MS gate of size 1.5m x 2.5m, including earth work, foundation, painting, etc., Item complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of Engineer in charge. This includes disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge	Km	2268.00
2	Tree Plantation in Roads, Parks & CA sites Planting of trees by the road side (Avenue trees), Parks & Civic Amenities sites in 0.60 m dia holes, 1 m deep dug in the ground, mixing the soil with decayed farm yard/sludge manure, planting the saplings, backfilling the trench, watering, fixing the tree guard and maintaining the plants for one year complete as per MORTH Specification No. 307. Item complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of Engineer in charge. This includes disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge	Nos.	2041.00
3	RCC Sign Boards Design, Construction, Supply and Fixing of RCC sign boards for indicating the cross roads details, including excavation in all kinds of soil, foundation, painting, finishing etc., Item complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of Engineer in charge. This includes disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge	Each	329.00

Sl. No.	Particulars	Unit	Qty
4	Sector Boards Design, Providing & fixing the "VITREOUS ENAMEL" (All Weather Proof) long lasting Porcelain Base, Ceramic Coated SECTOR BOARD made out of 16 guage thick CRCA mild steel sheet and Enamelled in Blue & Yellow background with Yellow & Blue letters and numbers with specified matter in English / Kannada with BTDA's logo in Red colour, as per approved enclosed drawing. Provided with Rust Proof Galvanised Square Tube Frame of size 38 x 38 x 2mm thick backside of the board all around and fitted with anti-corrosive screws with Rust Proof Galvanised Supporting Pipe of size 50mm dia x 10 feet long of 2 nos. per board, fitted with Stainless steel nut, bolt and washers. Size: 1500 mm x 1000 mm. including excavation in all kinds of soil, foundation, painting, finishing etc., Item complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of Engineer in charge. This includes disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge	Each	20.00
B	Road Works		
5	Construction of New Roads of 9m ROW - Flexible Pavement Design & Construction including Carrying out necessary survey, Investigations of 9 m ROW Local street of Intermediate lane with asphalted road of Carriageway 5.5 m wide, along with Interlocking paver blocks of minimum 75mm thick (M-30 grade) for Utility corridor with necessary sub base and base layers as per design as shown in the typical cross sections. Main carriageway to be designed for minimum 5 MSA and for a design speed of 30 km per hour, with design life of 20 years, including development of all junctions, bell mouth, pedestrian crossings with installation of traffic signboards at required places, Studs, road marking, grading, cutting, filling etc., complete as per MORTH -Vth Revision 2013 and IRC 37-2018, SP-63-2018, and other relevant codes including excavation in all kinds of soil, painting, finishing etc., Item complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of Engineer in charge. This also includes Utility crossings provisions at every 50m intervals with Paver blocks of 75mm thick etc., complete. This includes disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge	Km	16.29

Sl. No.	Particulars	Unit	Qty
6	Construction of New Roads of 12m ROW - Flexible Pavement Design & Construction including Carrying out necessary survey, Investigations of 12 m ROW Local street of Two lane with asphalted road of Carriageway 7.0m wide, along with Interlocking paver blocks of minimum 75mm thick (M-30 grade) for Utility corridor with necessary sub base and base layers as per design as shown in the typical cross sections. Main carriageway to be designed for minimum 5 MSA and for a design speed of 30 km per hour, with design life of 20 years, including development of all junctions, bell mouth, pedestrian crossings with installation of traffic signboards at required places, Studs, road marking, grading, cutting, filling etc., complete as per MORTH -Vth Revision 2013 and IRC 37-2018, SP-63-2018, and other relevant codes, including excavation in all kinds of soil, painting, finishing etc., Item complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of Engineer in charge. This also includes Utility crossings provisions at every 50m intervals with Paver blocks of 75mm thick etc complete. This includes disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge	Km	12.69
7	Construction of New Roads of 18 m ROW - Rigid Pavement Design & Construction including carrying out necessary survey, Investigations of 18m ROW Collector street of 2 lane with 1m paved shoulder with M-40 grade Pavement Quality Concrete road. Main carriageway to be designed for minimum 450 Commercial Vehicles per Day (CVPD) and for a design speed of 40 km per hour and design life of 30 years. Carriageway 9m wide, 1.0m wide green buffer between main carriageway and footpath on both sides, 3.5 m wide cycle track cum pedestrian pathway on either side of the carriageway. Along with Interlocking paver blocks of minimum 75mm thick (M-30 grade) for Cycle Track & Footpath with necessary sub base and base layers as per design as shown in the typical cross sections including development of all junctions, bell mouth, pedestrian & cycle crossings, property entry and exits ramps constructed in RCC with installation of traffic signboards at required places, Studs, Tabletop crossings, road marking, grading, cutting, filling, construction of double row cable cross duct with RCC NP 3 pipes of 300mm dia at 100m interval etc., including kerbs and Tactile pavers on both sides of the road complete as per MORTH -Vth Revision 2013 and IRC SP-62-2014, IRC 37-2018, SP-63-2018, IRC-58-2015 and other relevant codes. Item complete in all respect to the satisfaction of Engineer in charge, including excavation in all kinds of soil, painting, finishing etc., Item complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of Engineer in charge. This includes disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge	Km	3.37

Sl. No.	Particulars	Unit	Qty
8	Construction of New Roads of 25 m ROW - Rigid Pavement Design & Construction including Carrying out necessary survey, Investigations of 25m ROW Collector street of 4 lane divided carriageway M-40 grade Pavement Quality Concrete road with median of 1m and Carriageway 14m wide, 1.0m wide green buffer between main carriageway and footpath on both sides, 2m wide cycle track and 2m wide footpath on both sides, main carriageway to be designed for minimum 450 Commercial Vehicles per Day (CVPD) and for a design speed of 40 km per hour and design life of 30 years, along with Interlocking paver blocks of minimum 75mm thick (M-30 grade) for Cycle Track & Footpath with necessary sub base and base layers as per design as shown in the typical cross sections including development of all junctions, bell mouth, pedestrian & cycle crossings, property entry and exits ramps constructed in RCC with installation of traffic signboards at required places, Studs, Tabletop crossings, road marking, grading, cutting, filling, construction of double row cable cross duct with RCC NP 3 pipes of 300mm dia at 100m interval etc., including kerbs and Tactile pavers on both sides of the road complete as per MORTH – Vth Revision 2013 and IRC SP-62-2014, IRC 37-2018, SP-63-2018, IRC-58-2015 and other relevant codes. Item complete in all respect to the satisfaction of Engineer in charge, including excavation in all kinds of soil, painting, finishing etc., Item complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of Engineer in charge. This includes disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge	Km	1.44
9	Construction of New Roads of NMT (Pathway cum Cycle Track) - Rigid Pavement Design & Construction including Carrying out necessary survey, Investigations of Non Motorised Transport Corridor (NMT) of 6m ROW , which consists of 4m wide cycle track and 2m wide footpath, Cycle track paved with Plain Cement Concrete (M-30), with design life of 30 years and footpath with 75mm thick Interlocking concrete paver blocks with necessary sub base & base layers as per design as shown in the typical cross sections. Also, the Cycle track shall be coated with Green / Red colour Cold plastic paint, with concrete bollards, bicycle stand hoops, etc., including development of all junctions, bell mouth, pedestrian crossings with installation of traffic signboards at required places, road marking, grading, cutting, filling etc., complete as per MORTH –Vth Revision 2013 and IRC SP-62-2014, SP-63-2018, IRC 35-2015, and other relevant codes. including excavation in all kinds of soil, painting, finishing etc., Item complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of Engineer in charge. This includes disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge	Km	3.79

Sl. No.	Particulars	Unit	Qty
10	Construction of New Roads of (18+6) m ROW - Rigid Pavement Design & Construction including Carrying out necessary survey, Investigations of (18+6)m ROW Collector street (18m is 4 lane divided carriageway, whereas 6m indicated is for NMT corridor) which is 4 lane divided carriageway M-40 grade Pavement Quality Concrete road with median of 0.5m and Carriageway 14m wide, 2m wide cycle track and 1.5m wide footpath on one side, main carriageway to be designed for minimum 450 Commercial Vehicles per Day (CVPD) and for a design speed of 40 km per hour and design life of 30 years, (NMT consists of 4m wide cycle track and 2m wide footpath, Cycle track paved with Plain Cement Concrete (M-30), with design life of 30 years and footpath with 75mm thick Interlocking concrete paver blocks with necessary sub base & base layers as per design as shown in the typical cross sections. Also, the Cycle track shall be coated with Green / Red colour Cold plastic paint, with concrete bollards, bicycle stand hoops, etc.) including development of all junctions, bell mouth, pedestrian & cycle crossings, property entry and exits ramps constructed in RCC with installation of traffic signboards at required places, Studs, Tabletop crossings, road marking, grading, cutting, filling, construction of double row cable cross duct with RCC NP 3 pipes of 300mm dia at 100m interval etc., including kerbs and Tactile pavers on both sides of the road complete as per MORTH -Vth Revision 2013 and IRC SP-62-2014, IRC 37-2018, SP-63-2018, IRC-58-2015 and other relevant codes. Item complete in all respect to the satisfaction of Engineer in charge, including excavation in all kinds of soil, painting, finishing etc., Item complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of Engineer in charge. This includes disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge	Km	1.23
11	Site Grading - Clearing & Grubbing, cutting of hilly terrains, site grading including Carrying out necessary survey, of open areas to match the plot & open area levels with the Finished Road Levels, Item complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of Engineer in charge.	Per Acres	234.27

Sl. No.	Particulars	Unit	Qty
12	Rehabilitation of Existing Roads of 9 m ROW Design & Re-Construction including Carrying out necessary survey, Investigations of existing 9m ROW Local street which is Intermediate lane with asphalted road of Carriageway 5.5 m wide, along with Interlocking paver blocks of minimum 75mm thick (M-30 grade) for Utility corridor with necessary sub base and base layers as per design as shown in the typical cross sections. Main carriageway to be designed for minimum 5 MSA and for a design speed of 30 km per hour, with design life of 20 years, including development of all junctions, bell mouth, pedestrian crossings with installation of traffic signboards at required places, road marking, grading, cutting, filling etc., complete as per MORTH –Vth Revision 2013 and IRC 37-2018, SP-63-2018, and other relevant codes including excavation in all kinds of soil, painting, finishing etc., Item complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of Engineer in charge. This also includes Utility crossings provisions at every 50m intervals with Paver blocks of 75mm thick etc., complete. This includes disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge.	Km	0.12
13	Rehabilitation of Existing Roads of 12 m ROW Design & Re-Construction including Carrying out necessary survey, Investigations of existing 12m ROW Local street which is Intermediate lane with asphalted road of Carriageway 7.0 m wide, along with Interlocking paver blocks of minimum 75mm thick (M-30 grade) for Utility corridor with necessary sub base and base layers as per design as shown in the typical cross sections. Main carriageway to be designed for minimum 5 MSA and for a design speed of 30 km per hour, with design life of 20 years, including development of all junctions, bell mouth, pedestrian crossings with installation of traffic signboards at required places, road marking, grading, cutting, filling etc., complete as per MORTH –Vth Revision 2013 and IRC 37-2018, SP-63-2018, and other relevant codes including excavation in all kinds of soil, painting, finishing etc., Item complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of Engineer in charge. This also includes Utility crossings provisions at every 50m intervals with Paver blocks of 75mm thick etc., complete. This includes disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge.	Km	0.10

Sl. No.	Particulars	Unit	Qty
14	Rehabilitation of Existing Main Roads of 24 m ROW (Whitetopping) Design & Re-Construction including Carrying out necessary survey, Investigations of existing 24m ROW at excavated portion (excavated due to laying of utilities) with necessary sub base & base layers and providing the Whitetopping overlay (M-40 grade of concrete) to entire width of carriageway with required profile correction through milling and laying of Bituminous macadam (BM). It is a 4 lane divided carriageway road with median of 1m and Carriageway 14m wide, 1.0m wide green buffer between main carriageway and footpath on both sides, 3.5m wide cycle track cum footpath on both sides, of which main carriageway to be designed for minimum 1000 CVPD (and as per the traffic surveys & investigations) and a design speed of 40 km per hour, along with Interlocking paver blocks of minimum 75mm thick (M-30 grade) for Cycle Track & Footpath with necessary sub base and base layers as per design as shown in the typical cross sections including development of all junctions, bell mouth, pedestrian & cycle crossings, property entry and exits ramps constructed in RCC with installation of traffic signboards at required places, Studs, Tabletop crossings, road marking, grading, cutting, filling, construction of double row cable cross duct with RCC NP 3 pipes of 300mm dia at 100m interval etc., including kerbs and Tactile pavers on both sides of the road complete as per MORTH –Vth Revision 2013 and IRC SP-76-2015, IRC-58-2015, IRC 37-2018, SP-63-2018, and other relevant codes, Item complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of Engineer in charge. including excavation in all kinds of soil, painting, finishing etc., Item complete in all respect to the satisfaction of Engineer in charge. This includes disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge	Km	2.29

Sl. No.	Particulars	Unit	Qty
15	Rehabilitation of Existing Main Roads of 25 m ROW (Whitetopping) Design & Re-Construction including Carrying out necessary survey, Investigations of existing 25m ROW at excavated portion (excavated due to laying of utilities) with necessary sub base & base layers and providing the Whitetopping overlay (M-40 grade of concrete) to entire width of carriageway with required profile correction through milling and laying of Bituminous macadam (BM). It is a 4 lane divided carriageway road with median of 1m and Carriageway 14m wide, 1.0m wide green buffer between main carriageway and footpath on both sides, 2m wide cycle track and 2m wide footpath on both sides, of which main carriageway to be designed for minimum 1000 CVPD (and as per the traffic surveys & investigations) and a design speed of 40 km per hour, along with Interlocking paver blocks of minimum 75mm thick (M-30 grade) for Cycle Track & Footpath with necessary sub base and base layers as per design as shown in the typical cross sections including development of all junctions, bell mouth, pedestrian & cycle crossings, property entry and exits ramps constructed in RCC with installation of traffic signboards at required places, Studs, Tabletop crossings, road marking, grading, cutting, filling, construction of double row cable cross duct with RCC NP 3 pipes of 300mm dia at 100m interval etc., including kerbs and Tactile pavers on both sides of the road complete as per MORTH –Vth Revision 2013 and IRC SP-76-2015, IRC-58-2015, IRC 37-2018, SP-63-2018, and other relevant codes, Item complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of Engineer in charge. including excavation in all kinds of soil, painting, finishing etc., Item complete in all respect to the satisfaction of Engineer in charge. This includes disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge	Km	1.00

Sl. No.	Particulars	Unit	Qty
16	Rehabilitation of Existing Main Roads of 30 m ROW (Whitetopping) Design & Re-Construction including Carrying out necessary survey, Investigations of existing 30m ROW at excavated portion (excavated due to laying of utilities) with necessary sub base & base layers and providing the Whitetopping overlay (M-40 grade of concrete) to entire width of carriageway with required profile correction through milling and laying of Bituminous macadam (BM). It is a 6 lane divided carriageway road with median of 1m and Carriageway 21m wide, 1.0m wide green buffer between main carriageway and footpath on both sides, 3.5m wide cycle track cum footpath on both sides, of which main carriageway to be designed for minimum 1000 CVPD (and as per the traffic surveys & investigations) and a design speed of 60 km per hour, along with Interlocking paver blocks of minimum 75mm thick (M-30 grade) for Cycle Track & Footpath with necessary sub base and base layers as per design as shown in the typical cross sections including development of all junctions, bell mouth, pedestrian & cycle crossings, property entry and exits ramps constructed in RCC with installation of traffic signboards at required places, Studs, Tabletop crossings, road marking, grading, cutting, filling, construction of double row cable cross duct with RCC NP 3 pipes of 300mm dia at 100m interval etc., including kerbs and Tactile pavers on both sides of the road complete as per MORTH -Vth Revision 2013 and IRC SP-76-2015, IRC-58-2015, IRC 37-2018, SP-63-2018, and other relevant codes, Item complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of Engineer in charge. including excavation in all kinds of soil, painting, finishing etc., Item complete in all respect to the satisfaction of Engineer in charge. This includes disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge	Km	0.77
C	Storm Water		
17	Design and Construction including Carrying out necessary survey, Investigations of RCC box drain of all sizes varying between 0.5m x 0.5m to 4.0m x 2.5m in all Row Roads, and exclusively with Grit chambers / silt trap at every 5m intervals for roads with RoW 18m and above, including all culverts, necessary crossing (Roads, railway, canal etc). The work includes excavations in all type of soils, back filling, Horizontal drilling, in this package . The designs shall be carried out as per IRC/ CPHEEO standards, Item complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of Engineer in charge. This includes dismantling and disposal of existing drains and disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge	Km	74.93

Sl. No.	Particulars	Unit	Qty
18	Design and Construction including Carrying out necessary survey, Investigations of Recharge Pits of 50m depth with perforated PVC pipes with granular layers, Item complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of Engineer in charge.	Each	25.00
19	Design and Construction of RCC Electrical utility trench of inner width 0.6m x 0.9m along the side of RCC drain wall. with removable cover slabs including excavation in all kinds of soil, PCC, shuttering, edge angles, lifting hooks, etc complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of engineer in charge. For further details bidders should refer tender drawings and various technical schedules of tender document. This includes dismantling and disposal of existing network and disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge.	Km	60.95
D	Water Supply		
20	Design, survey, Investigations, supply, laying, joining testing and commissioning of water distribution system (HDPE-100, PN-8 material) (gravity System) of pipe diameters varying from 90mm to 600mm dia and DI-K9 (material) for diameter equal and more than 250mm- HDPE pipe shall be used and for higher dia- DI-K9 pipe shall be used. this includes laying of parallel pipes line of 90mm dia for pipe diameters more than 350mm dia. All design and constructions shall be carried out as per the relevant IS codes and CPHEEO manual. The work includes excavations in all type of soils, laying and back filling with providing and installation of bends, Tees, reducers, Sluice valves with extension spindles, Air valves, Scour valves, construction of RCC chambers with covers and frame, construction of RCC pedestals, Anchor blocks, thrust block with all necessary crossing (Roads, railway, canal, nala etc) be complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of engineer in charge. This includes dismantling and disposal of existing network and disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge	KM	74.04
21	Design, supply, laying, joining testing and commissioning of Water supply House Service connections with HDPE electrofusion saddle traps / DI saddle straps, including all necessary bends, compression fittings, end caps drain and electrical utility crossing using GI pipe encasements as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of engineer in charge. This includes dismantling and disposal of existing network and disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge- at 4 locations with various capacities as per designs	No	3931.00
E	Sewerage		

Sl. No.	Particulars	Unit	Qty
22	Design, survey, Investigations, supply, laying, joining testing and commissioning of Waste water collection System (DWC and RCC-NP-3 MATERIAL) of pipe diameters varying from 150 mm to 700 mm dia with RCC Precast manhole with SFRC covers and frames as per CPHEEO Manual. this includes laying parallel pipes of 150mm dia for pipe diameters more than 300mm. The work includes excavation in all types of soil, Shoring, shuttering, bedding, laying of pipes, encasement, design and construction of manholes, drop manholes, vent shafts. with all necessary crossing (Roads, railway, canal, nala etc) complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of engineer in charge. For further details bidders should refer tender drawings and various technical schedules of tender document. This includes dismantling and disposal of existing network and disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge.	Km	47.41
23	Design, Construction of HOUSE SERVICE CONNECTION with chambers in RCC of 0.5m X 0.5m with necessary Storm Drain and electrical utility crossing and making connection to the main sewer line, including all necessary bends, and electrical utility crossing using concrete encasements as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of engineer in charge. . This includes dismantling and disposal of existing network and disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge- at 4 locations with various capacities as per designs.	Each	5,646
24	Design (aesthetically), survey, Investigations, supply, laying, joining testing and construction of Wet Well cum pumping stations including SPS Layout, Compound walls with internal infrastructure works such as site grading, Roads (3.5m wide), Storm water drains, water and waste water connections, streetlighting and security systems etc (CCTV camera surveillance) , with Electrical Panel Room, Twin operator quarters, DG room, ICT infrastructures, Inlet and screening arrangements, with necessary Electro - Mechanical equipments, complete in all respect as per Technical Schedule, Technical Specification & Tender drawing and to the satisfaction of engineer in charge. For further details bidders should refer tender drawings and various technical schedules of tender document. This includes dismantling and disposal of existing network and disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge. of following Peak flow capacities		
a	SPS-1, 5.565 MLD (Sector-A)	No	1
b	SPS-2, 17.22 MLD (Sector -C)	No	1
c	SPS-3, 9.71 MLD (Sector -F)	No	1
d	SPS-4, 2.867 MLD (Sector -F)	No	1

Sl. No.	Particulars	Unit	Qty
e	SPS-5, 0.092 MLD (Sector -H)	No	1
f	SPS-6, 2.274 MLD (Sector -G)	No	1
g	SPS-7, 12.043 MLD (Sector-K)	No	1
25	Design, survey, Investigations, supply, laying, joining, testing and commissioning of waste water Transmission system (pumping System) of pipe diameters varying from 140 mm to 600mm dia and for pipedia less than 300mm - HDPE- PE10- PN 100 shall be used and DI-K9 (material) for diameter more than 300mm shall be used. All design and constructions shall be carried out as per the relevant IS codes and CPHEEO manual. The work includes excavations in all type of soils, laying and back filling with providing and installation of bends, Tees, Sluice valves, Scour valves, construction of RCC chambers with covers and frame, construction of RCC pedestals, Anchor blocks, thrust block with all necessary crossing (Roads, railway, canal, nala etc) , including connection to the existing / proposed Sewage pumping stations and STP, complete in all respect as per Techincal Schedule, Technical Specificaliton & Tender drawing and to the satisfaction of engineer in charge. This includes dismantling and disposal of existing network and disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge	Km	16.26
F	Information and Communication Technology		
26	Designing, construction, testing of commissioning of HDPE- 7- Way 40mm Multi Duct pipe of 120mm dia , complete in all respect as per Techincal Schedule, Technical Specificaliton & Tender drawing and to the satisfaction of engineer in charge. For further details bidders should refer tender drawings and various technical schedules of tender document. This includes dismantling and disposal of existing network and disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge.	Km	94.92
27	Design and construction of RCC OFC Chamber of size 1.m x 1m with removable cover slabs including excvation in all kinds of soil, PCC, shuttering,edge angles, lifting hooks, etc complete in all respect as per Techincal Schedule, Technical Specificaliton & Tender drawing and to the satisfaction of engineer in charge. For further details bidders should refer tender drawings and various technical schedules of tender document. This includes dismantling and disposal of existing network and disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge.	Each	1508.00
G	Reconstruction of Nalla & Bridges out side Unit-3 area		

Sl. No.	Particulars	Unit	Qty
28	Design and Construction of Retaining walls, for Rehabilitation and reconstruction of Primary drains outside Unit-3 project boundary leading to Ghataprabha River or Back waters of Alamatti Dam including excvation in all kinds of soil, PCC, shuttering,edge angles, lifting hooks, etc complete in all respect as per Techincal Schedule, Technical Specificaliton & Tender drawing and to the satisfaction of engineer in charge. For further details bidders should refer tender drawings and various technical schedules of tender document. This includes dismantling and disposal of existing network and disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge.	Km	19.14
29	Design and Construction of culverts / bridge TYPE-1, including chain link fencing for Rehabilitation and reconstruction of Primary drains outside Unit-3 project boundary leading to Ghataprabha River or Back waters of Alamatti Dam including excvation in all kinds of soil, PCC, shuttering,edge angles, lifting hooks, etc complete in all respect as per Techincal Schedule, Technical Specificaliton & Tender drawing and to the satisfaction of engineer in charge. For further details bidders should refer tender drawings and various technical schedules of tender document. This includes dismantling and disposal of existing network and disposal of BC soil and other debris if any upto a lead of 10KM as per the directions of Engineer In Charge.	Nos.	8.00
H	Electrical Works		
30	Street Lightning works - as per the HESCOM's specifications and quantities as mentioned in the Section-6 Clause 3.9.4 of Contract Data	Lumpsum / Complete job	
31	HESCOM works under self execution & labour component - as per the HESCOM's specifications and quantities as mentioned in the Section-6 Clause 3.9.3 of Contract Data		
32	Design and drawings, including submission of Good for construction (GFC) drawings		
33	Operation & Maintenance (O&M) cost - 5 Years for Civil Works		

SECTION - 10

FORMS OF BANK GUARANTEE AND OTHER FORMATS

SECTION 10: FORMS OF SECURITIES

FORM OF SECURITIES

REVISED MODEL FORM OF BANK GUARANTEE BOND

In consideration of the Bagalakote Town Development Authority ., (herein after called “the BTDA”) having agreed to exempt _____(herein after called the said contractor(s) from the demand, under the terms and conditions of an Agreement said dated _____ made between _____ (herein after called the said agreement) of security deposit for the due fulfillment by the said contractor(s) of the terms and conditions contained in the said agreement on productions of a Bank Guarantee for Rs. _____ (Rupees _____ only)

1. “We _____(indicate the name of the bank) (Herein after referred to as “ the Bank” the request of contractor(s) do hereby undertake to pay to the BTDA an amount not exceeding Rs. _____ against any loss or damage caused to or suffered or would be caused to or suffered by the BTDA by reason for any breach by the said contractor(s) of any of any of the terms or conditions contained in the said agreement.
2. We _____(indicate the name of bank) do hereby undertake to pay the amounts due and payable under this guarantee without any demur merely on a demand from the BTDA, stating that the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by the BTDA by reason breach by the said contractor(s) of the agreement or by reason of the contractor’s failure to perform the said agreement. Any such demand made on the bank shall be conclusive as regards the amount due and payable by the bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____(Rupees _____ only).
3. We undertake to pay BTDA any money so demanded notwithstanding any disputes raised by the contractor(s) supplier(s) in any suit or proceeding pending before any court or tribunal. Stating there to out liability under this present being absolute and unequivocal.
4. We _____(indicate the name of bank) further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said agreement and that it shall continue to be enforceable till the dues of the BTDA under or by virtue or said agreement have been fully paid and its claims satisfied or discharged for till _____office of BTDA, certifies out by the said contractors(s) and accordingly discharge this guarantee. Unless a demand or claims under this guarantee is made on us in writing on or before _____we shall be discharged from all liability under this guarantee thereafter.
5. We _____(indicate the name of the work) further agree with the BTDA, shall have the fullest liberty without our consent and without affecting in any manner our obligation hereunder to vary any of the terms and conditions of the

said agreement or to extend time of performance by the said contractor(s) from time to time or to postpone for any time from time to time any powers exercisable by the BTDA against the said contractor(s) and for bear or enforce any of the terms and conditions relating to the said agreement and we shall not be relieved from our liability by the reasons of any such variation /or extension being granted to the said contractor(s) or any forbearance act of omission on the part of the BTDA, or any indulgence by the BTDA to the said contractor(s) by any such matter or thing whatever which under the law relating to sureties would , but for this provision have effect of so relieving us.

6. This guarantee will not be discharged due to the change in the constitution of the bank or the contractor(s) / supplier(s).
7. We _____(indicate the name of the bank) lastly undertake not to revoke this guarantee during the currency except with previous consent of the BTDA in writing.

Dated _____ day of _____to
_____(indicate the name of the bank).

PROFORMA

BANK GUARANTEE EARNEST MONEY DEPOSIT

“In accordance with the provisions and conditions of Tender Notice for the work of _____”

Sri. _____ (name & Address of the Contractor) shall
deposit with the Executive Engineer, _____ Circle, _____ a
bank guarantee to guarantee his proper and faithful Performance under the said contract an
amount of (Amount of Guarantee) (in words) _____

We, the _____ (Bank or
Financial Institution) as requested by the contractor, agree unconditionally and irrevocably to
guarantee as primary obligatory and as surety merely, the payment to the
Executive Engineer, _____ Circle, _____ on his demand without what so ever
right of objection on our part and without his first claim to the Executive Engineer,
_____ Division, _____ for recovery of the whole or part of the
E.M.D from the contractor under the contract.

We further agree to change add to or other modifications of the forms of the contract
or of works to be performed there under or of any of the contract document which may be
made between the Executive Engineer, _____ Circle,
_____ and the contractor shall in any way release us from any liability under this
guarantee and we here by waive notice of any such change, addition or modification.

The Conditions of this obligation are:-

- (1) If after Tender opening the Tenderer withdraws or modifies his Tender during the
period of Tender validity specified in the Form of Tender.
- (2) If the Tenderer having been notified of the acceptance of his Tender by the
Department during the period of validity.
 - (a) fails or refuses to execute the Form of Contract in accordance with the
Instructions to Tenderers, if required; or
 - (b) fails or refuses to furnish the balance EMD and additional performance Security
in accordance with the instructions of Tenderers.

We undertake to pay to the Department up to the above amount upon receipt of
his first written-demand, without the Department having to substantiate his
demand, provided that in his demand the Department will note the amount
claimed by him is due to him owing to the occurrence of one or both of the two
Conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date * *
after the dead line for submission of Tenders as such deadline is stated in the
Instructions to Tenders or as it may be extended by the Department, notice of
which extension(s) to the Bank is hereby waived. Any demand in respect of this
Guarantee should reach the Bank not later than the above date.

Yours truly,

Signature & Seal
(Name of the Bank)

WITNESS SEAL
..... (Signature, Name
and Address)
.....

- * The Tenderers should insert the amount of the EMD in words and figures
denominated in Indian Rupee. This figure should be the same as shown in the NIT.
- ** 6 months from the deadline date for submission of Tender [As specified in NIT].

PROFORMA

BANK GUARANTEE FOR BALANCE "E.M.D."

_____ (name &Address of Department)

WHEREAS _____
_____ (name and address of Contractor) (hereinafter called "the Contractor") has undertaken, in pursuance of Contract No. _____ dated :
_____ to execute the work of _____ [name of work]

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a Nationalized / Public Sector banks for the sum specified therein as balance EMD / EMD for compliance with his obligations in accordance with the Contract;

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee;

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on _____ behalf of the Contractor, up to a total of _____ [amount of guarantee] _____ [in words], such sum being payable and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of _____ [amount of guarantee] as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

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

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

This guarantee shall be valid uptoi.e., until 30 days from the date of expiry of the Defects Liability period.

Signature & seal of the
Guarantor _____
Name of Bank _____
Address _____
Date _____

PROFORMA

BANK GUARANTEE FOR ADDITIONAL FURTHER SECURITY

_____ (name & Address of
Department)_____

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] (herein
after called "the contractor");

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor
shall furnish you with a Bank Guarantee by a Nationalized / Public Sector banks for the sum
specified therein as Additional further security bank guarantee for compliance with his
obligations in accordance with the Contract;

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee;

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to
you, on _____ behalf of the Contractor, up to a total of Rs. _____ [amount of
guarantee] _____ [in words], such sum being payable and we undertake to pay
you, upon your first written demand and without cavil or argument, any sum or sums within
the limits of _____ [amount of guarantee] as aforesaid without your needing to
prove or to show grounds or reasons for your demand for the sum specified therein.

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

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

This guarantee shall be valid upto and until 30 days from the date of completion.

Signature & seal of the Guarantor _____
Name of Bank _____
Address _____
Date _____

ANNEXURE-I (B)
FORMAT OF BANKER'S CERTIFICATE / LINE OF CREDIT LETTER [TO BE ISSUED IN
THE LETTER HEAD OF THE BANK BRANCH]

Reference Number (Sl. No.) Place:

Date:

To:

(Name & Address of the beneficiary)

This is to certify that, Mr./ M/s. _____ [name of the customer] having his/ their registered / administrative office at _____ is a customer of our Bank and is / are engaged _____ [nature of activity. If the said customer is allotted / awarded with _____ [brief details of work], we may extend credit facilities up to Rs. _____ Lakh, to meet if / their working capital requirement towards the execution of the said work order as per the Loan Policy of the Bank.

This certificate is valid upto three months from the date of issue, i.e., upto (dd/mm/yyyy) (till bid/ tender validity period)

Your faithfully,

BRANCH MANAGER

DECLARATION BY THE TENDERER

Name of the Work: **“Design and Construction along with Operation & Maintenance for a Period of 05 Years for (1) Layout development and Infrastructure works consisting of Roads, Water Distribution, Ground Service Reservoirs, Sewer Network, Storm Water Drains , Power Supply System (HESCOM), ICT infrastructure system works, Chain link fencing for Parks / open areas, Tree plantation for Sector B, C & D and (2) Primary drains outside Unit-3 area, along with Sewage Pumping Stations (SPS) (including pumping machineries & pumping mains for all sectors) for Navanagar- Unit 3 Area- Bagalakote- under Lumpsum Turnkey Contract”**

To : The Chief Engineer

Address : **BAGALAKOTE TOWN DEVELOPMENT AUTHORITY
NAVANAGR, BAGALAKOTE,**

Dear Sir,

I/We.....(Name of the Tenderer) hereby declare that I/We have made myself / ourselves conversant with the Unit-3 site, sub-soil investigations, water levels during various periods of the year, local conditions regarding all materials and labour on which I/We have based my/our quotes for this tender. Further, all the details furnished in this tender document have been carefully reviewed, examined and fully understood by me/us before submitting this Tender. We herewith give an undertaking that we fully undertake by the provisions of this contract document during the tenure of the Contract.

Name and Signature of the Tenderer

SECTION - 11

Data Sheets

DELETED

SECTION - 12

ANNEXURES

SECTION 12: ANNEXURES

- **Annexure A - Schedule of Royalty Charges**
- **Annexure B - Proceedings of Govt. of Karnataka vide G.O. No. PWD/ 11/ GMS/ 64 Dated: 10.3.1966 deductions of shrinkage of Settlement in earthwork embankments**
- **Annexure C - Circular No. WRD 170 KBN 2012 dated 11.06.2012. Guidelines for resorting to controlled blasting in excavation item applicable to all irrigation projects.**
- **Annexure D - Proceedings of Govt. of Karnataka Order No. No. FD 59 PRO, Cell 2004, Bangalore, Dated 26th November 2004**
- **Annexure E - Govt. Order for Price Adjustment for the year 2004, 2008, 2016 No. FD 59 PRO Cell 2004, Bangalore Dated: 26th November 2004, Government Order No.FD3 PCL 2008, Bangalore Dated: 21st November 2008, Government Order No:791 Exp-12/2015, Bangalore, Dated:26th February 2016**
- **Annexure F - Govt. Order for regarding Mobilization Advance issued by WRD vide No. WRD 127 MBI 2020 dt 30-05-2020**

ANNEXURE – A

MINES AND GEOLOGY SECRETARIAT CIRCULAR NO: MG/DCB/2020-21 DATED 03rd JULY 2020

(See Sub-rule (1) of Rule 36)
"ROYALTY "

ಸಂಖ್ಯೆ:ಗಭೋ/ಡಿಪಿಬಿ/2020-21	<u>ಕರ್ನಾಟಕ ಸರ್ಕಾರ</u> ನಿರ್ದೇಶಕರ ಕಛೇರಿ, ಗಣಿ ಮತ್ತು ಭೂವಿಜ್ಞಾನ ಇಲಾಖೆ, ನಂ.49, ಖನಿಜ ಭವನ, ರೇಸ್ ಕೋರ್ಸ್ ರಸ್ತೆ, ಬೆಂಗಳೂರು-560001. ದಿನಾಂಕ:03.07.2020 e-mail: dcbdmg@gmail.com			
<u>ಸುತ್ತೋಲೆ</u>				
ವಿಷಯ: ಕರ್ನಾಟಕ ಉಪ ಖನಿಜ ರಿಯಾಯಿತಿ ತಿದ್ದುಪಡಿ ನಿಯಮಾವಳಿಗಳು 2020ರನ್ವಯ ದಿನಾಂಕ: 30.06.2020 ರಿಂದ ಜಾರಿಗೆ ಬರುವಂತೆ ಉಪ ಖನಿಜಗಳ ರಾಜಧನ ದರಗಳನ್ನು ಪರಿಷ್ಕರಿಸಿರುವ ಕುರಿತು. ಉಲ್ಲೇಖ: ಸರ್ಕಾರದ ಅಧಿಸೂಚನೆ ಸಂಖ್ಯೆ: ಸಿಐ 115 ಎಂಎಂಎನ್ 2019 ದಿನಾಂಕ:30.06.2020.				

ಮೇಲ್ಕಂಡ ವಿಷಯಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ, ಉಲ್ಲೇಖಿತ ಸರ್ಕಾರದ ಅಧಿಸೂಚನೆ ಪ್ರಕರಣ, ದಿನಾಂಕ: 30.06.2020 ರಿಂದ ಜಾರಿಗೆ ಬರುವಂತೆ ಕರ್ನಾಟಕ ಉಪ ಖನಿಜ ರಿಯಾಯಿತಿ ತಿದ್ದುಪಡಿ ನಿಯಮಾವಳಿಗಳು 2020ರನ್ವಯ ಉಪ ಖನಿಜಗಳ ಮೇಲೆ ರಾಜಧನ ದರಗಳನ್ನು ಪರಿಷ್ಕರಿಸಲಾಗಿದೆ. ವಿವರಗಳು ಕೆಳಕಂಡಂತಿರುತ್ತದೆ.				
ಕ್ರ. ಸಂ.	ಉಪ ಖನಿಜ	ರಾಜಧನ ಪ್ರತಿ ಮೆಟ್ರಿಕ್ ಟನ್ ಗೆ	ಪರಿವರ್ತನ ಕೋಷ್ಟಕ ಕ್ಯೂಬಿಕ್ ಮೀಟರ್ ಗೆ	ರಾಜಧನ ಪ್ರತಿ ಕ್ಯೂಬಿಕ್ ಮೀಟರ್ ಗೆ
1	ಕಟ್ಟಡ ಕಲ್ಲು, Size Stone	ರೂ.70	1 ಕ್ಯೂಬಿಕ್ ಮೀಟರ್ ಗೆ=2.63 ಟನ್	ರೂ.184
2	ಬ್ಯಾಟರ್ಲೈಟ್ ಸ್ಲೇಬ್	ರೂ.60	1 ಕ್ಯೂಬಿಕ್ ಮೀಟರ್ ಗೆ=1.80 ಟನ್	ರೂ.108
3	ಜಲ/ಮೆಟಲ್ ಖನಿಜ ವಿಧವಾದ (ಪ್ರದಿ ಗ್ರಾನೈಟ್/ ಕ್ವಾಟೈಟ್)	ರೂ.70	1 ಕ್ಯೂಬಿಕ್ ಮೀಟರ್ ಗೆ=1.80 ಟನ್	ರೂ.126 ✓
4	ಮರಳು	ರೂ.80	1 ಕ್ಯೂಬಿಕ್ ಮೀಟರ್ ಗೆ=1.72 ಟನ್	ರೂ.138 ✓
5	ಗ್ರಾಫೀಟ್ (ಮುರಂ)	ರೂ.40	1 ಕ್ಯೂಬಿಕ್ ಮೀಟರ್ ಗೆ=1.50 ಟನ್	ರೂ.60
6	ಮಣ್ಣು(ಖನಿಜ ತರಹದ ಪಂಚು ಮತ್ತು ಇಟ್ಟಿಗೆ ತಯಾರಿಕೆಗಾಗಿ)	ರೂ.60	1 ಕ್ಯೂಬಿಕ್ ಮೀಟರ್ ಗೆ=1.50 ಟನ್	ರೂ.90

ಸದರಿ ತಿದ್ದುಪಡಿ ಅಧಿಸೂಚನೆ ಪ್ರತಿಯನ್ನು ಮಾಹಿತಿಗಾಗಿ ಈ ಪತ್ರದೊಂದಿಗೆ ಲಗತ್ತಿಸಿದೆ.

ನಿರ್ದೇಶಕರು

ANNEXURE – B

PROCEEDINGS OF THE GOVERNMENT OF KARNATAKA

Sub : Deduction of Shrinkage of settlement in earthwork embankment.

Ref : Correspondence ending with the letter No.BRP/IBR/TE-77/TA-4 dated 11th November, 1965 from the Chief Engineer, Irrigation Project, Bangalore.

PREMABLE :

The Chief Engineer, Irrigation Project has reported that there was no uniform practice of standard vogue for deduction for shrinkage or settlement in earth work embankment and that it was discussed in the meeting of Chief Engineers held in 1961 who have made certain recommendations. The recommendations on receipt in Government were examined and Government asked Chief Engineer, Irrigation Project to obtain report in the matter. Then the matter, has been referred to the Director, Karnataka Engineering Research Station, K.R.Sagar for conducting experiments on various types of the embankments and under various conditions in order to take decision on the uniform procedure to be adopted in making deductions for shrinkage or settlement in earthwork embankments. The Director, Karnataka Engineering Research Station has made the following recommendations.

Sl. No.	Type of Embankment	Settlement in percent of height of bank				
		Before Monsoon	After Monsoon	After Second Monsoon	After Monsoon	
1	2	3	4	5	6	
1.	Dry unrolled embankment in clay soil including black cotton soils. Nil		25	12.50	6.50	
2.	Dry unrolled embankment in all soils other than clayey soil. Nil		20	10.00	5.00	
3.	Compacted embankments without filed control of placement					
	a) Manual labour or rollers less than six tons.		15	07.50	3.75	Nil
	b) By power rollers of more than six tons.		10	05.00	2.50	Nil
4.	Compacted embankment with field control placement		5	02.50	Nil	Nil

The Matter was further referred to the Board of Chief Engineer for consideration and opinion. The board holds that the recommendations of the Director are based on generalization and are indication of general trends in different types of soils. However, soil differ from place to place and it is desirable that actual tests are carried out and their averages applied in individual cases. Where it is not possible to carry out the individual experiments the general values may be adopted.

ORDER NO.PWD/11/GMS/64, BANGALORE DATED 10TH MARCH, 1966.

After considering all aspects of the case and also the opinion furnished by the Board of Chief Engineers Government hereby directs that in respect of all important tan works actual tests are carried out and average applied and where it is not possible to carry out individual experiment the general values given by the Director, K.E.R.S. as noted in preamble may be adopted.

BY ORDER AND IN THE NAME OF THE
GOVERNMENT OF KARNATAKA

M. CHANNAPPA

Deputy Secretary to Government, P.W.D., (Irrn.)

ANNEXURE – C

GOVERNMENT CIRCULAR REGARDING CONTROLLED BLASTING

GOVERNMENT OF KARNATAKA

GOVERNMENT OF KARNATAKA
WRD 170 KBN 2012

Karnataka Government Secretariat,
Vikasa Soudha
Bangalore Dated: 11/06/2012

CIRCULAR

Sub:- Guidelines for resorting to controlled blasting in excavation item applicable to all Irrigation Projects.-reg.

- Ref:- 1. Circular dated 29/07/2004.
2. Chief Engineer, UTP, Shimoga letter No. CE/UTP /KNNL/SMG/TA-1/PB-8/2012-13 dated 20/04/2012.
3. Managing Director, KBJNL's letter No. MD/KBJNL /243/TECH/2012-13/257 dated 23/05/2012.

In the Circular dated 29/07/2004 cited under reference above, in the guidelines for resorting to controlled blasting in excavation under Sl.No.(iii) it is instructed that,

'Controlled blasting may be proposed, wherever necessary, keeping in view the danger zone of 300m radial distance from the blasting site to the village limit, human habitation permanent structure and the like'.

Now, that the Chief Engineer, Upper Tunga Project, Shimoga and Managing Director, Krishna Bhagya Jala Nigam Limited have informed the Government that the Technical Sub Committee of Karnataka Necravari Nigam Limited and Krishna Bhagya Jala Nigam have accepted for the provision of controlled blasting in hard rock excavation in canals running close to the highway line and National highways and also have desired that government may requested to specifically include the highway and railway line in the circular. Accordingly, it is now requested by both the Nigams to include the National Highway & Railway line in the above circular.

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Therefore, the above Sl. No. (iii) is modified as follows:

'Controlled blasting may be proposed, wherever necessary, keeping in view the danger zone of 300m radial distance from the blasting site to the village limit, human habitation permanent structure, National Highway and Railway line and the like'.

(GURUPADASWAMY. B.G.)

Secretary to Government,
Water Resources Department.

Copy to:

1. Secretary to Government, Minor Irrigation, Vikasa Soudha, Bangalore.
2. Managing Director, Krishna Bhagya Jala Nigam Limited, Bangalore.
3. Managing Director, Karnataka Neeravari Nigam Limited, Bangalore.
4. Managing Director, Cauvery Neeravari Nigam Limited, Bangalore.
5. Chief Engineer, Water Resources Development Organisation, Bangalore.
6. Chief Engineer, KBJNL, Dam Zone, Almatti.
7. Chief Engineer, KBJNL, Canal Zone No. Bheemarayanagudi.
8. Chief Engineer, KBJNL, O & M Zone, Narayanapura.
9. Chief Engineer, KBJNL, Canal Zone No.2, Kembavi.
10. Chief Engineer, Irrigation (South) Zone, Mysore.
11. Chief Engineer, Irrigation (North) Zone, Belgaum.
12. Chief Engineer, Hemavathi Project Zone, Gogur, Hassan Dist.
13. Chief Engineer, Hemavathi Canal Zone, Tumkur.
14. Chief Engineer, Irrigation Project Zone, Gulbarga.
15. Chief Engineer, Upper Tunga Project, Shimoga.
16. Chief Engineer, Irrigation Central Zone, Munirabad.
17. Chief Engineer, Hydrology & CMO, Bangalore.
18. Chief Engineer, Varahi Project Siddapura-576229, Udupi Dist.
19. Chief Engineer, Minor Irrigation (South), Bangalore.
20. Chief Engineer, Minor Irrigation (North), Bangalore.
21. Director, WALMI, Dharwad-580001.
22. Director, KERS, K.R.Sagar, Mandya Dist.

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ANNEXURE – D

Water Resources Department

PROCEEDINGS OF THE GOVERNMENT OF KARNATAKA

Subject: Procurement Reforms- Provision for price Adjustment Clauses in the tender documents.

Preamble:

In the country Procurement Assessment Reports prepared for the state of Karnataka, the World Bank has made a set of recommendations for Price Adjustment Reforms. One such recommendation in the Price Adjustment should be mandated in respect of all contracts of value more than Rs. 20 lakhs and completion period of more than 24 months and it should be made applicable from the date of opening tenders.

The state Government has examined the Recommendations. After considering all aspects in the matter, the Government issues following orders.

ORDER NO. No. FD 59 PRO, CELL 2004, BANGALORE DATED 26th NOVEMBER 2004

1. In super-session off standing Rules and instructions, in respect of Price Adjustment Clause in the tender documents, the following instructions are issued for compliance.
 - a. A Price Adjustment Clause shall be included in all works contracts whose estimated cost put to tender is Rs. 100 lakhs or more and the period of completion is 12 months or more. The Price Adjustment Clause and the formulae for adjustment shall be as per Annexure-I.
 - b. In works contract where, Price Adjustment Clause is provided, the Price Adjustment shall be admissible from the date of opening of tender (Original or extended)
 - c. Price Adjustment Clause shall not be included in goods and Equipment tender documents. However in respect of tender documents for procurement of Electric cables, Transformers, generators, motors, that have raw material component subject to price fluctuations, appropriate Price Adjustment clauses may be incorporated by the Tender Inviting Authority in the tender documents, with the

specific approval of the concerned Head of the Department or Managing Director of the Public Undertaking / Board.

2. The above instructions will only be applicable prospectively and shall not be applicable for contracts concluded in the past or being concluded presently or for tenders already invited.
3. The above instructions shall apply to all Procurement Entities as defined in Section 2(d) Chapter 1 of the Karnataka Transparency in Public Procurements Act, 1999.
4. The above instructions should be appropriately incorporated in the Standard Tender Documents under Preparation.

By Order and in the name of
Governor of Karnataka
(K.P.Pandey)
Additional Chief Secretary and
Principal Secretary to Government,
Finance Department.

ANNEXURE – D-1

PROCEEDINGS OF THE GOVERNMENT OF KARNATAKA

Subject: Provision for price Adjustment for specified materials for works –

Revision Reg.

Read : Govt. Order No. FD 59 PRO CELL 2004, dated:26-11-2004

Preamble :

In Government Order No. FD 59 PRO CELL 2004 dated: 26th November 2004 read above, the following instructions were issued about price adjustment.

(a) A Price Adjustment clause shall be included in all Works contracts whose estimated cost put to tender is Rs.100 lakhs or more and the period of completion is 12 months or more. The Price Adjustment clause and the formulae for adjustment shall be as per Annexure-1 of the said G.O.

(b) In works contracts where, Price Adjustment Clause is provided the Price Adjustment shall be admissible from the date of opening of tenders (original or extended).

(c) Price Adjustment Clause shall not be included in Goods and Equipment tender documents. However in respect of tender documents for procurement of electric cables, transformers, generators, motors, that have raw material component subject to price fluctuations, appropriate Price Adjustment clauses may be incorporated by the Tender Inviting Authority in the tender documents, with the specific approval of the concerned Head of the Department or Managing Director of the Public Undertaking/Board. The PWD has requested for certain modifications in the above conditions as the Department is facing problem in procurement of agencies for implementation of various works due to rapid fluctuation of rates of construction materials especially cement, steel and bitumen. This has resulted in poor response to the tenders floated by the department and also slowdown or stoppage of on-going works by the agencies. Further, the tender premiums being quoted by the agencies are very high which creates an opinion that the Schedule of Rates or the estimates are defective. Hence, P.W.D has requested to resolve this problem suitably by modifying the existing contract agreement to absorb the fluctuation in the market prices of major construction viz., cement, steel and bitumen. In the procurement Reforms Standing Committee Meeting held on 2-8-2008, the proposal of PWD for effecting certain changes in the price adjustment clause in the Tender Documents was discussed in detail and considering the frequent fluctuations in the basic rates of construction materials i.e. Cement, Steel, Bitumen, it was recommended by the Committee to modify the Government Order dated: 26.11.2004 referred to above.

The Government has considered the issue in detail and accordingly the following orders are issued.

Government Order No. FD 3 PCL 2008, Bangalore, dated:21-11-2008.

In the circumstances explained in the preamble, in modification of the Government Order dated: 26-11-2004, it is directed that the following price adjustment methods are applicable hereafter.

a) For all works costing more than Rs.50 lakhs, if the period of execution is more than 12 months, the price adjustment will be calculated as prescribed in Annexure to G.O. No: FD 59 PRO Cell/ 2004, dt: 26.11.2004.

b) If the period of execution is more than 6 months but less than or equal to 12 months for work costing more than Rs.50 lakhs, star rates in respect of specified materials (cement, steel and bitumen) only shall be payable to the contractor based on the all India average wholesale price index for the said materials.

The star rates adjustment shall be as per the increase or decrease in the index as applied to the said materials between the last date for receiving Tenders and the date of execution as per the approved programme of works submitted by the contractor at the time of execution of agreement which shall mandatorily be a part of the agreement.

c) If the period of execution is less than or equal to 6 months, for all works irrespective of the cost of the works, price adjustment or star rates shall not be applicable.

d) In works contracts where price adjustment clause is provided, the price adjustment shall be admissible from the date of opening of tenders (Original or extended).

e) Price adjustment clause shall not be included in Goods and Equipment tender documents. However, in respect of tender documents for procurement of Electric Cables, Transformers, Generators, Motors that have raw material component subject to price fluctuations, appropriate price adjustment clauses may be incorporated by the Tender Inviting Authority in the

tender documents, with the specific approval of the concerned Head of the Department or Managing Director of the Public Sector Undertaking/Board.

2. The above-mentioned methods of price adjustment clause are subject to the following conditions:

i) The price adjustment clause or the star rates shall not be admissible if the contract period is extended due to lapse on the part of the contractor.

ii) For the cases (a) and (b) above, if the contract period is extended due to no fault of the contractor, the modified programme shall be approved by the

competent authority and shall become a part of agreement for which price adjustment/star rates will be applicable.

iii) For the purpose of working out price adjustment and star rates, the price index issued from time to time by the Ministry of Commerce and Industry,

Government of India should be adopted.

iv) The formulae for price adjustment shall be as prescribed in Annexure-1 to the G.O. No: FD 59 PRO.Cell/2004 dated: 26.11.2004, which is appended.

3. The above instructions will only be applicable prospectively and shall not be applicable for contracts concluded in the past or being concluded presently or for tenders already invited.

4. The above instructions shall apply to all Procurement Entities as defined in Section 2(d) Chapter I of the Karnataka Transparency in Public Procurement Act, 1999.

5. The above instructions should be appropriately incorporated in the Standard Tender Documents.

By order and in the name of the

Governor of Karnataka,

Sd/-

(M.R. Sreenivasa Murthy)

Principal Secretary to Government,

Finance Department

To:

The Compiler, Karnataka Gazette for publication in the next issue of the Gazette and to supply 500 copies to Finance Department

Copy to:

The Chief Secretary/Additional Chief Secretaries to Government

The Principal Secretaries and Secretaries to Government

The Principal Secretary to Hon'ble Chief Minister

The Accountant General (A&E), Karnataka, Bangalore

The Secretary to Government (Expenditure), Finance Dept.

The Secretary, Karnataka Legislative Assembly/Council ()

The Registrar, Karnataka High Court, Bangalore ()With a covering letter

The Registrar, Karnataka Lokayukta, Bangalore ()

The Secretary, Karnataka Public ServiceCommission, Bangalore()

All the Deputy Commissioners

All the CEOs of Zilla Panchayats

All the Heads of Departments

All the CEOs of Boards and Corporations

All Internal Financial Advisors

Joint Secretaries / Deputy Secretaries / Special officers / Under Secretaries to Govt.,

Finance Department.

ANNEXURE – E

PRICE ADJUSTMENT CLAUSE FOR WORKS CONTRACTS

A. Price Adjustment:

Contract price shall be adjusted for increase or decrease in rates and prices of labour, materials, fuels and lubricants in accordance with the latest Government orders (given as Annexure-D-1) and any further order prevailing at the time of the execution as per the following principles and procedures and formula given hereunder.

- a. The price Adjustment shall apply for the work done from the date of commencement upto the end of original period of completion or extensions granted by the Employer and shall not apply to work carried out beyond the stipulated period of completion for reasons attributable to the contractor.
- b. The price adjustment shall be determined during each quarter from the formula given hereunder.
- c. Following expressions and meanings are assigned to the work done during the quarter:
R= Total value of work done during the quarter. It would include the amount of secured advance for materials paid for (if any) during the quarter, less the amount of the secured advance recovered during the quarter. It will exclude value for works executed under variations for which price adjustment (if any) will be worked out separately based on the terms mutually agreed.
- d. To the extent that full compensation for any rise or fall in costs to the contractor is not covered by the provisions of this or other clauses in the Contract, the unit rates included in the contract shall be deemed to include amounts to cover the contingency of such other rise or fall in costs.

Price Adjustment Formula:

Adjustment for labour component:

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

$$V_L = 0.85 \times P_L / 100 \times R \times (L_i - L_o) / L_o \text{ where,}$$

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

L_o = The average consumer price index for industrial workers for Hubli Centre for the quarter preceding the date of opening of tenders as published by the Labour Bureau, Ministry of Labour, Government of India;

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

P_L = Percentage of labour component of the work.

R = as per GO, dated: 26-02-2016

Adjustment for Cement Component:

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

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

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

C_o = The all India average wholesale price index for cement (Ordinary Portland cement) for the quarter preceding the date of opening of the tenders as published by the office of Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

C_i = The all India average wholesale price index for cement (Ordinary Portland cement) for the quarter under consideration as published by the Office of Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

P_c = Percentage of cement component of the work.

R = as per GO, dated: 26-02-2016

Note: For the application of this clause, index of Ordinary Portland Cement has been chosen to represent Cement group.

Adjustment for Steel component:

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

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

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

S_o = The all India average wholesale price index for steel (M.S. Bars and rods) for the quarter preceding the date of opening of Tenders as published by the Office of Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

S_i = The all India average wholesale price index for steel (M.S. Bars and rods) for the quarter under consideration as published by the Office of Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

P_s = Percentage of steel component of the work.

Note: For the application of this clause, index of M S rods, bars and steel plates for fabrication of M S works have to be chosen to represent relevant and appropriate Steel groups.

R = as per GO, dated: 26-02-2016

Adjustment of Fuel and Lubricant component:

- iv) Price adjustment for increase or decrease in the cost of Fuel and Lubricants shall be paid in accordance with the following formula.

$$V_F = 0.85 \times P_F / 100 \times R \times (F_i - F_o) / F_o$$

Where,

V_F = Increase or decrease in cost of work during the quarter under consideration due to changes in rates for Fuel and Lubricants;

F_o = The official retail price of High-Speed Diesel (HSD) at the IOC /HPCL/BPL or other consumer pump at Bagalakote on the day 30 days prior to the date of opening of Tenders;

F_i = The official retail price of HSD at the IOC/HPCL/BPL or other consumer pump at Bagalakote for the 15th day of the middle calendar month of the quarter under Consideration;

P_F = Percentage of Fuel and Lubricant component of the work.

R = as per GO, dated: 26-02-2016

Note: For the application of this clause, the price of HSD has been chosen to represent Fuel and Lubricant Group.

Adjustment for Plant and Machinery Spares component:

- v) Price adjustment for increase or decrease in the cost of plant and Machinery Spares Procured by the contractor shall be paid in accordance with the following formula.

$$V_p = 0.85 \times P_p / 100 \times R \times (P_i - P_o) / P_o \text{ Where,}$$

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

P_o = The all India average wholesale price index for Heavy Machinery and Parts for the quarter preceding the date of opening of Tenders, as published by the Office of the Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

P_i = The all India average wholesale price index for Heavy Machinery and Parts for the quarter under consideration as published by the office of the Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

P_p = Percentage of plant and Machinery Spares component of the work

R = as per GO, dated: 26-02-2016

Note : For the application of this clause index of Heavy Machinery and parts has been chosen to represent the plant and Machinery Spares Group.

Adjustment for Bitumen component:

- vi) Price adjustment for increase or decrease in the cost of Bitumen Procured by the contractor shall be paid in accordance with the following formula.

$$V_B = 0.85 \times P_B / 100 \times R \times (B_i - B_o) / B_o \text{ Where}$$

V_B = Increase or decrease in the cost of work during the quarter under consideration due to changes in the rate for bitumen:

B_o = The official retail price of bitumen at the IOC/HPCL/BPL or MRPL at Mangalore depot on the day 30 days prior to the date of opening of Bids.

B_i = The official retail price of bitumen at the IOC/HPCL/BPL or MRPL at Mangalore depot at for the 15th day of the middle calendar month of quarter under consideration.

P_B = Percentage of Bitumen component of the work.

R = as per GO, dated: 26-02-2016

Adjustment for Pipe component:

- vii) Price adjustment for increase or decrease in the cost of Pipes (HDPE, MS pipes, DI pipes, etc.,) Procured by the contractor shall be paid in accordance with the following formula.

$$V_{PI} = 0.85 \times P_{PI} / 100 \times R \times (PI_i - PI_o) / PI_o \text{ Where,}$$

V_{PI} = Increase or decrease in cost of work during the quarter under consideration due changes in rates for Pipes;

PI_o = The all India average wholesale price index for Pipes for the quarter preceding the date of opening of Tenders, as published by the Office of the Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

PI_i = The all India average wholesale price index for Pipes for the quarter under consideration as published by the office of the Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

P_{PI} = Percentage of Pipe component of the work

R = as per GO, dated: 26-02-2016

Adjustment for Electrical Cable component:

- viii) Price adjustment for increase or decrease in the cost of Electrical Cables Procured by the contractor shall be paid in accordance with the following formula.

$$V_{EC} = 0.85 \times P_{EC} / 100 \times R \times (EC_i - EC_o) / EC_o \text{ Where,}$$

V_{EC} = Increase or decrease in cost of work during the quarter under consideration due changes in rates for Electrical Cables;

EC_o = The all India average wholesale price index for Electrical Cables for the quarter preceding the date of opening of Tenders, as published by the Office of the Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

EC_i = The all India average wholesale price index for Electrical Cables for the quarter under consideration as published by the office of the Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

P_{EC} = Percentage of Electrical Cables component of the work

R = as per GO, dated: 26-02-2016

Adjustment for Other materials:

- ix) Price adjustment for increase or decrease in the cost of other materials other than labour, cement, steel, bitumen, pipes and Fuel & Lubricants, procured by the contractor shall be paid in accordance with the following formula.

$$V_M = 0.85 \times P_M / 100 \times R \times (M_i - M_o) / M_o \text{ Where,}$$

V_M = Increase or decrease in cost of work during the quarter under consideration due to changes in rates for local materials other than labour, cement, steel, bitumen, pipes, electrical cables and fuel & lubricants;

M_o = The all India average wholesale price index for all commodities for the quarter preceding the date of opening of Tenders, as published by the Office of the Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

M_i = The all India average wholesale price index for all commodities for the quarter under consideration as published by the office of the Economic Advisor, Ministry of Commerce and Industry, Government of India, New Delhi;

P_M = Percentage of other material component (other than labour, cement, steel, bitumen, pipes, electrical cables and fuel & lubricants;) of the work.

R = as per GO, dated: 26-02-2016

The following percentage will govern the price adjustment for the entire contract

1.	Labour - P _L	:	24%
2.	Cement - P _C	:	18%
3.	Steel - P _S	:	08%
4.	Fuel & Lubricants - P _F	:	06%
5.	Bitumen - P _B	:	02%
6.	Pipes (HDPE, RCC, etc.,) - P _{PI}	:	03%
7.	Plant & Machinery spare - P _P	:	15%
8.	Electrical Cable - P _{EC}	:	04%
9.	Other Materials - P _M	:	20%
	Total	:	100.00%

B. PRICE VARIATION FORMULA FOR TRANSFORMERS:

The Ex-works price inclusive of packing & forwarding charges indicated in the price schedule for the transformers (main & auxiliary) is based on the input cost of raw materials/components and labour cost as on the first day of the month, one month prior to date of Tender opening and the same is deemed to be related to prices of raw materials and all India average consumer price index number for industrial workers as specified in the price variation clause given below. In case of any variation in these prices and index numbers, the price payable shall be subject to adjustment, up or down in accordance with the following formula:

$$P = \frac{P_o}{100} \left[13 + 23 \frac{C}{C_o} + 28 \frac{ES}{ES_o} + 7 \frac{IS}{IS_o} + 7 \frac{IM}{IM_o} + 7 \frac{TB}{TBo} + 5 \frac{W}{W_o} \right]$$

Wherein

P = Price payable as adjusted in accordance with the above formula

Po = Ex-works price of Transformer inclusive of packing & forwarding charges

Co = Average LME settlement price of copper wire bars

Eso = C&F price of CRGO Electrical Steel Sheets

ISo = Wholesale price index number for Iron & steel

IMo = Price of insulating materials

TBo = Price of Transformer Oil Base Stock

Wo = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India.

And

C = Average LME settlement price of copper wire bars This price is as applicable for the month, four months prior to the date of scheduled delivery.

ES = C&F price of CRGO Electrical Steel Sheets This price is as applicable on the 1st working day for the month, three months prior to the date of scheduled delivery.

IS = Wholesale price index number for Iron & Steel This index number is as applicable for the week ending 1st Saturday of the month, three months prior to the date of scheduled delivery.

IM = Price of Insulating Materials This price is as applicable on the 1st working day of the month, three months prior to the date of scheduled delivery.

TB = Price of Transformer Oil Base Stock This price is as applicable on the 1st working day for the month, two months prior to the date of scheduled delivery.

W = All India average consumer price index number for Industrial Workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India.

This index number is as applicable on the first working day of the month, three months prior to the date of scheduled delivery.

The date of delivery for the purposes of calculation of variation in prices only shall be the date on which the transformer is notified as being ready for inspection.

Indices: All the above indices shall be as published by IEEMA prevailing as on first working day of the month.

Limitation: Price variation shall be applicable during the contractual delivery period only. If delivery period is extended then price variation shall be limited to contractual delivery period only.

C. PRICE VARIATION FOR INSTRUMENT TRANSFORMERS

$$P = \frac{P_0}{100} (18 + 13 \frac{C}{C_0} + 12 \frac{ES}{ES_0} + 12 \frac{IS}{IS_0} + 23 \frac{IM}{IM_0} + 6 \frac{TB}{TB_0} + 16 \frac{W}{W_0})$$

Wherein,

P = Price payable as adjusted in accordance with the above price variation formulae.

Po = Ex-works price of the instrument transformers.

Co – Average LME settlement price of copper wire bars (This price is as applicable for the month two months prior to date of Tender.)

ESo – C&F price of CRGO steel sheets (This price is as applicable on the first working day of the month one month prior to date of Tender.)

ISo – Wholesale price index for iron and steel (This index is as applicable on the first week ending first Saturday of the month, three months prior to date of Tender.)

IMo – IEEMA index for insulator (This index is as applicable on the first working day of the month, one month prior to date of Tender.)

TBo - Price of transformer oil base stock (This price is as applicable on the first working day of the month, two month prior to date of Tender.)

W0 –All India average consumer price index No. for industrial workers as published by the labor bureau, ministry of labor, Govt. of India (three month prior to date of Tender.)

C – Average LME settlement price of copper wire bars. (This price is as applicable for the month two months prior to date of Delivery.)

ES – C&F price of CRGO steel sheets. (This price is as applicable on the first working day of the month one month prior to date of Delivery.)

IS – Wholesale price index for iron and steel (This index is as applicable on the first week ending first Saturday of the month, three months prior to date of Delivery.)

IM – IEEMA index for insulator.(This index is as applicable on the first working day of the month, one month prior to date of Delivery.)

TB - Price of transformer oil base stock. (This price is as applicable on the first working day of the month, two month prior to date of Delivery.)

W –All India average consumer price index No. for industrial workers as published by the labour bureau, ministry of labour, Govt of India. (base 1982 =100)

(This index is as applicable on the first working day of the month, three month prior to date of Delivery.)

The date of delivery for the purpose of calculating price variation is the date on which the instrument transformer is notified as being ready for inspection. Incase of delay in supplies beyond delivery dates, price variation shall be calculated for contractual delivery date and for actual delivery date. Price variation payable shall be the least of the two. Price variation is without any ceiling limit.

D. PRICE VARIATION FORMULAE FOR BREAKERS:

PRICE VARIATION CLAUSE FOR HT SWITCHGEAR (ABOVE 36 KV)

The price quoted/confirmed is based on the cost of raw materials/components and labour cost as on the date of quotation and the same is deemed to be related to prices of raw materials/components and all India average consumer price index number for industrial workers as specified in the price variation clause given below. In case of any variation in these prices and Index number, the price payable shall be subject to adjustment up or down in accordance with the following formula:

$$PV_1 = \frac{P_o}{100} \left[25 + 17 \frac{CS}{CS_o} + 18 \frac{C}{C_o} + 10 \frac{Al}{Al_o} + 13 \frac{In}{In_o} + 17 \frac{W}{W_o} \right] - P_o$$

Wherein,

PV1 = Variation in price in Indian Rupees on account of variation in input costs of indigenous content, and labour costs payable in accordance with the above formula.

Po = Price quoted/confirmed

CS₀ = The price of constructional steel

The price is as applicable on the first working day of the month, one month prior to the date of Tender

Co = Price of electrolytic copper wire bars (refer notes)

This price is applicable on the first working day of the month, one month prior to the date of Tender

Al₀ = Price of bus bar grade aluminum (refer notes)

This price is applicable on the first working day of the month, one month prior to the date of Tender

In₀ = Price of epoxy resin (refer notes)

This price is applicable on the first working day of the month, one month prior to the date of Tender

W₀ = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base 1982 = 100). This Index number is as applicable for the month, four months prior to the date of Tender.

Note: For example, if the date of Tender falls in May 2001, the applicable prices of constructional steel (CS₀), electrolytic copper wire bars (Co), bus bar grade aluminium (Al₀) and insulating material (In₀) should be for the month of April 2001 and all India average consumer price index number (W₀) should be for the month of January 2001.

The above prices and indices are as published by IEEMA vide circular reference number IEEMA (PVC) SWGR/prevailing as on first working day of the month _____ i.e. one month prior to the date of Tender.

CS = The price of constructional steel (refer notes)

The price is applicable on the first working day of the month, two months prior to the date of delivery

C = Price of electrolytic copper wire bars (refer notes)

The price is applicable on the first working day of the month, two months prior to the date of delivery

Al = Price of bus bar grade aluminium (refer notes)

The price is applicable on the first working day of the month, two months prior to the date of delivery

In = Price of epoxy resin (refer notes)

The price is applicable on the first working day of the month, two months prior to the date of delivery

W = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base 1982 = 100). This index number is as applicable for the month, five months prior to the date of delivery.

Note: For example, if the date of delivery in terms of clause given below falls in December 2001 the applicable price of raw materials Viz. CS, C, Al and In should be for the month of October 2001 and all India average consumer price index number (W) should be for the month of July 2001.

The “date of delivery” is the date on which the switchgear equipment is notified as being ready for inspection. (In the absence of such notification the date of manufacturer’s dispatch note is to be considered as the date of delivery) or the contracted delivery date (including any agreed extension thereto), whichever is earlier.

E. PRICE VARIATION CLAUSE FOR FABRICATED AND GALVANIZED TRANSMISSION LINE TOWER:

Using: (A) Both heavy and lighter angles, (B) only heavy angles, (C) only lighter angles.

The price quoted/ confirmed is based on the cost of raw materials/ components and labour cost as on the date of quotation and the same is deemed to be related to the price of raw material and all India average consumer price index number for industrial workers as specified in the price variation clause given below. In case of any variation in these prices and index numbers, the price payable shall be subject to adjustment up or down in accordance with the

(A) Transmission line tower using Both heavy and Lighter Angles :

$$P = \frac{P_o}{100} \left[15 + 18 \frac{HA}{HA_o} + 40 \frac{LA}{LA_o} + 16 \frac{Z_n}{Z_{no}} + 11 \frac{W}{W_o} \right]$$

(B) Transmission line tower using only heavy Angles :

$$P = \frac{P_o}{100} \left[15 + 58 \frac{HA}{HA_o} + 16 \frac{Z_n}{Z_{no}} + 11 \frac{W}{W_o} \right]$$

(C) Transmission line tower using only lighter Angles :

$$P = \frac{P_o}{100} \left[15 + 58 \frac{LA}{LA_o} + 16 \frac{Z_n}{Z_{no}} + 11 \frac{W}{W_o} \right]$$



Proceedings of the Government of Karnataka

Sub: Provision for Price Adjustment for Specified
Materials for works - Clarification - reg.

Read: 1. G.O. No.FD 59 PRO CELL 2004, dated:26.11.2004
2. G.O. No.FD 3 PCL 2008, dated:21.11.2008

Preamble:

In Government Order reference at (1) above the instructions regarding Price Adjustment methods applicable were specified. Clarification are being sought on the method of computing Price Adjustment, whenever the contract period is extended due to lapse of part of the contractor and also when the contract period is extended due to no fault of the contractor. The rationale behind admissibility of Price Adjustment is to compensate the contractor on price fluctuations when extensions of time is given beyond the stipulated date of completion for reasons not attributable to the contractor. However, while extending such benefits it should be ensured that this will not result either in additional financial burden to Government or result in undue benefit to the contractor. Therefore after examining all aspects Government issues the following orders.

Government Order No:791 Exp-12/2015, Bangalore,
Dated:26.02.2016

In the circumstances explained in the preamble and in partial modification of the Government Order referred at (2) above, the following method, of price adjustment is applicable.

Case-1, When time extension is granted for the reasons not attributable to the contractor.

Price Adjustment is admissible as per terms of contract for the work carried out during the extension of the time granted for completion of work.

Case-2. When the time extension is granted for reasons attributable to the contractor

Price Adjustment is admissible upto the original contract period only and for the period of extension, price adjustment is not admissible and payment for such extension shall be at tendered rates only.

Case-3. When extension of time is granted for the reasons attributable to employer followed by reasons attributable to the contractor

Price Adjustment is admissible as per terms of contract for the work carried out during the original period of completion and during the extension of time granted for completion of work for reasons attributable to employer. For the work carried out during the extension of time granted due to delay attributable to the contractor Price Adjustment is not admissible and the contractor shall be paid only at the Tendered rates.

Case-4. When delay occurs initially attributable to contractor and later attributable to Employer

Extension of time in such cases is to be granted by first appending extension of time due to delay by employer to the original contract period, although the delay is initially due to contractor and later by the employer. The extension of time granted due to delay by the contractor shall be considered as the last phase after extension due to delay by employer is added to the original contract period.

Price Adjustment is admissible to the delay attributable to the employer. The Price Adjustment for the initial delay attributable to the contractor is not admissible and the contractor shall be paid only at the Tendered rates.

General Clarification:

1 - By way of abundant caution, it is also clarified that 'quarter' in this G.O. and G.O. at reference (1) and (2) above means a period of three consecutive months as detailed below:

(i) For reckoning the average base price index

Three consecutive calendar months preceding the calendar month of opening the Tender.

(iii) For reckoning the value of 'R'

Three consecutive Calendar months including the calendar month in which work was started in the first instance and thereafter next quarter shall be consecutive three months following the preceding quarter.

II - The value of R defined in Government order referred at (1) above is redefined as below:

R = Total value of work done during the quarter. It would include the amount of secured advance for materials paid for (if any) during the quarter, less the amount of the secured advance recovered during the quarter. It will exclude value for works executed under variations for which Price Adjustment (if any) will be worked out separately based on the terms mutually agreed. It will also exclude the value of work done during the quarter which was programmed to be done prior to this quarter as per the work schedule in the agreement.

By Order and in the name of the
Governor of Karnataka


(K. Nandakumar)

Special Officer and Ex-officio
Deputy Secretary to Government
Finance Department (PWFC)

23/2

To:

The Compiler, Karnataka Gazette for publication in the next issue of the Gazette and to supply 500 copies to Finance Department.

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The Secretary, Karnataka Public Service Commission, Bangalore.
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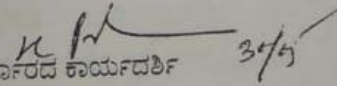
EXECUTIVE ENGINEER

ನಿಟ್ಟಿನಲ್ಲಿ ಅವಶ್ಯಕತೆಗೆ ಅನುಗುಣವಾಗಿ ಕಾಮಗಾರಿಗಳನ್ನು ಕೈಗೆತ್ತಿಕೊಳ್ಳಲು ಆರ್ಥಿಕ ಇಲಾಖೆಯ ದಿನಾಂಕ:04.05.2020ರ ಸುತ್ತೋಲೆಯಲ್ಲಿ ಆದೇಶವನ್ನೂ ಸಹಾ ಹೊರಡಿಸಲಾಗಿರುತ್ತದೆ.

ಈ ಹಿನ್ನೆಲೆಯಲ್ಲಿ, ಮೇಲ್ಕಂಡ ಎಲ್ಲಾ ಅಂಶಗಳನ್ನು ಪರಿಗಣಿಸಿ, ಇಲಾಖೆಯ ನಾಲ್ಕನೇ ನಿಗಮಗಳಲ್ಲಿ ಏಕರೂಪವಾಗಿ ಈ ಕೆಳಕಂಡಂತೆ ಕ್ರಮವಹಿಸಲು ಸೂಚಿಸಿದೆ:

1. ನಿಗಮಗಳಲ್ಲಿ ಆಹ್ವಾನಿಸಲಾಗುತ್ತಿರುವ ಟೆಂಡರ್‌ಗಳಲ್ಲಿ ಇನ್ನು ಮುಂದೆ ಮುಂಗಡ ಹಣ (Mobilisation Advance) ನೀಡುವ Tender Clause ಅನ್ನು ಕೈಬಿಡಲು ಅಗತ್ಯ ಕ್ರಮಕೈಗೊಳ್ಳುವಂತೆ ಸೂಚಿಸಲಾಗಿದೆ. ಜೊತೆಗೆ, ಪ್ರಸ್ತುತ ಈಗಾಗಲೇ ಆಹ್ವಾನಿಸಲಾಗಿರುವ ಯೋಜನಾ ಕಾಮಗಾರಿಗಳ ಟೆಂಡರ್‌ಗಳಲ್ಲಿ "ಮುಂಗಡ ಹಣ ನೀಡುವ" clauseಗೆ ಅವಕಾಶ ಕಲ್ಪಿಸಿದ್ದಲ್ಲಿ, ಅಂತಹ ಟೆಂಡರ್ ಪ್ರಕಟಣೆಗಳಲ್ಲಿ ಸದರಿ clause ಅನ್ನು ತೆಗೆದುಹಾಕುವ ಕುರಿತು ತಿದ್ದುಪಡಿ ಪ್ರಕಟಣೆಯನ್ನು ಹೊರಡಿಸಲು ಹಾಗೂ ಈಗಾಗಲೇ ಅನುಮೋದನೆಯಾಗಿ ಕರಾರು ಒಪ್ಪಂದಕ್ಕಾಗಿ ಬಾಕಿ ಇರುವ ಟೆಂಡರ್‌ಗಳಿಗೆ ಸಂಬಂಧಿಸಿದಂತೆ, ಕರಾರು ಒಪ್ಪಂದ ಮಾಡುವ ಮುನ್ನ ಸದರಿ clause ಅನ್ನು ಕರಾರಿನಿಂದ ತೆಗೆದುಹಾಕುವ ಬಗ್ಗೆ ಗುತ್ತಿಗೆದಾರರಿಂದ ಒಪ್ಪಿಗೆ ಪಡೆದ ನಂತರವೇ ಕರಾರು ಒಪ್ಪಂದ ಮಾಡಿಕೊಳ್ಳುವಂತೆ ಕ್ರಮ ವಹಿಸಲು ಸೂಚಿಸಿದೆ.

2. ನಿಗಮಗಳಲ್ಲಿ ಕೈಗೊಳ್ಳಲು ಉದ್ದೇಶಿಸಿರುವ ಯೋಜನಾ ಕಾಮಗಾರಿಗಳ ಕುರಿತಂತೆ ಪೈಪುಗಳ ಏಟಿಂಗ್‌ಗಳನ್ನು ಒಳಗೊಂಡಂತಹ ಕಾಮಗಾರಿಗಳ ಟೆಂಡರ್‌ಗಳಲ್ಲಿ, ಬಿಲ್ಲು ಪಾವತಿ ವಿಧಾನವನ್ನು ನಮೂದಿಸುವಾಗ ಪೈಪುಗಳ ಪೂರೈಕೆಯನ್ನು ಒಟ್ಟಾರೆಯಾಗಿ ಪೂರೈಸುವ ಬದಲು ತ್ರೈಮಾಸಿಕ ಕಾರ್ಯಕ್ರಮದನ್ವಯ ಪೂರೈಸಲು ಕ್ರಮವಹಿಸುವಂತೆ ಸೂಚಿಸಿದೆ ಹಾಗೂ ಈ ರೀತಿ ತ್ರೈಮಾಸಿಕವಾಗಿ ಪೂರೈಕೆಯಾದ ಪೈಪುಗಳಿಗೆ ಸಂಬಂಧಿಸಿದ ಮೊತ್ತದ ಶೇ.40ರಷ್ಟು ಮೊತ್ತವನ್ನು ಮಾತ್ರ ಪ್ರಾರಂಭಿಕವಾಗಿ ಪಾವತಿಗಾಗಿ ಪರಿಗಣಿಸುವ ಕುರಿತು ಸಕ್ಷಮ ಪ್ರಾಧಿಕಾರದ ಅನುಮೋದನೆಯೊಂದಿಗೆ ಕ್ರಮವಹಿಸಲು ಸೂಚಿಸಿದೆ. ಮುಂದುವರೆದು, ಈಗಾಗಲೇ ಯೋಜನಾ ಕಾಮಗಾರಿಗಳಿಗೆ ಟೆಂಡರ್ ಆಹ್ವಾನಿಸಿರುವ ಪ್ರಕರಣಗಳಲ್ಲಿ ಕೂಡಲೇ ತಿದ್ದುಪಡಿ ಪ್ರಕಟಣೆಯನ್ನು ಹೊರಡಿಸಿ ಪೈಪುಗಳ ಪೂರೈಕೆಗಾಗಿ ಮೇಲೆ ಹೇಳಿದ ಪಾವತಿ ವಿಧಾನವನ್ನು ಅಳವಡಿಸಿಕೊಳ್ಳಲು ಮತ್ತು ಟೆಂಡರ್ ಪ್ರಕ್ರಿಯೆ ಈಗಾಗಲೇ ಪೂರ್ಣಗೊಂಡು ಗುತ್ತಿಗೆದಾರರೊಡನೆ ಕರಾರು ಒಪ್ಪಂದ ಮಾಡಿಕೊಳ್ಳುವ ಪ್ರಕರಣಗಳಲ್ಲಿಯೂ ಕೂಡ ಈ ಷರತ್ತಿಗೆ ಗುತ್ತಿಗೆದಾರರು ಒಪ್ಪುವ ನಿಬಂಧನೆಯೊಂದಿಗೆ ಕರಾರು ಒಪ್ಪಂದ ಮಾಡಿಕೊಳ್ಳಲೂ ಸಹಾ ಸೂಚಿಸಿದೆ.


ಸರ್ಕಾರದ ಕಾರ್ಯದರ್ಶಿ 3/5
ಜಲ ಸಂಪನ್ಮೂಲ ಇಲಾಖೆ.

ಪ್ರತಿಯನ್ನು ಮಾಹಿತಿಗಾಗಿ ಹಾಗೂ ಅಗತ್ಯ ಕ್ರಮಕ್ಕಾಗಿ:

1. ವ್ಯವಸ್ಥಾಪಕ ನಿರ್ದೇಶಕರು, ಕೃಷ್ಣಾ ಭಾಗ್ಯ ಜಲ ನಿಗಮ ನಿಯಮಿತ, ಬೆಂಗಳೂರು.
2. ವ್ಯವಸ್ಥಾಪಕ ನಿರ್ದೇಶಕರು, ಕರ್ನಾಟಕ ನೀರಾವರಿ ನಿಗಮ ನಿಯಮಿತ, ಬೆಂಗಳೂರು.
3. ವ್ಯವಸ್ಥಾಪಕ ನಿರ್ದೇಶಕರು, ವಿಶ್ವೇಶ್ವರಯ್ಯ ಜಲ ನಿಗಮ ನಿಯಮಿತ, ಬೆಂಗಳೂರು.
4. ವ್ಯವಸ್ಥಾಪಕ ನಿರ್ದೇಶಕರು, ಕಾವೇರಿ ನೀರಾವರಿ ನಿಗಮ ನಿಯಮಿತ, ಬೆಂಗಳೂರು.
5. ನಿರ್ದೇಶಕರು, ಕಾಡಾ ನಿರ್ದೇಶನಾಲಯ, ಬೆಂಗಳೂರು.
6. ನಿರ್ದೇಶಕರು, ಕರ್ನಾಟಕ ಇಂಜಿನಿಯರಿಂಗ್ ಸಂಶೋಧನಾ ಕೇಂದ್ರ, ಕೃಷ್ಣರಾಜಸಾಗರ.
7. ಮುಖ್ಯ ಇಂಜಿನಿಯರ್, ಜಲಸಂಪನ್ಮೂಲ ಅಭಿವೃದ್ಧಿ ಸಂಸ್ಥೆ, ಬೆಂಗಳೂರು.
8. ಮುಖ್ಯ ಇಂಜಿನಿಯರ್, ಕೇಂದ್ರ ಯಾಂತ್ರಿಕ ಸಂಸ್ಥೆ, ಬೆಂಗಳೂರು.
9. ಮುಖ್ಯ ಇಂಜಿನಿಯರ್, AC-IWRM, ಬೆಂಗಳೂರು.

ಪ್ರತಿಯನ್ನು ಮಾಹಿತಿಗಾಗಿ:

1. ಮಾನ್ಯ ಜಲಸಂಪನ್ಮೂಲ ಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ವಿಧಾನ ಸೌಧ, ಬೆಂಗಳೂರು.
2. ಸರ್ಕಾರದ ಅಪರ ಮುಖ್ಯ ಕಾರ್ಯದರ್ಶಿಗಳು, ಆರ್ಥಿಕ ಇಲಾಖೆ, ಇವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು.
3. ಸರ್ಕಾರದ ಅಪರ ಮುಖ್ಯ ಕಾರ್ಯದರ್ಶಿಗಳು, ಜಲಸಂಪನ್ಮೂಲ ಇಲಾಖೆ, ಇವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು.
4. ಸರ್ಕಾರದ ಕಾರ್ಯದರ್ಶಿಗಳು, ಜಲಸಂಪನ್ಮೂಲ ಇಲಾಖೆ, ಇವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು.
5. ಸರ್ಕಾರದ ಹೆಚ್ಚುವರಿ ಕಾರ್ಯದರ್ಶಿಗಳು, ಜಲಸಂಪನ್ಮೂಲ ಇಲಾಖೆ, ಇವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು.
6. ಸರ್ಕಾರದ ಉಪ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕೆಬಿಜಿಎನ್/ಸೇವೆಗಳು, ಜಲಸಂಪನ್ಮೂಲ ಇಲಾಖೆ.
7. ಸರ್ಕಾರದ ವಿಶೇಷ ಕರ್ತವ್ಯಾಧಿಕಾರಿಗಳು, ತಾಂತ್ರಿಕ-3/ತಾಂತ್ರಿಕ-4, ಜಲಸಂಪನ್ಮೂಲ ಇಲಾಖೆ.
8. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು, ತಾಂತ್ರಿಕ-1/2/5/ಸೇವೆಗಳು-ಎ/ಸೇವೆಗಳು-ಬಿ/ಕಾಡಾ ಜಲಸಂಪನ್ಮೂಲ ಇಲಾಖೆ.
9. ತಾಂತ್ರಿಕ ಸಹಾಯಕರು, ತಾಂತ್ರಿಕ-7, ಜಲಸಂಪನ್ಮೂಲ ಇಲಾಖೆ.

Draft tender papers booklet for the work: “Design and Construction along with Operation & Maintenance for a Period of 05 Years for (1) Layout development and Infrastructure works consisting of Roads, Water Distribution, Ground Service Reservoirs, Sewer Network, Storm Water Drains, Power Supply System (HESCOM), ICT infrastructure system works, Chain link fencing for Parks / open areas, Tree plantation for Sector B, C & D and (2) Primary drains outside Unit-3 area, along with Sewage Pumping Stations (SPS) (including pumping machineries & pumping mains for all sectors) for Bagalakote Navanagar - Unit 3 Area under Lumpsum Turnkey Contract, Package 1” from Page no. 01 to 329 is herewith recommended for approval.

-Sd-

Executive Engineer,
BTDA, Division No.1,
Bagalakote

-Sd-

Superintending Engineer,
BTDA, Bagalakote

-Sd-

Chief Engineer,
BTDA, Bagalakote