

GOVERNMENT OF ODISHA

DEPARTMENT OF WATER RESOURCES

OFFICE OF THE CHIEF CONSTRUCTION ENGINEER KHAIRIBHANDAN & DEO IRRIGATION PROJECT, KARANJIA

STANDARD BID DOCUMENT

For EPC Contract

Tender Reference No.17/CCEKDIP of 2026-27

(BID Identification No.17/CCEKDIP of 2026-27)

NAME OF WORK: Construction of distribution system for 467 Ha of CCA including Command Area Development (CAD) of Karadiha and Karanjia Sub-Minor off-taking from R.D. 16045m of Right Main Distributary of Deo Irrigation Project through Underground Pipeline Irrigation system (Gravity flow) in Mayurbhanj District of Odisha on EPC turnkey basis including Operation and Maintenance of complete commissioned project for 05 (five) years.

CHIEF CONSTRUCTION ENGINEER
KHAIRIBHANDAN & DEO IRRIGATION PROJECT,
KARANJIA

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SECTION – I

NOTICE INVITING TENDER (NIT)

GOVERNMENT OF ODISHA
DEPARTMENT OF WATER RESOURCES
OFFICE OF THE CHIEF CONSTRUCTION ENGINEER,
KHAIRIBHANDAN & DEO IRRIGATION PROJECT, KARANJIA
AT/PO: KARANJIA, DIST.: MAYURBHANJ-757037
Tel: 06796-296144, e-mail: cce.dip.dowr@gmail.com

"e" Procurement Notice No. 17/ CCEKDIP of 2026-27
Bid Identification No. 17/ CCEKDIP of 2026-27

1.	Nature of the Work	:	Civil Work
2.	Number of Works	:	01 (One) No of Individual Work
3.	Name of Work	:	Construction of distribution system for 467 Ha of CCA including Command Area Development (CAD) of Karadiha and Karanjia Sub-Minor off-taking from R.D. 16045m of Right Main Distributary of Deo Irrigation Project through Underground Pipeline Irrigation system (Gravity flow) in Mayurbhanj District of Odisha on EPC turnkey basis including Operation and Maintenance of complete commissioned project for 05 (five) years.
4	Approximate amount put to tender	:	10.62 Crore
5.	Period of Completion	:	11 (Eleven) Calendar Months including rainy season
6.	Class of Contractor	:	"A" Class and "Special" Class Contractor
7.	Date & time of Availability of Bid document in the portal	:	Dt. 30.10.2026, 10.00 AM to 13.11.2026 up to 5.30 PM
8.	Last date & time of seeking tender clarification	:	Dt.05.11.2026 through email
9.	Date & time for Pre-bid Conference	:	Dt.07.11.2026, 11.00 AM
10	Last date & time of receipt of Bids in the Portal	:	Dt. 13.11.2026 up to 5.30 PM
11	Date, time & place of opening of Technical Bid/s (Cover-I)	:	Dt.16.11.2026 at 10.30 AM in O/o the Chief Construction Engineer, Khairibhandan & Deo Irrigation Project, Karanjia
12	Date, time & place ofopening of Financial Bid/s(Cover-II)	:	To be intimated after evaluation of Technical BID
13	Name & address of the officer inviting Bid	:	Chief Construction Engineer, Khairibhandan & Deo Irrigation Project, Karanjia, AT/PO-Karanjia, PS-Karanjia, Dist-Mayurbhanj, PIN-757037

*Further details can be seen from the Govt. web sitewww.tendersodisha.gov.in.
Any addendum/corrigendum/cancellation of tender can also be seen in the said Website.

Chief Construction Engineer,
Khairibhandan &
Deo Irrigation Project, Karanjia.

DETAILED NOTICE INVITING TENDER

1. **INTRODUCTION:** Government of Odisha proposes to cover command area of **467 Ha** through Distribution System of Karadiha and Karanjia Sub-Minor off-taking from Right Main Distributary of Deo Irrigation Project by UGPL system* (including Micro Irrigation/without micro irrigation/compatible with micro irrigation) up to 1Ha Sub-Chaka level under Engineering Procurement and Construction contracts on Turnkey basis by utilizing water of River Deo in Mayurbhanj District. The System is primarily aimed for irrigation to command area.

1.1 Through this tender, it is now proposed take up execution of UGPL (gravity flow) Irrigation system with distribution network upto 1ha Sub-Chaka area* (including micro irrigation/without micro irrigation/ compatible with micro irrigation) having total planned CCA of 467 ha on EPC mode including Command Area Development (CAD) of Karadiha and Karanjia Sub-Minor off-taking from Right Main Distributary of Deo Irrigation Project and maintenance of complete commissioned project for **5 (five)** years.

1.2 The Broad conceptual layout (BCL) of UGPL System has been prepared based on topo sheet Planning. Salient features of the system based on the planning, is furnished herewith in the Basic Project Profile in the Bidding Document. The locations of system are shown in the index map. The salient features and the drawings provided are for guidance only. Since the present tender is an EPC tender, the contractor is to plan and design the system after detailed survey and investigation depending on site conditions and suitable O&M conditions.

1.3 The approximate value of work put to tender **is Rs.10.62 Cr. (including O & M Cost and excluding GST)**

The Tender Inviting Authority will decide, whether the work is inclusive of micro irrigation /without micro irrigation/compatible with micro irrigation

2. INVITATION:

2.1 Online tenders for the following work is invited on EPC contract basis by **the Chief Construction Engineer, Khairibhandan & Deo Irrigation Project, Karanjia** from the eligible perspective bidders

2.2 The concerned Bidder shall submit the certificate of registration with concerned State / Government bodies / Authority along with the tender.

2.3 The Bidder registered outside Odisha shall get himself registered in "**A-Class or Special Class Contractor**" class in the state of Government of Odisha before signing of agreement.

2.4 Failure of taking action specified in Para 2.2 and 2.3 above, the concerned bidder shall be disqualified and they will be suspended for three years.

3. PARTICULARS OF TENDER

a)	Name of Department	:	Department of Water Resources, Govt. of Odisha.
b)	Tender Notice Number / Bid Identification Number	:	17/CCEKDIP of 2026-27
c)	Period of Completion	:	11 (Eleven) calendar months Including rainy seasons.
d)	Form of Contract	:	EPC (Turn-Key Basis)
e)	Qualification of Bidders	:	A-CLASS AND SPECIAL CLASS CONTRACTOR
f)	Tender category	:	Works.

g)	EMD/Bid Security	:	Rs. 10,62,500.00
h)	Cost of Tender fee	:	Rs. 10,000.00 (Non-Refundable) through online mode
i)	Bid Submission	:	Technical and Financial bid through Online
j)	Bid Validity	:	180 days from last date of receipt of Bid
k)	Availability of tender online Start Date from	:	30.10.2026, 10.00 AM
l)	Availability of tender online Closing Date	:	13.11.2026 upto 5.30 PM
m)	Seek clarification start date	:	30.10.2026 from 10.00 AM through e-mail
n)	Seeking clarification last date (2days before Pre-bid meeting)	:	05.11.2026 up to 5.30 PM
o)	Last date of submission of Bid (Online)	:	13.11.2026 up to 5.30 PM
p)	Pre-Bid meeting	:	07.11.2026 at 11.00 AM to be held in the O/o the Chief Construction Engineer, Khairibhandan & Deo Irrigation Project, Karanjia (Hybrid Mode)
q)	Technical Bid opening date	:	16.11.2026 at 10.30 AM.
r)	Place of Technical Bid opening	:	O/o the Chief Construction Engineer, Khairibhandan & Deo Irrigation Project, Karanjia.
s)	Price Bid opening Date	:	Date & Place of opening of price bid shall be notified by the Chief Construction Engineer, Khairibhandan & Deo Irrigation Project, Karanjia.
t)	Initial Security Deposit (ISD)	:	After acceptance of the tender, 2% of the accepted amount will be deposited by the bidder in shape of NSC / Post Office Saving Bank Account / Post office Time Deposit Account/ Kisan Vikas Patra / Bank Guarantee from any Nationalized/Scheduled Bank in India counter guaranteed by its local branch at Bhubaneswar/e-Bank Guarantee executed on the Nationale-Governance Services Limited (NeSL) Digital Document Execution Portal / Insurance Surety Bond issued by an Insurance Company authorized by the Insurance Regulatory and Development Authority of India(IRDAI)duly pledged in favour of the Superintending Engineer, Deo Head Works Division, Karanjia.[Vide Works Dept. OM No. WORKS-FA-MISCSB-0003-2026-4909/W, dt. 12.03.2026.]
u)	Performance Security	:	5 % of the gross amount will be deducted from each works bill
v)	Authority Inviting Bid	:	O/o the Chief Construction Engineer, Khairibhandan & Deo Irrigation, Project, Karanjia.
w)	Address	:	O/o the Chief Construction Engineer, Khairibhandan & Deo Irrigation Project, At/PO Karanjia, Dist.: Mayurbhanj, Odisha. PIN-757037
x)	Contact Details	:	Telephone No.:06796-296144 Email Id: cce.dip.dowr@gmail.com

4. **Download of Tender Documents:**

The tender documents are available from **30.10.2026, 10.00 AM to 13.11.2026, 5.30 PM** in the website www.tendersodisha.gov.in. Interested bidders can view these tender documents online and can download tender documents. Bidders who wish to submit their offer shall deposit required tender document fees through online mode only.

5. **PRE-BID CONFERENCE:** A Pre-Bid Meeting, open to all prospective bidders, will be convened by the Chief Construction Engineer, Khairibhandan & Deo Irrigation Project, Karanjia on dt.**07.11.2026 at 11.00** AM in Hybrid mode through Google Meet. The interested bidder should ask for link by giving their email id to cce.dip.dowr@gmail.com.

5.1 The purpose of this meeting will be to discuss and answer to the queries on any matter that may be raised by the bidders at that stage.

5.2 The bidders are requested to submit any query in writing, on-line in e-procurement portal or e-mail (**cce.dip.dowr@gmail.com**) to reach the office of the Chief Construction Engineer, Khairibhandan & Deo Irrigation Project, Karanjia during the clarification seeking period as mentioned in NIT before Pre-Bid meeting.

5.3 Any modification of the bid documents that may become necessary as a result of the Pre-Bid Meeting shall be made by the Employer, by issuing an addendum to Bid Documents, which eventually becomes a part of the Agreement.

5.4 The proceedings of the Pre-Bid Meeting will be uploaded in the designated location of the website and shall be treated as a part of bid document. No further information relating to Pre-Bid shall be provided to the bidders.

5.5 Non-attendance at the Pre-Bid meeting shall not be a cause for disqualification of the bidder.

5.6 Non-attendance at the Pre-Bid meeting shall not be considered as ground of ignorance of the Bidders

6. **OPENING OF TENDER**

The Technical Bid will be opened on **dt.16.11.2026 at 10.30 AM** through website **www.tendersodisha.gov.in** at office of the Chief Construction Engineer, Khairibhandan & Deo Irrigation Project, Karanjia. Intending bidders or their representatives who wish to participate in online tender opening can log on to **www.tendersodisha.gov.in** on the due date and time after online opening of the bid by the Authorized Officer. The bidders or only one authorized representative who wishes to remain present at the time of opening of technical bid can do so. The financial bid will be opened after approval of technical bid by the Government of Odisha, DOWR.

7. **GENERAL INSTRUCTIONS**

7.1 The cost of tender document will not be refunded under any circumstances.

7.2 The bid along with EMD specified in tender document shall be accepted only.

7.3 The bid shall be valid for **180 (One hundred eighty) days** from the specified last date of submission of bid through Online.

7.4 Tenders without Tender document fees, EMD and which do not fulfill all or any of the condition or submitted incomplete in any respect will be rejected.

7.5 Conditional tender shall not be accepted.

7.6 The Tender Inviting Authority reserves the right to accept or reject any or all tenders without assigning any reason thereof.

7.7 The bid document shall form a part of contract and only required documents need to be uploaded during online bid submission for evaluation of bid.

7.8 The bidders are advised to read carefully the "**Instruction to Bidders**" contained in the tender documents at Section-II.

7.9 The website address for e -Tendering is www.tendersodisha.gov.in.

7.10 The details of the above notice will be available on www.tendersodisha.gov.in.

7.11 Defects liability period: 05 (five) years from the date of commissioning of the system or 05 Khariff / 05 Rabi water supply seasons whichever is later.

7.12 Operation & Maintenance period: 05 (five) years from the date of commissioning of the system or 05 (five) khariff / Rabi water supply seasons whichever is later.

7.13 The dates stipulated in the NIT are firm and under no circumstances they will be relaxed unless officially extended/modified.

7.14 GST will be deducted from the work bills as applicable by the Govt. from time to time.

7.15 Other terms and conditions shall be applied as per terms and condition of the tender documents.

7.16 Joint Venture tender is acceptable for tentative project cost of **Rs.50.00 Crore and above**. Bids from joint Venture of maximum two firms as partners are acceptable.

7.17 The pipe and equipment manufacturer should not have been blacklisted/ debarred/ dis-qualified/ dis-allowed to supply pipes in case of EPC contracts/ Turnkey contracts/ Supply Order contracts/ Rate contracts for the entire or any part thereof, by any of the Central/ State Government/ Board/ Corporation/ any procuring entity in India with respect to quality issues in last three years from the date of the submission of the tender. The tenderer will submit affidavit from the manufacturer of pipes duly notarized (with seal) in respect of the above condition.

7.18 Eligibility criteria of pipe manufacturing companies to supply pipes will be as per DoWR Letter No.32624/WR, dt.28.11.2024

Further details can be seen from e-Procurement portal **https://tendersodisha.gov.in**

Sd/-
Chief Construction Engineer,
Khairibhandan &
Deo Irrigation Project,
Karanjia.

Memo No: Date.

Copy submitted to the Principal Secretary to Government, Department of Water Resources, Odisha, Bhubaneswar for favour of kind information and necessary action.

Sd/-
CHIEF CONSTRUCTION ENGINEER

Memo No: Date.

Copy submitted to the Engineer-in-Chief, Water Resources, / Engineer-in Chief, Procurement, Odisha, Bhubaneswar for favour of kind information and necessary action.

Sd/-
CHIEF CONSTRUCTION ENGINEER

Memo No: Date.

Copy submitted to the Director, Monitoring and Evaluation, O/o the Engineer-in-Chief, Water Resources, Odisha, Bhubaneswar for favour of information and necessary action. It is requested to kindly publish the NIFB in the official website.

Encl: Soft copy of the e-procurement notice.

Sd/-
CHIEF CONSTRUCTION ENGINEER

Memo No: Date.

Copy submitted to the Head State Portal, IT Center, Information & Technology Department, Odisha Secretariat, Bhubaneswar for favour of information and necessary action. It is requested to kindly publish the tender call notice in the official website of Govt. of Odisha on or before 30.10.2026.

Encl: Soft copy of the e-procurement notice.

Sd/-
CHIEF CONSTRUCTION ENGINEER

Memo No: Date.

Copy submitted to the Director, Printing, Stationery & Publication, Government Press, Madhupatna, Cuttack with a request to publish the notice in the next issue of Odisha Gazette.

Sd/-
CHIEF CONSTRUCTION ENGINEER

Memo No: Date.

Copy submitted to the Collector & District Magistrate, Mayurbhanj & Keonjhar/ Superintendent of Police, Mayurbhanj, Baripada for information and wide publication.

Sd/-
CHIEF CONSTRUCTION ENGINEER

Memo No: Date.

Copy to the Superintending Engineer, M.I. Division, Jashipur / Deo Canal Division, Karanjia / Deo Head Works Division, Karanjia/ R.W Division Karanjia/ R & B Division Rairangpur / Executive Officer, Karanjia NAC for information and wide publication.

Sd/-
CHIEF CONSTRUCTION ENGINEER

Memo No: Date.

Copy to the District Informatics Officer, NIC Collectorate, Baripada, Dist.: Mayurbhanj for favour of kind information and necessary action. He is requested to display the tender notice in the Dist. website.

Sd/-
CHIEF CONSTRUCTION ENGINEER

Memo No: Date.

Copy to Notice Board of Chief Construction Engineer, Khairibhandan & Deo Irrigation Project, Karanjia for wide publication.

Sd/-
CHIEF CONSTRUCTION ENGINEER

SECTION – II

INSTRUCTION TO BIDDERS

SECTION – II
INSTRUCTION TO BIDDERS

1. SPECIAL ATTENTION.

1.1 The tenders are invited on turnkey basis with single point responsibility from EPC agencies/firms, which are registered as "A" Class and "Special" class agency with Govt. of Odisha. Agencies registered in special class or equivalent grade outside Odisha are also eligible. However, they shall get themselves registered in special class in the State of Odisha before signing of agreement.

1.2 All bidders are urged to submit a written request immediately upon receipt of the tender documents for the matter where clarifications and/or additional information are desired, along with the details of work. All such request should reach Office of the authority inviting tender at least two day before the pre-bid conference through e-mail.

1.3 The bidders are advised to visit the site before quoting the rates for price bid. They should ascertain all the required data for completion of the work on **TURNKEY BASIS.**

1.4 The tender document shall be submitted as per procedure laid down in Clause 14, **Section –II, (Instruction to Bidders)**.

1.5 Tender shall be opened as per procedure laid down in Clause-15 & 16, **Section –II, (Instruction to Bidders)**.

1.6 All bidders are cautioned that bid containing any deviation from the contractual terms and conditions, specifications or requirements shall be rejected as non-responsive.

1.7 Conditional bid will be rejected outright. No condition shall be included in tender.

1.8 Alternative bids are not acceptable.

1.9 Evaluation of bid will be done when tender is considered responsive as per conditions of the technical bid document.

1.10 Bidder shall have to submit a declaration regarding correctness of the information in tenders submitted in shape of affidavit in the prescribed format.

1.11 The Department / Authority reserve the right to qualify /disqualify any bidder without assigning any reason thereof.

1.12 Bidders shall be disqualified if they have made untrue or false representation in the forms, statements and attachments required in the bid documents;

Or

Record of poor performance either due to technical or financial grounds or any other reasons.

1.13 If the bidder has submitted tender fee and Bid Security Declaration online, the request of the bidder for not opening of bid shall not be accepted in any circumstances.

1.14 The bidder intending to hire/lease equipments/machineries are required to furnish proof of ownership from the company/person providing equipments/machineries on hire/lease deed should cover the entire period of work. In the event of non-submission of above specified documents in proper shape, the document will be summarily rejected.

1.15 Before releasing the work order after finalization of the tender, it should be ensured that the bidders shall have provident code number, if applicable and the bidder shall also ensure compliance of the EPF & MP Act, 1952 by the sub-contractors, if any engaged by the bidder for the said work.(This is as per Lr No-1909(41)/LESI dated 04.03.2017 of Labour & ESI Deptt., Govt. of Odisha)

1.16 The bidder shall have to upload all required documents as per Clause No. 14 of Section – II duly scanned with his bid. Only scanned copy uploaded shall be considered. The bid shall be considered non–responsive, if any required documents are not uploaded duly scanned during online submission of bid.

2. DEFINITIONS.

In this document the following words and expressions have the meaning hereby assigned to them.

2.1 **Bidder**: firm, Limited Company or Corporation, as eligible for bidding.

2.2 **Contractor/ Agency**: Shall mean the Bidder whose bid will be accepted by the Owner for award of the Work and shall include such successful Bidder's legal representatives, successors and permitted assignees.

Prime Contractor- A contractor/agency who has executed directly any work or through an agreement with any Govt. Organization/UTs/Central Govt./Central PSUs/State PSUs.

2.3 **Government / Owner / Employer**: Means the Government of Odisha / Department of Water Resources (or Employer or Owner).

2.4 **Online**: Any activity that is done on website is referred as 'Online' activity e.g., Submission of Price Bid online would mean that the Price Bid has to be submitted on the prescribed website.

2.5 **Offline**: Any activity that is done in conventional route is referred as 'Offline' activity e.g., Submission of Earnest Money Deposit in Offline fashion would mean the Earnest Money Deposit is to be Submitted in Form of Demand Draft and is to be physically sent to the concerned officer.

2.6 **E-Tender**: Tender in which one can participate online by means of logging on to the respective website.

2.7 **Digital Signature**: Any electronic document, which contains encrypted message digest using hash algorithm and Tenders public key is known as Digitally Signed Documents and the process of generating such document is called digitally signing it.

2.8 **Scanned Copy**: Electronic Copy of any document generated using a Scanner.

2.9 **System**: Means the computer which hosts the website (www.tendersodisha.gov.in) where bidders can participate in the tendering process online.

2.10 **Upload:** The process of transferring electronic document from bidder's computer using internet connection to the website is called uploading.

2.11 **Approved / Approval**: Means approval in writing.

2.12 **Construction Plant**: Means all equipment, appliances or things of whatsoever nature required for the execution, completion or maintenance of the work or temporary works but does not include materials or other things intended to form or forming part of permanent work.

2.13 **Contract:** Means the instructions and information for bidders, general and special conditions, specifications, drawings, tender (including schedules of quantities & tender prices), the formal agreement and all addenda and attachments related to the above.

2.14 **Drawings**: Means the drawings referred to in the specifications, any modifications of such drawings approved in writing by the Executive Engineer, and such other drawings as may from time to time be furnished or approved in writing by the Engineer-in-Charge.

2.15 **Engineer/Engineer-in-Charge**: Means the Superintending Engineer in charge of the works, specified parts of the works under the contract or such other departmental Deputy Executive Engineer/ Assistant Executive Engineers /Assistant Engineers or Junior Engineers to whom the Engineer-in-Charge may have delegated certain duties, acting separately within the scope of the particular duties entrusted to them.

The agency will be given a copy of the Government / Department authorization designating the Engineer-in-Charge by designation and delegating him his authority at the time when contract is signed. It is however, to be distinctly understood that, no delegation of powers shall be made to such departmental assistants or subordinates, except in respect of supervision to ensure compliance of the contract conditions.

2.16 **Contract Price**: Means the agreed amount stated in the Contract Agreement for the design, execution and completion of the works on turn-key basis and the remedying of any defects, and includes adjustments (if any) in accordance with the contract.

2.17 **Agency's Equipment**: Means all apparatus, machinery, vehicles and other things required & brought to site by the agency, for the execution and completion of the works and the remedying of any defects. However, Agency's Equipment excludes Temporary works, Employer's equipment (if any) plant, materials and any other things intended to form or forming part of the permanent works.

2.18 **Goods**: Means Agency's Equipment, Materials, Plant and Temporary Works, or any of them as appropriate.

2.19 **Materials**: Means things of all kinds (other than Plant) intended to form or forming part of the Permanent Works, including the supply of materials (if any) to be supplied by the Agency under the Contract.

2.20 **Permanent Works**: Means the permanent works to be designed and executed by the Agency under the Contract.

2.21 **I.S.S/ B.I.S**: Means Indian Standard specifications/ Bureau of Indian standard.

2.22 **Month**: Means from the beginning of a given date of a calendar month to the end of preceding date of the next calendar month.

2.23 **Week:** Means seven consecutive days.

2.24 **Rupees**: Means Rupees of Indian Currency.

2.25 **Site:** Means the lands and other places on, under, in or through which, the works are to be executed or carried out and any other lands or places provided by the Owner for the purposes of the contract together with such other places as may be specifically designated in the Contract or subsequently approved as forming part of the site.

2.26 **Superintending Engineer**: Means the Superintending Engineer in overall charge of the works i.e. Engineer-in-Charge.

2.27 **Temporary Works**: Means all temporary works of every kind required for performance of the Contract.

2.28 **Works**: Means the works to be executed in accordance with the contract.

2.29 **Country**: Means the Country in which the site (or most of it) is located, where the Permanent Works are to be executed i.e. INDIA.

2.30 **'Sub-Agency'** shall mean the person named in the Contract for any part of the Works or any person to whom any part of the Contract has been sub-let by the Agency with the consent in writing of the Engineer-in-Charge and will include the legal representatives, successors and permitted assignees of such person.

2.31 **'Consulting Engineer'/'Consultant'** shall mean any firm or person duly appointed as such from time to time by the Owner which includes;

- **(i) WALMI- Water and Land Management Institute, an autonomous body under Department of Water Resources, Govt. of Odisha.**
- **(ii) PEC- Proof Engineering Consultant**
- **(iii) TPIA- Third Party Inspection Agency**

2.32 '**Specification'** shall mean the Technical Specifications forming a part of the Contract and such other schedules and drawings as may be mutually agreed upon.

2.33 The term **'Erection Portion'** of the Contract Price shall mean the value of field activities of the Contract including erection, testing and commissioning to be performed at Site by the Agency.

2.34 **'Manufacturer's Works'** or **'Agency's Works'** shall mean the place of work used by the Manufacturer, the Agency and their Collaborators for the performance of the Works.

2.35 **'Inspector'** shall mean the Owner or any person nominated by the Owner from time to time, to inspect the equipment, stores or works under the Contract and/or the duly authorized representative of the Owner.

2.36 **'Notice of Award of Contract'/'Letter of Award'/'Telex of Award'** shall mean the official notice issued by the Owner notifying the Agency that his proposal has been accepted.

2.37 **'Date of Contract'** shall mean the date on which both the parties have signed the Contract Agreement.

2.38 **'Writing'** shall include any manuscript, type-written or printed statement, under or over signature and/ or seal as the case may be.

2.39 When the words 'Approved', 'Subject to Approval', 'Satisfactory', 'Equal to', 'Proper' 'Requested', 'As Directed', 'Where Directed', 'When Directed', 'Determined By', 'Accepted', 'Permitted' or words and phrases of like import are used, the approval, judgment, direction etc. is understood to be function of the Owner/Engineer.

2.40 **"Consumer installation"** means any composite electrical unit including electric wires, fittings, motors, transformers and apparatus portable and stationary, indoor, outdoor and underground erected and wired by or on behalf of the consumer in one and at the same premises

2.41 **'Guarantee Period'/Maintenance Period'** shall mean the period during which the Agency shall remain liable for repair or replacement of any defective part of the Works performed under the Contract.

2.42 **"Flood Seasons"** shall mean the period from 1st June to 31st October.

2.43 Words importing the singular only shall also include the plural and vice-versa where the context so requires.

2.44 Words importing 'Person' shall include firms, companies, corporations and associations or bodies of individuals, whether incorporated or not.

2.45 Terms and expressions not herein defined shall have the same meaning as are assigned to them in the Indian Sale of goods Act (1930), failing that in the Indian Contract Act (1872) and failing that in the General Clauses Act (1897).

2.46 FOT: Famers' Organization and Turnover i.e. formation of Pani-Panchayat (WUA) and training them / organization for operation and maintenance of the system.

3. GENERAL DESCRIPTION OF THE WORK.

i) **Construction of distribution system for 467 Ha of CCA including Command Area Development (CAD) of Karadiha and Karanjia Sub-Minor off-taking from R.D. 16045m of Right Main Distributary of Deo Irrigation Project through Underground Pipeline Irrigation system (Gravity flow) in Mayurbhanj District of Odisha on EPC turnkey basis including Operation and Maintenance of complete commissioned project for 05 (five) years.**

ii) Operation & Maintenance of complete commissioned system for five years**.**

4. BRIEF DESCRIPTION & SCOPE OF WORK

4.1 The project is proposed to be implemented on Engineering Procurement and Construction (EPC) on Turnkey basis on single point responsibility. The work includes providing, supplying, laying, jointing etc. complete in all respects for UGPL distributaries, Minors, Sub-minors & CAD works. Moreover, providing off-take structures, control structures, air valves, blow off assemblies, flush valves, turnout structures etc. whatever required for serving the command efficiently up to 1 Ha sub-

chak as per provision to Har Khet Ko Pani under AIBP-PMKSY / CADWM Project. The bidder shall be responsible for the survey, investigation, planning, designs, estimation, getting approval of the design & drawings, preparation of technical datasheet, Quality Assurance Programme, construction programme etc. for all components of the project as per the works specifications provided in the bid documents and commissioning of the project on turnkey basis followed by operation and maintenance of the entire project in the package for a period of five years or five Khariff & five Rabi seasons whichever is later.

4.2 **Detail scope of work:**

Survey & Investigation shall include but not limited to following activities

4.2.1 Survey & detailed Investigation, subsoil exploration, planning, fixing alignment and designing of all components, preparation of detailed technical specification and preparation of detailedestimate as per SOR of Govt. of Odisha on the basis of approved design & drawing by the competent authority.

4.2.2 Fixing of permanent & Temporary Benchmark stones and transferring the values of the levels to the required worksite.

4.2.3 Collection of revenue village maps, demarcation of command area, contour survey of the command area with contour interval of 0.5m, survey along the alignment of rising main/Pressure main including alternatives, marking the alignment of distribution systems in the village sheet, assessment of the CCA for the workfrom the records of the rights of villages (R.O.R).

4.2.4 Preparation of List of beneficiaries chak wise with holding area & category (kisam) of land from the Records of Rights (R.O.R) of villages coming under CCA.

4.2.5 Preparation of site survey plans for all crossing of the pipe lines to the rivers, nallahs, roads, drains, railway lines existing water, gas & oil pipes etc .

4.2.6 Processing of land alienation/acquisition proposals (Govt. & Private) as per LA act including environment & forest clearance, if any required on the basis of approved alignment, preparation of land schedule and property cases if any, submitting to the Deptt., Pursuing the same till completion of the process and getting approval/award from competent authority as per LA act, processing the Right of way/ Right of use permission from different Govt., Semi Govt. and private authority if required.

4.3 **Design:**

4.3.1 Preparation of separate plan for the Rising main/Pressure main, distribution chambers and distribution networks.

4.3.2 Design of all components and sub components including intake system, Rising main/Pressure mains, distribution chamber, distribution network etc.

4.3.3 Processing for approval of all the required designs & drawings and getting it approved from competent authority.

4.4 **Procurement & Installation:**

4.4.1 Preparation of Procurement schedule for construction materials, machineries and equipment.

4.4.2 Making arrangement for pre-procurement quality verification by third party.

4.4.3 Procurement of the machineries and equipment, if required for the work as per the specifications of the agreement.

4.4.4 Installation and commissioning of machineries and equipment, if required as per the approved drawings**.**

4.5 **Works:**

4.5.1 Preparation of CPM/PERT chart for scheduling the construction as per the mile stone.

4.5.2 Intake structures including protection works.

4.5.3 Rising main/Pressure mains, distribution tank or chamber, distribution through pipe systems including civil & other works.

4.6 **Operation & Maintenance:**

4.6.1 Operation & Maintenance of the system for five years or five Kharif / five Rabi water supply seasons whichever is later.

4.6.2 Capacity building of O&M staff of Government.

4.6.3 Preparation of operation and maintenance manual of the system.

4.6.4 Continued capacity building and training up to market linkage of WUAs by local NGO

4.7 **Other Responsibilities:**

4.7.1 The scope also includes necessary co-ordination and management to obtain consent or permission from affected bodies/ authority/ parties whose damage to property is involved in construction of all the components. The agency will be responsible for processing all the documents required for permission for right way/right of use from Govt., Semi Govt. and private parties etc. All statutory charges required to be paid for this shall be borne by the Govt. The Engineer-in-Charge will sign the necessary documents required for permissions/ clearances/land acquisition. Required co-ordination for sanction from the concerned authority & NOC from the concerned authority / field owner for satisfactory completion shall be provided by the bidder. For laying pipeline under railway, roads, existing gas, oil or water pipe lines etc. all the statutory charges shall be borne by the Govt. On satisfactory completion of the work required NOC is to be obtained from the concerned department by the bidder.

4.7.2 The Contractor shall be responsible for compensation to be paid for standing crops, trees etc. and the cost there upon shall not be borne by the Govt.

4.7.3 During planning & design, care shall be taken by the contractor to avoid forest land. In unavoidable circumstances, the contractor shall process all forest clearance paper works on behalf of the Department. Cost of forest land & cost of afforestation, if any to be required shall be paid by the Department.

5. COMMUNICATION

5.1 Airports: Bhubaneswar & Jharsuguda is the nearby airports in Odisha and Kolkata in West Bengal.

5.2 Railways: Kendujhar and Badampahar railway stations are the main railway stations on the East Coast Railways nearer to the work.

5.3 Roads: Nearest town approach is Karanjia which are connected by National Highway. The site of UGPL scheme is approachable by MDR, PMGSY roads & Panchayat roads.

5.4 Approach to work site: The bidder has to make his own arrangement for approaching to the work site from nearest point of connecting roads.

6. GENERAL FACILITIES:

6.1 **Transport Communication Facilities**: The agency has to make arrangement at his own cost to transport all his construction equipments, construction materials and labour to work site.

6.2 **Availability of Labour**: Both semi-skilled & unskilled labour required for the work are available in project area and it is preferable to engage local labour. However, the Agency must make his own arrangements for labour/ machineries/ equipments.

6.3 **Availability of petrol, Diesel and other lubricants**: The nearest petrol pumps for procurement of petrol, diesel and other lubricants are available at nearest State High ways/ National high ways/ Sub-Division/District Head Quarters. The agency shall make his own arrangement for procurement of same at his own cost required for the machineries and equipments engaged for the work.

6.4 **Electricity Supply:** The Agency shall make his own arrangement for extension of electric connection at his own cost from the Distribution Companies if so required by him.

6.5 **Housing Facilities**: Private house may not be available in the vicinity of the work site. The Agency shall make his own arrangement for housing the Laborers, workers and staff at the work site.

6.6 **Medical Aid:** The Health Centre is available at Govt. Hospitals at the nearest Block/Sub-Division/District head quarters. However, the Agency shall make first aid arrangement at his own cost in accordance with rule and regulations of prevailing Labour Act.

6.7 **Post, Telegraph & Telephones**: Post, Telegraph, Telephones & Fax are available at Block/Sub-Division/District head quarters. Most of the sites are covered by different mobile networks**.**

7. CLIMATE AND WORKING SEASON

7.1 **Climate**: The Project area has moderate climate with temperature varying from 7°C to 46°C. The rainy season is generally confined to four months from 15th June to 15th October.

7.2 **Working Season**: Since rainfall is confined mainly to the period starting from middle of June to the middle of October, it may be necessary to close the work of concrete during the monsoon. However, the work of earthwork and pipeline work can be continued in dry spells during the monsoon.

8. COST OF BIDDING

All costs and expenses incidental to preparation of the proposals, to attend discussion and conferences, if any, including pre-award discussion with the successful bidder, technical and other presentation including any demonstration, etc. shall be borne by the bidders and the Employer shall bear no liabilities whatsoever on such cost and expenses.

9. LANGUAGE OF TENDER

Tender documents shall be submitted in prescribed form in English only. All literature or correspondence in connection with tender shall be made in English only.

10. BID VALIDITY:

10.1 Bids shall remain valid for a period of not less than One hundred eighty (180) days from the last date of submission of Bids.

10.2 During the above mentioned period no plea by the Bidder for any sort of modification of the Bid based upon or arising out of any alleged misunderstanding of misconceptions or mistake or for any reason will be entertained.

10.3 In exceptional circumstances, prior to expiry of the original time limit, the Bid Inviting Officer may request the bidders to extend the period of validity for a specified additional period. Such request to the bidders shall be made in writing.

11.METHOD OF TENDERING

11.1 If the tender is uploaded by an individual, it shall be digitally signed by the individual.

11.2 If the tender is uploaded by a proprietary firm, it shall be digitally signed by the proprietor.

11.3 If the tender is uploaded by a firm in partnership, it shall be digitally signed by a partner holding a registered power of attorney for the firm in which case a certified copy of the power of attorney shall accompany the tender, a certified copy of the partnership deed, full name, current address of the firm, current addresses of all the partners of the firm shall also accompany the tender.

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

tender. Such limited company or corporation may be required to furnish satisfactory evidence of its existence before the contract is awarded. They should also furnish Articles of Memorandum of Association.

11.5 Each bidder shall submit only one bid for the work. A bidder who submits more than one bid for the work will be disqualified.

12. EARNEST MONEY DEPOSIT (EMD)

12.1 The bid must be accompanied with EMD, which should be transferred through online mode / unconditional and irrevocable Bank Guarantee (BG) pledged in favour of the Divisional Officer as specified in the Bid document in the standard format on any Nationalized/ Scheduled Commercial Bank located anywhere in the country with Branches at Bhubaneswar with facility of authentication & encashment at Bhubaneswar Branch. Standard format for Bank Gurantee for EMD provided at Annexure-I of SECTION-III in the bid document.

12.2 (i) The bid without EMD will be summarily rejected.
(ii)The EMD will be forfeited in case, where bidders/tenderers back out from the offer before acceptance of tender by the competent authority.

12.3 The bidder shall be debarred from participation in bidding for three years and action will be taken to blacklist the contractor in the following cases:
(i) In case of successful Bidder, if the bidder fails to submit ISD & Additional Performance Security as specified in instructions to bidder.
(ii) In the case of a successful Bidder, if the bidder fails to sign the Contract for whatever the reason.

12.4 If required, the Department may request to extend the bid validity period.

13. ACCOMPANIMENTS TO TENDER

The bidder shall have to upload following legible documents duly signed digitally.

13.1 Scanned copy of the PAN/ TIN and GST.

13.2 Declaration showing the works in hand with the bidder and the value of works that remain to be executed in each case in prescribed forms required for evaluation of qualification of the bidder.

13.3 Scanned copy of the certificate of Registration as Approved Bidder of concerned State Government / Railway / CPWD / Government bodies.

13.4 Scanned copy of Demand draft towards tender document fee and Bid Security Declaration.

13.5 Scanned copy of current year solvency certificate & Credit Facility available from any Nationalized Bank / Scheduled Bank so as to assess the capability of the bidder for execution of work.

13.6 The copy of power of attorney, if power is delegated for signing the bid to other person by the bidder. (As per para-11 of Section-II)

13.7 Forms with Annexure shall have to be submitted in Electronic form and where the space / window of the prescribed form are not sufficient to fill required matter, bidder may submit the details in separate “scanned sheet”. In online submission, the bidders have to mention relevant form number in heading of above mentioned separate “scanned sheet”.

13.8 Other documents as mentioned in Tender Notice.
All other documents mentioned in the tender documents in physical form shall also be uploaded.

14.0 SUBMISSION OF TENDER

14.1 The bidders shall submit their tender online only. In case of any failure, malfunction or breakdown of electronic system used during the e-procurement process, the tender inviting authority shall not accept any responsibility for failure or breakdown other than in those systems strictly within their own control.

14.2 The e-procurement applications are PKI (Public Key Infrastructure) enabled and supports the Digital Signature Certificates (DSC) of appropriate class issued from a registered Certifying Authority (CA) as stipulated by Controller of Certifying Authorities (CCA), Government of India such as n-code, Sify, TCS, e-Mudhra etc., for signing the bids at the time of submission by agency. The contactor has to procure Digital Signature Certificates issued by above authority as per the procedure. This process should be completed before award of the work. Digitally signed bids are to be submitted electronically through e-procurement, without which the tender will not be considered for opening the Price Bid.

14.3 Suitable training will be given by **State Procurement Cell, Nirman Soudh, Bhubaneswar** to the bidders interested to know the procedure of bid submission on e-procurement platform. The telephone No is 18003456765 (Toll free), 0674-2530998.

14.4 The bidders would be required to register on the e-procurement market place www.tendersorissa.gov.in and submit their bids online. The Department will not accept any bid submitted in the paper form. The bidders should quote their Tender contract price at the prescribed field / place provided in the e-market place.

14.5 The bidder may ask question online in the e-procurement portal using his/her DSC, provided the questions are raised within the period of seeking clarification as mentioned in the particular of tender. The officer inviting tender will clarify queries related to the tender.

14.6 Intending bidders can contact the office of the Chief Construction Engineer, Khairibhandan & Deo Irrigation Project, Karanjia for any clarification, information on any working day during working hours. No clarification will be entertained after the Pre-Bid meeting.

14.7 The bidders are requested to submit the bids in single stage with double covers. Cover-I -Technical Bid (Qualification Criteria) and Cover-II - Financial Bid in separate.

14.8 All Bidders including joint venture should submit the certified copies and fulfill the following criteria.

a) The bid shall include all the information listed as below: -

(i) Copies of original documents defining the constitution or legal status, place of registration, and principal place of business; written power of attorney of the signatory of the Bid to commit the Bidder;

(ii) Total monetary value of construction work performed by each partner during the last five years;

(iii) Experience in works of a similar nature and size for each partner in the last five years, and details of works or committed contracts; and clients who may be contacted for further information on those contracts;

(iv) Major items of construction equipment proposed to carry out the Contract;

(v) Qualifications and experience of key site management and technical personnel proposed for the Contract;

(vi) Reports on the financial standing of the Bidder, such as profit and loss statements and auditor's reports for the past five years;

(vii) Evidence of adequacy of working capital for this contract (access to line (s) of credit and availability of other financial resources);

(viii) Authority has the right to seek references from the Bidder's bankers;

(ix) Information regarding any litigation or arbitration resulting from contracts executed by the Bidder in the last five years or currently under execution. The information shall include the names of the parties concerned, the disputed amount, cause of litigation, and matter in dispute if any;

(x) The proposed methodology and programme of construction including Environmental Management Plan backed with equipment, materials and manpower planning and deployment, duly supported with broad calculations and quality control procedures proposed to be adopted, justifying their capability of execution and completion of the work as per technical specifications within the stipulated period of completion as per milestones.

b) Bids from joint ventures are acceptable of tentative project cost of Rs.50.00 Crore and above. Bids from joint venture of maximum two firms as partners are acceptable.

For determining the eligibility of Applicants for their qualification hereunder, the following shall apply:

A. (a) The Applicant for qualification may be a single entity or a group of entities (the "Joint Venture"), coming together to take part in Bid competition. However, no applicant applying individually or as a member of a Joint Venture, as the case may be, can be member of another Applicant. The term Applicant used herein would apply to both a single entity and a Joint Venture.

(b) An Applicant may be a company incorporated under the Indian Companies Act, 1956 or a combination of companies with a formal intent to enter into a Joint Venture agreement or under an existing agreement to form a Joint Venture. A Joint Venture shall be eligible for consideration subject to the conditions as mentioned.

(c) An Applicant shall not have a conflict of interest (the "Conflict of Interest") that affects the Bidding Process. Any Applicant found to have a Conflict of Interest shall be disqualified. An Applicant shall be deemed to have a Conflict of Interest affecting the Bidding Process, if:

(i) the Applicant, its Member or any constituent thereof and any other Applicant, its Member or any constituent thereof have common controlling shareholders or other ownership interest; provided that this disqualification shall not apply in cases where the direct or indirect shareholding of an Applicant, its Member thereof (or any shareholder thereof having a shareholding of more than 5 per cent of the paid up and subscribed share capital of such Applicant, Member, as the case may be), in the other Applicant, its Member is less than 5 per cent of the subscribed and paid up equity share capital thereof; provided further that this disqualification shall not apply to any ownership by a bank, insurance company, pension fund or a public financial institution referred to in section 4A of the Companies Act 1956. For the purposes of this Clause 79 (c), indirect shareholding held through one or more intermediate persons shall be computed as follows: (aa) where any intermediary is controlled by a person through management control or otherwise, the entire shareholding held by such controlled intermediary in any other person (the "Subject Person") shall be taken into account for

computing the shareholding of such controlling person in the Subject Person; and (bb) subject always to sub-clause (aa) above, where a person does not exercise control over an intermediary, which has shareholding in the Subject Person, the computation of indirect shareholding of such person in the Subject Person shall be undertaken on a proportionate basis; provided, however, that no such shareholding shall be reckoned under this sub-clause (bb) if the shareholding of such person in the intermediary is less than 26% of the subscribed and paid up equity shareholding of such intermediary; or

(ii) a constituent of such Applicant is also a constituent of another Applicant; or

(iii) such Applicant receives or has received any direct or indirect subsidy, grant, concessional loan or subordinated debt from any other Applicant, or has provided any such subsidy, grant, concessional loan or subordinated debt to any other Applicant, its Member thereof; or

(iv) such Applicant has the same legal representative for purposes of this Application as any other Applicant; or

(v) such Applicant has a relationship with another Applicant, directly or through common third party/ parties, that puts either or both of them in a position to have access to each others' information about, or to influence the Application of either or each other; or

(vi) such Applicant has participated as a consultant to the Authority in the preparation of any documents, design or technical specifications of the Project.

(d) An Applicant shall be liable for disqualification if any legal, financial or technical adviser of the Authority in relation to the Project is engaged by the Applicant, or any of its Members, as the case may be, in any manner for matters related to or incidental to the Project. For the avoidance of doubt, this disqualification shall not apply where such adviser was engaged by the Applicant, its Member in the past but its assignment expired or was terminated 6 (six) months prior to the date of issue of the NIT. Nor will this disqualification apply where such adviser is engaged after a period of 3 (three) years from the date of commercial operation of the Project.

Explanation: In case an Applicant is a Joint Venture, then the term Applicant as used in this document, shall include each Member of such Joint Venture.

B. The bid and, in case of a successful bid, the Agreement, shall be signed by the lead partner so as to be legally binding on all partners;

C. The partner having the highest share shall be created as the lead partner. The lead partners shall be nominated as being in charge, and this authorization shall be evidenced by submitting a power of attorney signed by legally authorized signatories of all the partners;

D. the partner in charge shall be authorized to incur liabilities and receive instructions for and on behalf of all partners of the joint venture and the entire execution of the contract, including payment, shall be done exclusively with the partner in charge;

E. all partners of the joint venture shall be liable jointly and severally for the execution of the contract in accordance with the contract terms, and a statement to this effect shall be included in the authorization mentioned under [c] above, as well as in the bid and in the Agreement [in case of a successful bid];

F. the joint venture agreement should indicate precisely the role of all members of JV in respect of planning, design, construction equipment, key personnel, work execution, and financing of the project. All members of JV should have active participation in execution during the currency of the contract. This should not be varied/modified subsequently without prior approval of the employer,

G. the joint venture agreement should be registered in India so as to be legally valid and binding on partners; and

H. a copy of the Joint Venture Agreement entered into by the partners shall be submitted with the bid vide appendix-III. Alternatively, a Letter of Intent to execute a joint Venture Agreement in the event of a successful bid shall be signed by all partners and submitted with the bid, together with a copy of the proposed Agreement

I. "A Bidder may be a firm that is a private entity, a government-owned entity-subject to IIT (Section -2) – or any combination of such entities in the form of a joint venture (JV) under an existing agreement or with the intent to enter into such an agreement supported by a letter of intent. The JV shall nominate a Representative from the partners who shall have the authority to conduct all business for and on behalf of any and all the members of the JV during the bidding process and, in the event the JV is awarded the Contract, during contract execution.

J. The joint venture should submit the certificates in the forms enclosed in Section-3.

K. In case of a Joint Venture, the JV must collectively satisfy the Minimum Technical Capacity, provided that all the Member must individually satisfy at least 20% requirement of Technical capacity.

Further, the JV must collectively and individually satisfy Financial Capacity (i.e. Minimum Annual Turnover, Credit Facility & Bid Capacity) proportionately as defined in the joint venture agreement.

The Applicant should submit a Power of Attorney as per the format at Appendix-I of Section-III, authorizing the signatory of the Application to commit the Applicant. In the case of a Joint Venture, the Members should submit a Power of Attorney in favour of the Lead Member as per format at Appendix-II of Section-III.

L. In case the Applicant is a Joint Venture, it shall comply with the following additional requirements:

a) Number of members in a Joint Venture shall not exceed 2 (two);

b) Subject to the provisions of clause (a) above, the Application should contain the information required for each Member of the Joint Venture;

c) the Application should include a brief description of the roles and responsibilities of individual members, particularly with reference to financial, technical and defect liability obligations;

d) an individual Applicant cannot at the same time be member of a Joint Venture applying for qualification. Further, a member of a particular Applicant Joint Venture cannot be member of any other Applicant Joint Venture applying for qualification;

e) Members of the Joint Venture shall have entered into a binding Joint Bidding Agreement, substantially in the form specified at Appendix-III of Section-3 (the "Jt.

Bidding Agreement"), for the purpose of making the Application and submitting a Bid in the event of being qualified. The Jt. Bidding Agreement, to be submitted along with the application, shall, interalia :

(i) Convey the commitment(s) of the Lead Member in accordance with this SBD, in case the contract to undertake the Project is awarded to the Joint Venture;

(ii) Clearly outline the proposed roles and responsibilities, if any, of each member;

(iii) Commit the approximate share of work to be undertaken by each member;

(iv) Include a statement to the effect that all members of the Joint Venture shall be liable jointly and severally for all obligations of the Contractor in relation to the Project until the completion of the Project (the "Defects Liability Period") is achieved.

f) Except as provided under this Bidding Documents, there shall not be any amendment to the joint venture Bidding Agreement.

M. Any entity which has been barred by the Central/State Government, or any entity controlled by it, from participating in any project, and the bar subsists as on the date of Application, would not be eligible to submit an application, either individually or as member of a Joint Venture.

N. An Applicant including any member should, in the last 5(five) years, have neither failed to perform on any contract, as evidenced by imposition of a penalty by an arbitral or judicial authority or a judicial pronouncement or arbitration award against the Applicant or Member, as the case may be, nor has been expelled from any project or contract by any public entity nor have had any contract terminated by any public entity for breach by such Applicant or Member.

O. The Applicant including any Member may provide details of all their on-going projects along with stage of litigation, if so, against the Authority/Governments.

The Applicant including any member may also provide details of on-going process of blacklisting if so, under any contract with Authority/Government.

COVER-I: TECHNICAL BID (Qualification Criteria)

This will contain the following documents in three PDF files:

File–I: This shall contain

1. Letter of Submission (Form A),
2. Information of Cost of Bid Document & Bid security declaration in Form C,
3. Registration Certificate,
4. GST Registration No.,
5. Any other Registration No. (if any)
6. PAN,
7. Latest income tax return certificate,
8. Declaration Affidavit (Form J),
9. No Relationship Certificate (Form D),
10. Power of Attorney (Appendix-I).

File-II: This shall contain

1. Assessed Available Bid capacity as specified in clause under "INSTRUCTION TO BIDDERS",
2. Details of Financial Capacity
3. List of works in hand
4. List of machinery & Equipments available for the work
5. Similar nature of works executed

6. Details of personnel to be engaged in this work
7. Additional information
8. Bank Certificate for credit facility
9. Litigation History

And any other document required as per bid documents.

File-III: This shall contain

1. Details of technical proposal along with all technical data in the format in accordance with technical specification of bid document describing broadly the technology and methodology of Survey & Investigation, Planning, Design and Construction of major components along with irrigation distribution network of the project including Commissioning of the total project.
2. The bidder shall furnish the Methodology of the proposed Operation & Maintenance for five years with particular reference to minimum Life Cycle Cost and other O&M expenses separately.
3. A construction programme for completion of the project in 11 (Eleven) months is to be furnished.

Cover-2: Financial bid

This will contain Financial Bid (Appendix-FB), shall be uploaded in one file.

File – I: The Financial Bid (Appendix–FB) shall be in intelligent Excel format. This is to be downloaded from website; the lump sum price is to be filled up without any change in wording & format and uploaded.

Q.

1. The following documents in file - I of cover I- Technical Bid i.e. Cost of Bid documents, EMD/Bid security, Affidavits, No Relationship Certificate, Power of attorney are to be submitted by the bidder. Similarly, if any of the documents furnished by the bidder is found to be false / fabricated / bogus, the bidder will be black listed and the EMD will be forfeited. The other documents of file I, file II and file III of Technical Bid are also to be uploaded.
2. The bidder must submit online duly filled in Forms, Schedules, i.e. of Technical Bid and Forms and Annexure of Price Bid etc. All the forms, annexure shall be submitted duly filled in electronic form & shall be available on website.
3. The bidder shall fill & submit the required details / data / information in the prescribed form of tender document i.e. Volume– I.
4. The bidder shall quote his/her rate only in Price Bid.
5. **Tender in offline mode will not be accepted.**
6. If Earnest Money Deposit (EMD) has not been received with the tender as mentioned in Para No.-12 of Section-II, Tender shall be liable for rejection.
7. The employer at its discretion can extend the last date for submission of tender by amending the bidding document in which case all rights and obligations of the employer and bidder will thereafter be subject to the last date as extended.
8. All duties, taxes, royalty and other levies payable by the agency as per State/Central Government rules, shall be deemed to have been included in the contract value quoted by the Bidder.
9. The agency is expected to quote the bid price in Lump sum after careful analysis of cost involved for the performance of work complete considering all specification and conditions of contract. In case it is noticed that the price quoted by the Bidder is unusually high or unusually low, unless the Employer is convinced about the reasonableness of bid price on scrutiny of the analysis for such price to be furnished by the Bidder, it will be sufficient cause for the rejection of the bid.

10. The department has prepared milestones for executing the work which may be referred while bidding. In case the bidder has alternative plan for milestone, they should submit the indicative milestone at the time of submission of bid and firm mile stone after completion of survey and investigation. The bidder shall pay special attention as regards achieving of critical milestones on schedule, so as to ensure final commissioning in time. The Employer shall critically monitor both the Physical as well as Financial Targets, on monthly and quarterly basis. Shortfalls, if any, in the monthly targets shall be immediately rectified by supplementing the resources by the agency leading to increase in the progress, at no extra cost to the Employer, so as to achieve the quarterly targets as per schedule.
11. The agency will be responsible for processing of permission for right of way/right of use and land acquisition till the same is obtained. Payment of statutory charges and cost of the land will be the responsibility of Govt. Demarcation of acquisition area, preparation of schedules for acquisition is the responsibility of the agency. Similarly preparation of all the base papers for right of way/right of use the NOC from different authorities/owners is the responsibility of the agency. The agency should be responsible for compensation to be paid for standing crops, trees etc. and the cost there upon will not be borne by the Govt.

15.0 ELIGIBILITY OF BIDDER

15.1 The bidder/firm/company should not have been black listed in the last five financial years in any department in Govt. of Odisha or in any other state/union Govt. due to any reasons.

15.2 To be eligible for participation in the tender, an bidder shall fulfill the following conditions of eligibility:

(A) <u>Minimum Technical Capacity in executing eligible projects:</u>

For demonstrating technical capacity and experience (the "Technical Capacity"), the bidder as a prime contractor in the last **5 (five) years FY 2021-22 to FY 2025-26** (5 years prior to the FY of invitation of tender and including current FY).

a) should have Satisfactorily completed (not less than 80% of the original contract value) at least one similar work comprising work of Survey, Design, Supply, Execution, Installation, testing and commissioning of UGPL (Pressurised/Gravity) network in Irrigation Projects/Water Supply Project of value not less than **Rs.4.25 Crore** at financial year 2025-26 price level.

Weightage of 10% per year shall be given on cost of the satisfactorily completed works of previous years to bring them to the current price level during last five years including current financial year. (Weightage to be given on year wise break up of cost component of completed works to bring them to current price level)

and

b) should have completed supply, laying, jointing, testing & commissioning of MS/DI/GRP/PSC Pipes of minimum **600 mm** & **above** diameter for a minimum length of **2.335 Km** in any one year during last five financial year & including current FY.

and

c) should have completed supply, laying, jointing, Testing & commissioning of HDPE/PVC minimum **110 mm & above** diameter for a minimum length of **9.340 Km** in any one year during last five financial year & including current FY.

All the experience cited for evaluation of technical capacity should be supported with appropriate self-attested client certificate duly signed from an officer not below the rank of Divisional Engineer or equivalent authority (**Experience Certificates from State Government / Central Government /UTs/State PSUs /Central PSUs projects are to be considered only).**The Experience certificate issued by the **State PSUs** must carry the counter signature of the concerned Engineer-in-Charge not below the rank of Divisional Engineer or equivalent authority. In that case, both the original State PSU and the authorized Sub-Contractor will be treated at par as prime contractor. The detail correspondence address/Fax number/phone no./ e-mail Id of officer issuing certificate shall be furnished.

i) Experience cited without supporting credentials from client shall not be considered for evaluation.

ii) The projects proposed for assessment of Technical Capacity should be submitted in the prescribed format.

(B) Minimum Financial Capacity:

i) The Applicant should have in the last 5 financial years (from FY 2021-22 to FY 2025-26) achieved a minimum annual turnover of **Rs. 17.38 Crore** (i.e one and half times of the estimated annualised cost of tender) in all types of **Civil Engineering Construction works only** at FY 2025-26 price level in any one financial year. Attested copy of certificate of authenticity is to be enclosed from the appropriate authority. Weightage of 10% per year shall be given on financial turnover of pervious years to bring them to current price level.

ii) The intending bidders must possess credit facilities of not less than **Rs. 2.12 Crore** and furnish the credentials from any Nationalized / Scheduled Commercial Bank located anywhere in the country with branch at Bhubaneswar along with the bid against the specific work by mentioning the name of the work and tender identification number in prescribed proforma, Annexure-VI of Section-III.

(Note: Required Credit Facility=20% of the amount put to tender)

The bank certificate shall be in prescribed format provided in DTCN only, failing which the bid will be rejected.

Further conditional bank certificate and subsequent clarifications issued by Bank authority will not be accepted and the bid will be rejected.

iii) Audited Balance Sheets and Profit and Loss account for the FY 2021-22 to FY 2025-26 (last five years) shall be furnished.

iv) Financial Capacity shall be submitted in the manner stated in Annexure VIII supported through Annexure IX duly certified by a practicing Chartered Accountant.

(C) Bid Capacity:

To qualify for award of contract each Bidder who meets the minimum qualification criteria will be qualified only if their available bid capacity is more than **Rs.10.62 Crore**. The available bid capacity will be calculated as under:

Assessed Available Bid capacity = (A*N*2 - B)

Where,

A =Maximum value of the turnover of the bidder in any one year during the last five years updated by giving 10% simple weight age per year to bring it to the present 2025-26 (Yr of Invitation of bid) price level.

N= Number of years prescribed for completion of the works for which, the bid is invited.

Note: If N < 1, then N value would be considered as 1.

B= Value of existing commitments and on-going works to be completed during the period of completion of the project.

NOTE: The existing Commitment will include works in respect of which Letter of Acceptance (LoA) has been issued.

The value of existing commitment should be given in shape of affidavit before the **Executive Magistrate/Notary** mentioning the name of work. If the bidder fails to produce the existing commitments in the prescribed format Form-F of Section-III along with affidavit, his/her bid shall be rejected.

- Each page of the affidavit and annexure shall be signed by Executive Magistrate/Notary failing which the bid will be rejected.

(D) Availability of Plant & Machinery:

The bidder should produce documentary evidence regarding availability of key plant and machineries and equipment in working condition required for execution of the work (either owned in his name or obtained on hire purchase scheme or by hiring from the reputed forms/ Contractor's firm). If the machineries are to be procured for specific period for completion of the work on lease/ rental basis, then a copy of registered MOU must be attached. The contractor should attach an affidavit that the plant and machinery/ equipment are free and will be available during execution of work.

15.3 Technical Bids shall be scrutinized in accordance with the conditions stipulated in the Bid document. In case of any discrepancy or non-adherence of conditions, the Bid accepting authority shall communicate the same, which will be binding both on the Bid opening authority and the Bidder. In case of any ambiguity, the decision taken by the Bid Accepting Authority on Bids shall be final. Department reserves the right to accept or reject any of the bid for qualification without assigning any reason thereof.

15.4 After opening of the same, the technical evaluation will be carried out & details will be scrutinized by the competent authority. In case of any clarification, same will be obtained from the bidder. After completing the above procedure & evaluation of Technical Bid the bid accepting Authority shall be moved for acceptance of the Technical Bid. The date of opening of online Price Bid will be intimated to the bidders by the bid opening authority on acceptance of the technical bid by bid accepting authority.

16.0 OPENING OF TECHNICAL BID

16.1 The Technical Bid will be opened **on 16.11.2026 at 10.30 AM** onwards on website **www.tendersodisha.gov.in** as mentioned in NIT. Intending bidders or their representatives who wish to participate in online tender opening can log on to www.tendersodisha.gov.in on the due date and time after online opening of the bid by the authorized officer. The bidders who wish to remain present at office of the

Chief Construction Engineer, Khairibhandan & Deo Irrigation Project, Karanjia premises at the time of tender opening can do so. Only one representative of each firm will be allowed to remain present. The price bid will be opened after approval of the Technical Bid of tender by the Govt. All the statements, documents, certificates, Fixed Deposit Receipt/Bank Guarantee and technical proposals will be verified for evaluation. The clarification on particulars, if any required from the Bidders will be obtained by addressing the bidders. The bids will be evaluated against the specified parameter/criteria and the qualified bidders will be identified.

16.2 If any of the Bidders is not present at the time of opening of Bids, the Bid opening authority will, on opening the Bid of the absentee Bidder, read out and record the deficiencies if any, this shall be binding on the Bidder.

16.3 The bids not accompanying with documents as per clauses of "Instruction to Bidders" will be considered as Non Responsive.

16.4 Bid capacity & the technical proposal of the bidders who have paid the requisite tender fee, Bid security Declaration, submitted registration certificate, Power of attorney, No relationship Certificate etc shall be scrutinized.

17. OPENING OF PRICE BID

17.1 On acceptance of the technical bid by the Bid Accepting Authority the date & place of opening of price bid shall be notified by the Bid Inviting Authority. The price bid of technically responsive bidders shall be opened on the notified date & time in presence of bidders or their authorized representatives who wish to be present. The details submitted by the bidders online in **Cover-II Financial Bid** shall be opened.

17.2 The responsive bidder's name and bid price shall be announced.

17.3 If more than one bid is quoted (Decimals up to two numbers will be taken for all practical purposes) either at the estimated cost put to tender or less than the estimated cost put to tender, the tender accepting authority will finalize the tender through a transparent lottery system, where all the concerned bidders / their authorized representatives, the concerned Superintending Engineer/Executive Engineer of concerned Division and DAO will remain present. (Works Department OM No.1437 dtd.31.01.2023).

18 EVALUATION OF FINANCIAL BID

18.1 The prices shall be considered as filled up by the bidder online in the prescribed Financial Bid Format given in Cover- II: Financial Bid.

(i) The bid is for execution of the work on "EPC" basis. The lump sum price mentioned in Financial Bid (Appendix-FB) shall be considered for evaluation as given below.

(ii) The bidder has to furnish the execution cost in lump sum basis in Item-1 **and O & M cost of the bid for 5 years in item-2** of financial bid in appendix-FB.

(iii) Total Cost of the bid for evaluation shall be the sum of the Bid Price quoted for execution of work (as in Sl. No. 1 of Appendix-FB) and total O & M cost (as in Sl. No. 2 of Appendix-FB).

(iv) The tender inviting authority shall evaluate and compare the price bids of all the responsive & qualified Bidders.

(v) The amount to be quoted by the bidder for O&M shall not be less than 5% of the quoted execution cost.

If the bidder quoted the rate of O&M cost less than 5% of the quoted execution cost, his/her bid shall be rejected.

18.2 Selection of Bidder among the lowest & equally quoted Bidders will be in the following orders:

~~18.2.1 The Bidder whose bid capacity is higher will be selected.~~

~~18.2.2 In case the bid capacity is also same the Bidder whose annual turnover is more will be preferred.~~

~~18.2.3 Even if the criteria incidentally become the same, the turnover on similar works and thereafter machinery available for the work and then the clean track record of the firm will be considered for selection.~~

18.2.4 In case of any discrepancy between the overall Contract price quoted in words and figures, the price quoted in words shall prevail.

19 PROCESS TO BE CONFIDENTIAL

19.1 Information relating to the examination, clarification, evaluation and comparison of Bids and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process until the award to the successful Bidder has been announced by the Bid accepting authority.

19.2 Any effort by a Bidder to influence the processing of Bids or award decisions may result in the rejection of his Bid.

19.3 No Bidder shall contact the bid inviting authority or any authority concerned with finalization of Bids on any matter relating to its Bid from the time of the Bid opening to the time the Contract is awarded.

19.4 Before recommending/accepting the Bid, the Bid recommending/accepting authority shall verify the correctness of certificates submitted to meet the eligibility criteria and specifically experience. The authenticated contracts of previous works executed by the lowest Bidder shall be called for.

19.5 If the contract price quoted by a Bidder is found to be either abnormally high or within the reasonable limits but under collusion or due to unethical practices adopted at the time of Bidding process, such Bids shall be rejected.

20 AWARD OF CONTRACT

20.1 The Bid accepting authority reserves the right to accept or reject any Bid or all Bids and to cancel the Bidding process, at any time prior to the award of Contract, and shall not bear any liability for such decision and shall not have obligation to inform the affected Bidder of the reasons.

20.2 The Bidder whose Bid has been accepted will be notified of the award of the work by the Bid inviting authority, prior to expiry of the Bid validity period by registered letter/Speed Post. This letter (hereinafter and in the Contract called "Letter of Acceptance") will indicate the sum that the Government 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 "Contract Amount**").

21 INITIAL SECURITY DEPOSIT (ISD)

21.1 When a Bid is to be accepted the concerned Bidder shall attend the office of the Engineer-in-Charge concerned on the date fixed in the Letter of acceptance. Upon intimation being given by the Chief Engineer of acceptance of his Bid, the successful Bidder shall have to pay Initial Security Deposit (ISD). Agreements in two parts, Part-I: Work and Part-II: Operation & Maintenance of the system shall be executed. The agreement amount for Part-I: Work shall be bid amount of Sl.-1,2 of Price Bid (APPENDIX-FB). The agreement amount for Part-II: Operation & Maintenance of the system shall be the bid amount of Sl.-3,4 of Price Bid (APPENDIX-FB). The ISD @ 2% of the amount for each part of agreement in the shape of fixed Deposit Receipt and/or unconditional and irrevocable Bank Guarantee on the standard format enclosed in the Bid schedule shall be furnished separately in the following manner. The ISD @ 2% of the accepted amount will be deposited by the bidder **in**

shape of NSC / Post office Saving Bank Account/ Post office Time Deposit Account/ Kishan Vikas Patra/Bank Guarantee pledged in favour of Superintending Engineer, Deo Head Works Division, Karanjia from any Nationalized/ Scheduled Commercial Bank in India counter guaranteed by its local branch at Bhubaneswar / e-Bank Guarantee executed on National e-Governance Services Limited (NeSL) Digital Document Execution Portal / Insurance Surety Bond issued by an Insurance Company authorized by the Insurance Regulatory and Development Authority of India (IRDAI) duly pledge in favour of Superintending Engineer, Deo Head Works Division, Karanjia. [vide Works Dept. OM No. WORKS-FA-MISCSB-0003-2026-4909/W, dt.12.03.2026]. The Bank Guarantee is to be produced in shape of unconditional and irrevocable Bank Guarantee in the standard format on any Nationalized/ Scheduled Commercial Bank located anywhere in the country with branches at Bhubaneswar with facility of authentication & encashment of BG at local Branch.

21.2 The **validity of the ISD for Part-I: Work Agreement** shall be for a total period not less than the stipulated period of the completion of the work in question, plus the defect liability period plus three months.

21.3 The **validity of the ISD for Part-II O & M Agreement** shall be for a total period not less than stipulated period of completion plus the period of O & M plus three months.

21.4 The bidder shall enter into a contract in the form prescribed by the department for the due fulfillment of the contracts. Failure to attend the Engineer-in-Charge office on the date fixed, in the written intimation, to enter into the required contract shall entail forfeiture of the Earnest Money deposited. The written contract entered into between the contractor and the Government shall be the foundation of the rights and obligations of both the parties and the contract shall not be deemed to be complete until the contract has first been signed by the contractor and then by the proper officer authorized to enter into contract on behalf of the Government.

21.5 The successful Bidder has to sign the contracts **within 15 days of issue of the letter of acceptance.** The issue of letter of acceptance shall be treated as closure of bid process and commencement of the contract process. On failure to do so his Bid will be cancelled and they will be suspended for a period of three years without issuing any further notice and action will be initiated for black listing the Bidder.

21.6 The date of signing of the Agreement shall be treated as date of commencement of work.

22 Additional Performance Security: As per Works Department Office Memorandum No.17941/W, Dt.08.10.2026, Ammendment of Codal & Contractual Provisions; Earlier, the provisions of threshold negative bid caps of 15% introduced in Appendix-IX Clause 36 of OPWD Code Vol-II had been abolished, and the system of incremental Additional Performance Security (APS) was adopted vide Works Department O.M. No.173/W, dated 03.01.2026 in the procurement of Works undertaken by Government of Odisha and its agencies to ensure that the procurement process results in a viable and successful manner

Subsequently, a clarification vide Works Department O.M. No. 632/W. dated 09.01.2026, and a corrigendum No. 14560/W, dated 11.06.2026, wore Issued on the subject.

Considering the continuing trend of quoting of abnormally low bids in procurement of Works, Government, after careful consideration, have been pleased to further review the issue of abnormally low bid prices.

Now, therefore, in supersession of Works Department O.M. No.173, dated 03.01.2026. O.M. No.632/W., dated 09.01.2026 and Corrigendum No. 14560/W dated 11.08.2026, it has

been decided that the Additional Performance Security (APS) shall be obtained from the selected bidder, on an incremental basis, where the accepted bid price is lower than the Cost Pul to Tender, in the following manner

i. The Additional Performance Security (APS) shall be calculated as a percentage of the accepted Bid Price of the selected bidder.

ii. For the purpose of determining the APS, the percentage by which the accepted Bid Price is lower than the Cost Put to Tender shall be calculated and rounded off.

iii. The rounded-off percentage so determined shall be referred to as the Rounding Off of Percentage Less (ROPL) of accepted Bid Price and shall form the basis for calculation of the APS in accordance with the applicable incremental rate prescribed under this Office Memorandum.

iv. Rounding Off of Percentage Less (ROPL) of accepted Bid Price, le. the percentage by which the accepted Bid Price is less than the Cost Put to Tender shall be as follows:
   - Where the decimal fraction is less than 0.50, the percentage shall be rounded off to the next lower whole percentage.
   - Where the decimal fraction is 0.50 or above, the percentage shall be rounded off to the next higher whole percentage.
   - For avoidance of doubt, 13.25% less shall be reckoned as 13% less, whereas 13.50% less shall be reckoned as 14% less, for the purpose of determining the applicable APS under this Office Memorandum

v. Calculation of Additional Performance Security:
   - Where the accepted bid price is such that the ROPL is up to (-)10%, no additional performance security is required.
   - where the accepted bid price is such that the ROPL is below (-)10% but not below 20%, the additional performance security percentage shall be incremented by 0.2% for every percentage of ROPL below (-)10%, for avoidance of doubt, if ROPL is (-)13%, then APS shall be @ 0.2% x (13-10) = 0.6% of accepted bid price.
   - where the accepted bid price is such that the ROPL is below (-)20% but not below (-)30%, the additional performance security percentage shall be incremented by 0.3% for every percentage of ROPL below (-)20% in addition to 2% of the accepted bid price; for avoidance of doubt, if ROPL is (-)24%, then APS shall be 0.3% x (24-20) +2% = 1.2% + 2% = 3.2% of accepted bid price.
   - Where the accepted bid price is such that the ROPL is below (-)30% or more, the additional performance security percentage shall be incremented by 0.5% for every percentage of ROPL below (-)30% in addition to 5% of the accepted bid price: for avoidance of doubt, if ROPL is (-)37%, then APS shall be 0.5% x (37-30) + 5% = 3.5% + 5% = 8.5% of accepted bid price.

vi. The additional performance security shall be treated as part of the **performance security.**

vii. The provision of additional performance security shall be applicable to all forms of tender except Turnkey tender.

viii. Justification for abnormally low bids shall be scrutinized by the Technical Committee and recommended to the Competent Authority for Acceptance of Tender as per Para 6.3.15 of OPWD Code, Vol-1 for the approval of the Additional Performance Security (APS). An abnormally low bid is one in which the Bid price, in combination with other elements of the Bid, appears so low that it raises material concerns as to the capability of the Bidder to perform the contract at the offered price. Procuring Entity may, in such cases, seek written clarifications from the Bidder, including detailed price analysis of its Bid price in relation to scope, schedule, resource mobilization, allocation of risks and responsibilities, and any other requirements of the bid document. If, after evaluating the price analysis, the procuring entity determines that the Bidder has substantially failed to demonstrate its capability to deliver the contract at the offered price, the Procuring Entity may reject the Bid/ Proposal. However, it would not be advisable to fix a normative percentage below the estimated cost, which would automatically be considered as an abnormally low bid.

Additional Performance Security shall be furnished in shape of National Savings Certificate (N.S.C) /Post Office Savings Bank Account/ Post Office Time Deposit Account / Kisan Vikas Patra/Bank Guarantee in favour of Divisional Officer (**Superintending Engineer, Deo Head Works Division, Karanjia)** from any Nationalized/Schedule Bank in India counter Guaranteed by its local Branch at Bhubaneswar / e-Bank Guarantee executed on the Nationale-Governance Services Limited (NeSL) Digital Document Execution Portal / Insurance Surety Bond issued by an Insurance Company authorized by the Insurance Regulatory and Development Authority of India (IRDAI) [Vide Works Dept. OM No. WORKS-FA-MISCSB-0003-2026-4909/W, dt. 12.03.2026.] within **seven days** of issue of letter of acceptance (LOA) by the concerned divisional officer (by e-mail) to the successful bidder otherwise the bid of the successful bidder shall be cancelled & the Earnest Money Deposit/Bid Security shall be forfeited. Further, proceeding for blacklisting shall be initiated against the bidder. If the APS is submitted in shape of Bank Guarantee by the bidder, then the validity of the Bank Guarantee shall be for a total period not less than the stipulated period of the completion of the work, plus the defect liability period plus three months.

23 BID AMOUNT

The bid amount to be quoted by the bidder shall be exclusive of GST but inclusive of all statutory taxes, duties & other ancillary works mentioned in the documents. No claim whatsoever in this connection shall be entertained under any circumstances.

24 NO SANCTION FOR FOREGIN EXCHANGE

It should be clearly understood that no foreign exchange sanctions will be made available either for purpose of equipments, plants, and machineries, materials of any kind or other things required for execution of work. It should be clearly understood that no request for importing equipments, materials, plants, etc. that may be required in carrying out the work even from rupee payment currency will be entertained except specifically mentioned in respective item of the tender documents.

25 CONSTRUCTION PROGRAMME

25.1 The Bidder shall include in his Bid, a detailed construction programme of executing the project, describing broadly the Technology and Construction Methodology of

Major Components of the Project including survey, investigation, soil exploration, design & Engineering estimation, land acquisition proposal, commissioning of total project trial of total distribution system. The programme shall be supplemented with Master Control Network.

25.2 The Employer reserves the right to request for changes in the Master control Network during pre-award discussion with the responsive bidder. Mutually agreed Master Control Network shall form part of the Contract.

26 SPECIFIC ISSUES

26.1 Every Bidder is expected, before quoting his bid, inspect the site of proposed work. He should also inspect the quarries and satisfy himself about the quality and availability of materials. The best class of materials to be obtained from quarries, or other source shall be used on the work. In every case the material must comply with the relevant standard specifications. Samples of materials as called for in the standard specifications or in the Bid notice or as required by the Superintending Engineer, in any case shall be submitted for the Superintending Engineer's, approval before the supply to site of work is begun.

26.2 The Bidders particular attention is drawn to the sections and clauses in the standard specifications dealing with.

26.2.1 Test, Inspection and rejection of defective materials and work.
26.2.2 Carriage.
26.2.3 Construction plant.
26.2.4 Water and lighting.
26.2.5 Cleaning up during the progress and for delivery
26.2.6 Accidents
26.2.7 Delays
26.2.8 Particulars of payments.

26.3 The contractor should closely peruse all the specifications clauses, which govern the bid he is bidding.

26.4 The contractor is responsible for the quality of works executed. If any defects are noticed during execution of the work and the defect liability period after completion of works, the contractor has to rectify at his own cost

26.5 The contractor shall maintain the system for a period of five years covering at least five Khariff seasons including water supply regulations, maintenance of the system, plantation, beautification measures etc. The contractor will carry out maintenance or repair or rectification works in case of any problem or emergency that may arise when the system is in operation including cost of all labours, materials and equipments. The contractor shall also prepare a operation & Maintenance Manual and train the Govt. staff/selected Pani Panchayat Beneficiaries to carry out subsequent O & M of the project.

26.6 The Bidder will quote lump sum price on the work as a whole.

26.7 No alteration which is made by the Bidder in the contract form, the conditions of the contract, the drawings, and specifications the same will be recognized and if any such alterations are made, the Bid will be void.

26.8 A Bidder submitting a quotation which the Bid accepting authority considers excessive and or indication of insufficient knowledge of current Prices or definite attempt of profiteering will render himself liable to be debarred permanently from Bidding or for such period as the Bid accepting authority may decide.

26.9 The Bidder should demonstrate availability (owned or leased or to be procured against mobilization advance) of the Key and critical equipment in the shape of list and declaration supported by ownership documents necessarily be enclosed to the

Bid on **Non-Judicial Stamp Paper of worth of Rs.100/- stating**. "**I do hereby solemnly declare that I own ---------- procured on lease the following equipment".**

26.10 A prospective bidder is expected to examine all instructions, terms & conditions, forms and specifications in the Bid Document and fully inform himself as to all the conditions and matters which may in any way affect the works, his bid or the cost thereof. Further, failure of furnishing all information required by the Bid Document or submission of incomplete offers, conditional bids containing deviations from the bid document shall be rejected as non-responsive.

26.11 It will be imperative for each Bidder to fully inform himself of all local conditions and factors which may have any effect on the execution of the Works covered under the specifications and documents. In their own interest, the bidders are particularly requested to familiarize themselves with the prevailing Income Tax Act, Companies Act, Customs Act, prevailing Labour Laws and other related Acts and Law.

Further, the bidders are requested to comply with the Insurance Act including Workmen's Compensation Act and third party insurance and other relevant provisions particularly with reference to the requirements of taking insurance for storage, Civil, Structural and Architectural Work, Erection, testing and commissioning, operation and Maintenance, till the project is handed over to Employer. Employer shall not entertain any request for clarification from the bidders regarding such local conditions. It must be understood and agreed that such factors have properly been investigated and considered by the bidders while submitting their bids. Failure to do so will not relieve the bidders from responsibility for estimating properly the cost of successfully performing the work and completion time required for the Work. Employer will assume no responsibility for any understanding, or representation concerning conditions made by any of its officers or agents prior to award of the Contract. Neither any change in the time schedule of the contract nor any financial adjustments arising thereof shall be permitted by the Employer, which arises out of lack of such clear knowledge or its effect on the cost of execution of the contract on the part of the bidder. Employer shall not entertain any request for clarifications from the Bidders, regarding any statutory provisions.

26.12 Being a Turnkey Contract, the Bidder is to take full responsibility for the survey, Investigation, Design & Engineering and execution of entire works including commissioning, Trial run of the scheme complete including operation & maintenance of the project for a period of 5 years or fifteen Khariff water supply seasons whichever is more from the date of commissioning to be notifited by the Employer.

26.13 Survey, Investigation, Designs, Technical Specifications and Technical Parameters shall conform to Bureau of Indian Standard Codes and/or International Standards & practices/C.W.C. Manuals/IRC Codes/Odisha Govt. Department specifications/ Circulars issued by Department from time to time and technical specification of the bid documents.

26.14 It is understood that all plant, equipment, and works connected with the normal efficient execution of the Project are covered in the scope, brought out in Bid Documents. In case of decisions to be taken on issues relating to technical matter of planning, design & construction, decision of **Tender Inviting Authority** is final & binding on the contractor.

26.15 While working out their price bid, the bidders are required to take into account entire scope of the work defined in Bid documents, additional Infrastructure and other related activities, whatsoever required.

26.16 Bidder shall also include in his price bid, cost of de-mobilization and shipping back the construction equipment and other equipment/materials etc. from the Project Site.

27 CORRUPT OR FRAUDULENT PRACTICES.

27.1 The Government requires that the bidders/suppliers/ contractors under Government financed contracts, observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy, the Government

27.2.1 Define for the purposes of the provision, the terms set forth below as follows:

27.2.2 "**Corrupt practices**" means the offering, giving, receiving or soliciting of anything of value to influence the action of a government official in procurement process or in contract execution: and

27.2.3 "**Fraudulent practices**" means misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Government and includes collusive practice among Bidders (prior to or after a Bid submission) designed to establish in Bid prices at artificial noncompetitive levels and to deprive the Government of the benefits of free and open competition.

27.2.4 Will reject a proposal for award if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question.

27.2.5 Will blacklist/or debar a firm either indefinitely or for a stated period of time, if at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing a Government Contract.

27.2.6 Furthermore, Bidders shall be aware of the provisions stated in the General Conditions of Contract.

28 SUBLETTING OF CONTRACT

No part of the contract shall be sublet without written permission of the Employer nor shall transfer be made by power of attorney, authorizing others to receive payment on the contractor's behalf. If the prime contractor desires to sublet a part the work he should submit the same at the time of filing Bids itself or during execution giving the names of the proposed sub-contractor along with the details of his qualification and experience. The Bid accepting authority should verify the experience of the sub-contractor and if the sub-contractor satisfies the qualification criteria with reference to the value of work proposed to be sublet, he may permit the same. However, the total value of works to be awarded on subletting shall not exceed 50% of contract value. The extent of subletting shall be added to the experience of the sub-contractor and to that extent deducted from that of the main contractor.

29 CHECK LIST

DOCUMENT TO BE FURNISHED BY THE BIDDER

The check list has been prepared to facilitate submission of information sheets by the bidders. Other information required for the bid, but not mentioned in the check list shall also be submitted.

Sl. No.	Particulars of Submittal	BID document Reference	Whether furnished		Reference to uploaded document Page No.
			Yes	No	
	Cover – I				

Sl. No.	Particulars of Submittal	BID document Reference	Whether furnished		Reference to uploaded document Page No.
			Yes	No	
	FILE-I				
1	Letter of submission of Bid	Form-A of Section-III			
2	Cost of Bid document	As per NIT of Section-I			
3	EMD/Bid Security	As per NIT of Section-I, Annexure-I of Section-III			
4	Details of cost of Bid Document.	Form-C of Section-III			
5	Registration Certificate	As per ITB of Section-II			
6	GST Registration No.	As per ITB of Section-II			
7	PAN	As per ITB of Section-II			
8	Income Tax Return Certificate	As per ITB of Section-II			
9	Declaration by Affidavit	As per ITB of Section-II, Form-J of Section-III			
10	No Relation certificate	As per ITB of Section-II, Form-D of Section-III			
	FILE-II				
1	Bid Capacity	As per ITB of Section-II			
2	List of Machinery & Equipment	As per ITB of Section-II, Form-E of Section-III			
3	List of work in Hand	As per ITB of Section-II, Form-F of Section-III			
4	Details of Financial capacity	As per ITB of Section-II, Form-G, Annexure-VIII, IX of Section-III			
5	Details of personnel's	As per ITB of Section-II, Form-H of Section-III			
6	Similar nature of works executed	As per ITB of Section-II, Form-I of Section-III			
7	Additional information	As per ITB of Section-II, Form-I of Section-III			
8	Form of Bank certificate for credit facility	As per ITB of Section-II, Annexure-VI of Section-III			
9	Form of Solvency Certificate by Bank	As per ITB of Section-II, Annexure-VII of Section-III			
10	Litigation History	Annexure-V of Section-III			
	FILE – III				
1	Details of technical proposal along with all technical data describing technology & Methodology of a. Survey & Investigation b. Intake System c. Rising main/Pressure main d. Delivery chamber(optional) e. Distribution System f. Instrumentation including particulars of pipeline for	As per ITB of Section-II			

Sl. No.	Particulars of Submittal	BID document Reference	Whether furnished		Reference to uploaded document Page No.
			Yes	No	
	Rising main/Pressure main, distribution main, minors and sub-minors and type of outlets along with location, make and type of Anti Surge Devices and Control Valves.				
2	Methodology of the Operation & Maintenance of the Scheme for 5 Years	As per ITB of Section-II			
3	Construction Program for **11 (Eleven)** Months	As per ITB of Section-II			
4	Milestones for execution of work.	As per ITB of Section-II			
5	Maintenance Personnel	Clause-5 of Section-VI			
6	List of Equipments, Tools & Plants and Spare Parts for O&M of the system.	Clause-14 of Section-VI			
19	Methodology for Pipe Line System				
	Cover – II - Financial Bid				
	FILE-I				
1	Financial Bid	Appendix-FB of Section-X			
	FILE-II				
1	Year wise breakup of O&M Cost	**DELETED**			

SECTION – III

FORMS & ANNEXURES

FORMS & ANNEXURES

FORM-A

LETTER OF SUBMISSION OF BID

(ON BIDDER'S LETTER HEAD)

To

The Chief Construction Engineer,
Khairibhandan & Deo Irrigation Project, Karanjia

Sir,

I / We do hereby submit the Bid and if this Bid be accepted, undertake to execute and complete the following work:

As provided for in the "conditions of the bid document":

1. I/We have quoted the bid in Price Bid vide Appendix-PB of Price Bid for which l/we agree to execute the work at the quoted lump sum amount under the terms of the contract.

2. In case of any discrepancy between the bid price quoted in words and figures, the bid price quoted in words only shall prevail.

3. I/We agree to keep the offer in this Bid valid for a period of 180 days from the last date of submission of bid, mentioned in the Bid notice and not to modify the whole or any part of it for any reason within above period. If the Bid is withdrawn by me/us for any reasons whatsoever, the earnest money paid by me/us will be forfeited to Government.

4. I/We hereby distinctly and expressly, declare and acknowledge that, before the submission of my/our Bid I/We have carefully followed the instructions in the Bid document and have read the technical Specification therein and the and that I/We have made such examination of the contract documents and the plans, specifications and of the location where the said work is to be done, and such investigation of the work required to be done, and in regard to the equipments and material required to be furnished as to enable me/us to thoroughly understand the intention of same and the requirements of covenant/contracts, stipulations and restrictions contained in the contract, and in the said plans and specifications and distinctly agree that I/We will not hereafter make any claim or demand upon the Government based upon or arising out of any alleged misunderstanding or misconception /or mistake on my/or our part of the said requirement of covenants/contracts, stipulations, restrictions and conditions.

   I/We have enclosed to my/our application the cost of bid (non refundable) and Earnest Money Deposit without any claim of interest on the department.

5. I/We shall not assign the contract or sublet any portion of the same. In case if it becomes necessary I/We shall submit the same at the time of filing Bids itself or during execution, giving the name of the sub agency with details of his qualification and experience and agree to sublet with permission of Bid accepting authority only to such of the sub-agency who satisfies the qualification criteria in proportion to the value of work proposed to be sublet.

6. If upon written intimation to me/us about acceptance my/our bid, by the Authorized officer of Govt. of Odisha, I/We fail to attend the said office on the date herein fixed or and if I/We fail to make the initial security deposit (ISD) / APS to enter into the required contract as defined in the instructions to Bidders, then I/We agree to the forfeiture of the earnest money. Any notice required to be served on me/us here under shall be deemed to have been sufficiently served on me/us if delivered to me/us personally or forwarded to me/us by post (registered/Speed Post/ ordinary/e-mail) or left at my/our address given herein.

7. I/We fully understand that the written contract to be entered into between me/us and Government shall be the foundation of the rights of the both the parties and the contract shall not be deemed to be complete until the contract has first been signed by me/us and then by the proper officer authorized to enter into contract on behalf of Government.

8. I/We declare that I/We agree to recover the salaries of the technical staff actually engaged on the work by the department, from the work bills, if I/We fail to employ technical staff as per the Bid condition.

BIDDERS / AGENCY'S CERTIFICATE

1. I/We am/are prepared to furnish detailed data in support of all my quoted rates, if and when called upon to do so without any reservations.

2. I/We hereby declare that I/We shall not claim any price escalation except as provided in the bidding documents.

3. I/We declare that the I/We shall take up the responsibility for processing for ROW/ROU land acquisition, for execution of all components of work, in the name of Department of Water Resources, Odisha as per conditions bid and arranging and obtaining the land for disposal of spoil/soil not useful for construction purposes shall rest with me/us. Crop compensation for executing the work and O & M of command shall be paid by us.

4. I/We hereby declare that the responsibility of getting statutory clearances of forest & environment & other department/commission/authority on behalf of the Department of Water Resources for execution/completion of work rests on me/us**.**

5. I/We declare that I/We will execute the work as per the mile stone programme, and if I/We fail to complete the work as per the mile stone programme I abide by the condition to recover liquidated damages as per the Bid conditions.

6. I/We declare that I/We will abide for settlement of disputes as per the Bid conditions.

7. I/We have not been black listed in any department in Govt. of Odisha and in any other state/Union Govt. due to any reasons.

8. I/We have not been demoted to the next lower category for not filing the Bids after buying the Bid schedules in a whole year and my/our registration has not been cancelled for a similar default in two consecutive years.

9. I/We hereby certify that all the statement made and information supplied in enclosed Forms and accompanying statements and Annexure are true and correct.

10. I/We agree to disqualify me/us for any wrong declaration in respect of the above and to summarily reject my/our Bid.

Address of the Bidder:
Phone No:
Fax No:
E-mail id:
Bidder/Authorized Signatory with Seal

FORM – B

ARTICLES OF CONTRACT

Articles of contract made this _____day of _____between His Excellency the Governor of Odisha (herein after called Governor which expression shall, where the context so admits, include his successors in office and assignees) of the one part and _____of _____(herein after called the agency which expression shall, where the context so admit, include his heirs, executors, administrators and legal representative) on the other part.

Whereas the Government of Odisha (herein after called the Government) are desirous of taking up the work of

"Construction of distribution system for 467 Ha of CCA including Command Area Development (CAD) of Karadiha and Karanjia Sub-Minor off-taking from R.D. 16045m of Right Main Distributary of Deo Irrigation Project through Underground Pipeline Irrigation system (Gravity flow) in Mayurbhanj District of Odisha on EPC turnkey basis including Operation and Maintenance of complete commissioned project for 05 (five) years."

And have caused a proposal contained in Basic Project Profile, Instruction to Bidder, Conditions of contract, Special Conditions of Contract, Conditions of Contract for O&M and Price Bid, Technical Specifications and drawings describing the work to be prepared /to be done.

And whereas the said Basic Project Profile, drawings, Notice inviting Tenders Instruction to Bidders, General condition of Contract, Special conditions, Price Bid & Technical Specification, Conditions of contract for O&M & other appendices and annexures etc. of contract documents (herein after referred as contract) as have been signed by on behalf of the parties here to.

And whereas for the **Part I**: Works of Agreement, the agency has produced

1. Rupees _____paid by him vide FDR No. _____ Date _____issued by (Bank) _____pledged in favour of E.E _____

and

2. Rupees _____ paid by him vide B G No. _____date _____issued by (Bank) _____with validity of all the instruments up to _____towards Initial security deposit of 2% of contract Amount for Part I: Works for the due fulfillment of the contract.

AND

For the **Part II**: O & M of Agreement the agency has produced

1. Rupees _____paid by him vide FDR No. _____ Date _____issued by (Bank)

_____pledged in favor of E.E _____ and

2. Rupees _____paid by him vide BG No. _____date _____issued by (Bank) _____with validity of all the instruments up to _____towards Initial security deposit of 2% of contract Amount for Part II: O & M for the due fulfillment of contract.

   And whereas the agency has agreed that during the course of the contract period an amount at the rate of 5.0 % (five) of the value of work done will be withheld from the bills as Performance Security Deposit.

   And whereas the agency has agreed to execute upon the contract, subject to the Scope of work described in all sections and conditions & specifications forming part of the contract (herein after referred to as the said conditions), and set forth in Appendix – PB of Price Bid, as the price bid and comply with the rate of progress noted in the conditions for a sum of rupees ` _____(Rupees _____) on lump sum basis and such other sum as may be arrived at under the clauses of the contract documents relating to payment

   And whereas the agency has agreed to execute the subject work in two parts, namely Part: I Works for a sum of _____ (Rupees_____) and (Part II: O&M for a sum of _____ (Rupees _____), both totaling to a sum of_____(Rupees _____)as mentioned in the para above.

   Note: It is hereby agreed as follows:

   1. Time shall be considered as the essence of the contract and the agency hereby agrees to commence the work as soon as the contract is signed and agrees to complete the work within 60 calendar months from the date of such signing the contract and to show the progress as per milestone subject nevertheless to the provisions for extension of time contained in the conditions of contract.
   2. The conditions of the bid document & technical specification shall be read and construed as forming part of this contract and the parties here to will respectfully abide by and submit themselves to the conditions and stipulations and perform the contract on their part, respectively.
   3. Upon the terms and conditions of this contract being fulfilled and preformed to the satisfaction of the Superintending Engineer, the security deposited by the Agency as herein before recited or such portion thereof as he may be entitled to under the said condition shall be returned to the agency as provided in the contract.

      In witness thereof, the agency M/s._____ duly represented by Sri _____has here unto set his hand and Sri _____Executive Engineer acting on behalf of and by the order and direction of his Excellency, the Governor of Odisha has here unto set his hand the day and year first above written.

Signed by agency: _____

SEAL

Address : _____

Phone No.: Fax No.: e-mail id.:

In the presence of Witness i) Sri_____

Address

Signed by on behalf of Government Sri_____

SEAL

Phone No.: Fax No.: e-mail id.:

In the presence of Witness i) Sri_____

Address

FORM – C1

DETAILS OF COST OF TENDER DOCUMENTS

Sl. No.	Description	Remarks
1	Name of bidder	
2	Details of cost of Tender documents	
[A]	D/D No.	
[B]	Date	

Address of the Office

Telephone No:

SIGNATURE OF BIDDER

FORM – C2

DETAILS OF COST OF TENDER DOCUMENTS, ISD AND B.G

Sl. No.	Description				Remarks
1	Name of bidder				
2	Details of cost of Tender documents				
[A]	D/D No.				
[B]	Date				
[C]	Name of Bank				
3	ISD Details				
	Total ISD Amount				
	[A]	FDR/STDR Details (In favour of the Superintending Engineer only) (no joint operation)			
		For _____ Lakhs for ISD in form of FDR			
	FDR No.	Date	Bank Name	Amount in Lakh	Validity Period
	(B)	Details of Bank Guarantee _____ Lakhs.			
	Bank guarantee No	Date	Bank Name	Amount in Lakh	Validity period

Note–Please see clauses as mentioned in 'Instruction to Bidders' for validity period.

Address of the Office SIGNATURE OF BIDDER

Telephone No:

FORM - D

RELATIONSHIP DECLARATION

To

The Chief Construction Engineer,
Khairibhandan & Deo Irrigation Project, Karanjia

Sub: (Name of the Work)

Ref: (Bid reference number)

Sir,

Pursuant to the ITB, it is to inform that I have relative(s) employed as an Officer in the rank of an Assistant Engineer/Under Secretary under the_____ Department. His (Their) details are as follows.

Relationship: Name:
Designation Office
Address

Pursuant to the ITB, I am to submit herewith the names of persons who are working under my firm having near relatives to any gazette officer in the rank of an Assistant Engineer/Under Secretary in the _____Department.

Sl. No	Name of my employee and his designation in the firm	Presently working at	Details of his relatives working in the Department
			Relationship Name: Office Address
			Relationship Name: Designation Office Address

I am also duty bound to inform the relationship of any subsequent employment with any gazette officer in the rank of an Assistant Engineer /Under Secretary under the Department. I am aware that any breach of this condition would render my firm liable for penal action for suppression of facts.

I am also duty bound to inform that I have no relations with any employee working in the rank of or above the rank of any Assistant Engineer/ Under Secretary under this Department of Water Recourses.

Yours Sincerely,

SIGNATURE OF THE BIDDER

NB: Please strike out the para not applicable

FORM: E

DETAILS OF MACHINERY AND EQUIPMENTS PROPOSED

TO BE DEPLOYED FOR THE WORKS

Sl. No	Type of Equipment	Make/ Model	Nos. Owned	Year of Procurement	Present Condition	Present Location	Is it free for deployment in new project	Remarks
1	2	3	4	5	6	7	8	9

SIGNATURE OF BIDDER

FORM – F

DETAILS OF WORKS IN HAND

Sl. No.	Name of work	Place	Tendered amount in Lakh	Date of issue of **LoA**	Stipulated period of completion	Amount of work done up to the month previous to the month in which tender are invited in Lakh	Amount of works to be done during the period of completion of the project (Yr is to be mentioned)	Brief detail of delay if any	Remarks
1	2	3	4	5	6	7	8	9	10

Date: **SIGNATURE OF BIDDER**

Note1: Amount of work done in column 7 should be given up to the month previous to the month in which tender invited.

Note2: Necessary certificates from the officer concerned shall be attached with the tender.

Note3: In Col. 8 amount of works to be done during the completion period for which the bid is invited is to be furnished.

Note-4: The form-F (Details of work in hand in India) should be furnished in shape of affidavit before the Executive Magistrate before the **Executive Magistrate/ Notary.**

Each page of the affidavit and annexure shall be signed by Executive Magistrate/Notary failing which the bid will be rejected.

Note-5: In case of no existing Commitment the bidder shall mention nil in Form F mandatorily.

FORM - G

DETAILS OF FINANCIAL CAPABILITY

FINANCIAL CAPABILITY					
NAME OF APPLICANT:					
Financial information in Indian Rupees	Actual: Previous Five years				
Annual Turn over					
Total Assets					
Current Assets					
Total Liabilities					
Net Worth					
Working Capital					
Current liabilities					
Profits Before Taxes					
List of Banks & their addresses:					
Financial resources like	a) Bank Guarantee Limits				
	b) Lines of Credit				
	c) Solvency				

SIGNATURE OF BIDDER

NB: Certified Audit Reports are to be furnished.

FORM - H

DETAILS OF PERSONNEL

Give details of key Technical and Administrative Personnel who could be assigned the work in the following Proforma.

A)		Details of the Board of Directors	
	1)	Name of the Director	
	2)	Address	
	3)	Organisation of the Board of Directors	
B)		Key Technical and administrative Personnel and Consultants	
	1)	Project Manager (Min. 5years experience)	
	2)	Site Engineer	
	3)	Supervisor	
	4)	Technical assistants.	
C)		Skilled and other labour (indicate number category-wise)	
	1)	Skilled labour	
	2)	Other labour	

SIGNATURE OF BIDDER

FORM - I

ADDITIONAL INFORMATION

(A) Please add any further information which the applicant considers relevant in regard to his capabilities.

(B) Please give a brief note indicating why applicant considers himself as eligible.

(C) List of works for which tender have already been submitted to the client but not awarded.

Sr. No	Name of Work	Estimated amount (In Cores)	Date of Submission of Offer	Name of Client	Likely date of award	Position with ref. to lowest bid.
[1]	[2]	[3]	[4]	[5]	[6]	[7]

SIGNATURE OF BIDDER

FORM –I- 1		
GENERAL INFORMATION		
1	Name of the Firm / Applicant	
2	Address of Applicant	
3	Telephone No. / Fax	
4	Name of Contact Persons & Tele hone Nos.	
5	Place of Registration	
6	Legal Status of Firm	
7	Quality Assurance System Certified by	
8	Total Value of Civil Engineering construction work executed and payments received in the last five ears	

FORM – I-2						
WORKS OF SIMILAR NATURE EXECUTED OVER THE LAST FIVE YEARS						
Sl.N0	project Name	Name of the Employer	Description of Work	Contract No.	Value of Contract Date of issue of work order	Actual date of Completion

FORM – I-3							
WORKS FOR WHICH BIDS ALREADY SUBMITTED							
Sl.No	Description of work	Place State	Name & Address of Employer	Estimated Value of Works	Stipulated period of Completion	Date when decision is Expected	Remarks if any
1	2	3	4	5	6	7	8

FORM – J

DECLARATION BY AFFIDAVIT

(ON NON-JUDICIAL STAMP PAPER)

I / We …….. have gone through carefully all the Bid conditions and solemnly declare that I / we will abide by any penal action such as disqualification or black listing or determination of contract or any other action deemed fit, taken by, the Department against us, if it is found that the statements, documents, certificates produced by us are false / fabricated.

I /we hereby declare that, I / We have not been blacklisted / debarred / Suspended / demoted in any department in Odisha or in any State due to any reasons.

I /we hereby declare that the Technical bid and financial bid are without any deviations and are strictly in conformity with the documents issued by the Employer.

Signature of Bidder

FORMS & ANNEXURES

Annexure-I

(1) BANK GUARANTEE FOR EARNEST MONEY DEPOSIT (EMD)

[Ref: - Clause 12.0 of Section – II, Volume – I of Bid Identification No. 17/CCEKDIP of 2026-27]

WHEREAS _____ (name and address of Bidder) (hereinafter called "the Bidder") has submitted their offer dated _____for the work of _____(herein after called the "Bid") against the employer's Bid Identification No_____KNOW ALL MEN by these presents that WE _____of _____(Name of Bank) having Our registered office at _____are bound unto Superintending Engineer, ……..Division, ……. (herein after called "Employer") unconditionally & irrevocably for the sum_____(Rupees _____) for which payment will and truly to be made to the said employer, the Bank binds itself, its successors and assigns by the presents.

Sealed with the

Common seal of the said Bank this _____day of _____20_____

THE CONDITIONS OF THIS OBLIGATION ARE:

(2) If the Bidder If the Bidder withdraws or amends, impairs or derogates from the bid in any respect within the period of validity of this bid.

(3) If the Bidder having been notified of the acceptance of his Bid by the employer during the period of its validity in accordance with Instruction to Bidders of the Bid document.

(a) If the Bidder fails to furnish the initial Security Deposit for the due performance of the contract.
(b) Fails or refuses to accept/execute the contract.

WE undertake to pay the employer up to the above amount upon receipt of its first written demand, without the employer having to substantiate its demand, provided that in its demand the employer will note that the amount claimed by it, is due to it, owing to the occurrence of one or both the two conditions, specifying the occurred condition or conditions.

This guarantee will remain in force up to and including 60 days after the period of tender validity as specified in DNIT and any demand in respect thereof should reach the Bank not later than the above date.

We _____(Name of Bank) hereby also undertake to have the signature of Branch Manager issuing Bank Guarantee verified from Local Branch of the Bank in Bhubaneswar, _____(address of Local Branch Bhubaneswar, Odisha) for due authentication.

Our_____Branch at Bhubaneswar (Name & Address of the _____ branch) is liable to pay the guaranteed amount depending on the filing of claim and any part thereof under this Bank Guarantee only and only if it is served upon us by the employer at our Bhubaneswar Branch, a written claim or demand and received by us at our Bhubaneswar branch on or before Dt. _____otherwise bank shall be discharged of all liabilities under this guarantee thereafter.

(Signature of the authorized officer of the Bank)

……..

……..

Name and designation of the officer

…….

Seal, name & address of the Bank and address of the Branch

N.B- 1. The original Bank Guarantee which is issued from the concerned bank shall reach O/o the Chief Construction Engineer, Khairibhandan & Deo Irrigation Project, Karanjia within three working days from the date of opening of technical opening of this bid.

2. Onus of extension of validity of Bank Guarantee beyond the above stipulated period till drawal of agreement solely lies with the bidder.

Account Details of Bank Guarantee		
Account Name	:	SUPERINTENDING ENGINEER DEO H W DIV KJA.
Beneficiary Bank Account No.	:	11397266503
Bank Name	:	State Bank of India, Karanjia
IFSC CODE	:	SBIN0001081
MICR Code	:	757002507
Branch Address	:	AT/Po – Karanjia, Dist- Mayurbhanj, Pin-757037

ANNEXURE - II

BANK GUARANTEE FOR INITIAL SECURITY DEPOSIT (ISD)

Superintending Engineer, (Name & address of Department)

WHEREAS_____ (name and address of Agency) (hereinafter called "the Agency") 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 Agency shall furnish you with a Bank Guarantee by a Schedule bank 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 Agency such a Bank Guarantee;

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Agency, up to a total of _____[amount of guarantee] _____ [in works], 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 Agency before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Agency or of the Works to be performed there under or of any of the contract documents which may be made between you and the Agency 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 up to…… i.e. until 3 (three) months from the date of expiry of the Defects Liability period.

Signature & seal of the Guarantor_____

Name of Bank _____

Address _____

Date _____

ANNEXURE - III

REVISED BANK GUARANTEE FORMAT FOR MOBILIZATION ADVANCE

THIS DEED OF GUARANTEE made on …… day of ……. 20 …….. BETWEEN ……. Bank, a Banking Company incorporated under the Banking Companies Act, 19 ……. And having its registered office at ……. In the State of …… (hereinafter called the 'Guarantor') of the ONE PART AND the Governor of Odisha (hereinafter called the 'Government') of the OTHER PART.

WITNESS AS FOLLOWS:-

1. In consideration of the Governor of Odisha (hereinafter called the 'Government') having agreed to advance a sum of ` ……. (Rupees ……) to ……. (name and address of the contractor) (hereinafter called "the Contractor") against the work concerned by and under the terms and conditions upon agreement No. ……. dated …… made between the contractor and the Governor of Odisha, on production of a bank guarantee for` …… (Rupees ……) we hereby guarantee the payment of sums of money that may be due to the Government on account of any breach of the terms and conditions contained in the aforesaid contract on demand with interest at 10% per annum till payment.
2. We hereby further agree that we are aware of all the terms and conditions of the said contract and shall abide by the decision of the Secretary to Government of Odisha, Water Resources Department, as to whether there has been any breach of the terms and conditions of the said contract and as to whether the supplier is liable to pay any sum as so determined.
3. Any demand made to us for payment of any sum in discharge of this guarantee shall be conclusive proof of the fact that there has been a breach of said contract by the suppliers which warrants the enforcement of this guarantee and is binding on the Bank without prejudice to the claims and counter claims of the parties in the proper court of law.

4. This guarantee shall continue to be enforceable till all dues of the Government under or by virtue of the said contract have been fully paid and its claims are satisfied or discharged or till the Water Resources Department of the State Government certifies the terms and conditions of the said contract have been fully and properly carried out by the said contractor and according discharges the guarantee subject however that the Government has no right under this bond after the expiry of contract period or the extended contract period From the date of its execution, unless the said Government choose to further extend the said period or extended period of guarantee by giving reasonable notice in

writing to the bank on account of any special circumstances of which the Government shall be the sole judge.

This guarantee shall be valid until the …… day of ……., 20 ……

We ……. (Name of Bank) hereby also undertake to have the signature of Branch Manager issuing Bank Guarantee verified from Local Branch of the Bank in Bhubaneswar, ……. (address of Local Branch Bhubaneswar, Odisha) for due authentication.

Our…… branch at Bhubaneswar (Name & Address of the …… branch) is liable to pay the guaranteed amount depending on the filing of claim and any part thereof under this Bank Guarantee only and only if it is served upon us by the employer at our Bhubaneswar Branch, a written claim or demand and received by us at our Bhubaneswar branch on or before Dt. …… otherwise bank shall be discharged of all liabilities under this guarantee thereafter.

……..

(Signature of the authorized officer of the Bank)

……..

……..

Name and designation of the officer

……

Seal, name & address of the Bank and address of the Branch

ANNEXURE-IV

BANK GUARANTEE FOR PERFORMANCE SECURITY DEPOSIT (PSD)

WHEREAS _____ (name and address of Contractor) (hereinafter called "the Contractor") has undertaken a contract, in pursuance of Contract No. _____ dated _____ of Superintending Engineer, _____ to execute the work of _____ [name of work] (hereinafter called "the contract")

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a Nationalized/Scheduled Commercial Bank with branches at Bhubaneswar for the release of Performance Security, for compliance with his obligations in accordance with the Contract;

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee;

NOW THEREFORE we hereby affirm that we are the Guarantors 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 declaring the supplier to be in default under the contract 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 up to _____ day of _____ 20 _____ i.e. upto 3 (three) months beyond the date of expiry of the Defects Liability period for the works portion / up to 3 months beyond the O&M period for O&M portion.

We _____ (Name of Bank) hereby also undertake to have the signature of Branch Manager issuing Bank Guarantee verified from Local Branch of the Bank in Bhubaneswar, _____ (address of Local Branch Bhubaneswar, Odisha) for due authentication.

Our_____ branch at Bhubaneswar (Name & Address of the _____ branch) is liable to pay the guaranteed amount depending on the filing of claim and any part thereof under this Bank Guarantee only and only if it is served upon us by the employer at our Bhubaneswar Branch, a written claim or demand and received by us at our Bhubaneswar branch on or before Dt. _____ otherwise bank shall be discharged of all liabilities under this guarantee thereafter.

(Signature of the authorized officer of the Bank)

… Name and designation of the officer

Seal, name & address of the Bank and address of the Branch

ANNEXURE-V

LITIGATION HISTORY

- **Name of Applicant:**

Please describe: Company's history of litigation or arbitration from contract executed in the last ten years or currently under execution. Please indicate for each case the year, name of employer, cause of litigation, matter in dispute, disputed amount, and whether the award was for or against the company.

SIGNATURE OF BIDDER

ANNEXURE-VI

BANK CERTIFICATE FOR CREDIT FACILITY

This is to certify that M/s …… is **one of our customer.**

If the contractor for the work namely, "Construction of distribution system for 467 Ha of CCA including Command Area Development (CAD) of Karadiha and Karanjia Sub-Minor off-taking from R.D. 16045m of Right Main Distributary of Deo Irrigation Project through Underground Pipeline Irrigation system (Gravity flow) in Mayurbhanj District of Odisha on EPC turnkey basis including Operation and Maintenance of complete commissioned project for 05 (five) years." is awarded to the above firm, we shall be able to provide overdraft/ credit facilities to the extent of Rs. …… (In words) to meet their working capital requirements for executing the above work.

Place — Signature& Seal of Bank Manager

Date — [Name & Address of Bank]

***(NOTE**: The bank certificate for credit facility shall be in prescribed format provided in DTCN only, failing which the bid will be rejected.*
Further conditional bank certificate and subsequent clarifications issued by Bank authority will not be accepted and the bid will be rejected.)

ANNEXURE –VII

FORM OF SOLVENCY CERTIFICATE BY BANKS

I, _____ Managing Director / Manager / General Manager / Agent of _____ _____ bank Limited do hereby certify that a _____ _____ [here the Names and addresses of the agency] to be solvent to the extent of _____ [Rupees _____ _____] as disclosed by the information and record which are available with the aforesaid bank.

For the _____ Bank

Date:

Place:

Signature of Bank Manager

[Authorised Signatory]

ANNEXURE-VIII

FINANCIAL CAPACITY OF BIDDER (Ref Clause 15.2.(B))

	Total Annual Turnover/ revenues (Rupees in Crore)				
Year					
A. Turnover as per Audited P&L statement					
B. Adjustment factor @ 10%	1.61	1.46	1.33	1.21	1.1
C. Adjusted Turnover at __--(Yr of Invitation of Bid) prices (A x B)					
D. Number of years with Adjusted Turnover more than Rs. ____ Crore					

(Authorised Signatory)

Instructions:

1. Copies of the audited financial statements for **FIVE (5)** Financial years Yr 2021-22 till Yr2025-26 (Balance Sheet, Profit & Loss Statement etc.) to support the above information relating to the Applicant/each member of the Consortium should be attached.
2. Annual Turnover (Total revenue) shall mean total gross revenue earned from all types of Civil Engineering Construction works only.
3. In case the amounts required to be specified above are not in Indian Rupees, please convert other currencies into Indian Rupees using the most recent exchange rate available and specify such exchange rate in your submissions.

ANNEXURE-IX

CHARTERED ACCOUNTANT CERTIFICATE ON FINANCIAL CAPACITY

CERTIFICATE FROM THE STATUTORY AUDITOR/PRACTICING CHARTERED ACCOUNTANT REGARDING FINANCIAL CAPACITY

(*On the letter head of the statutory auditor/practicing chartered accountant*)

Based on the books of accounts of ***(insert name of the Applicant)*** (**Applicant**) and other published information authenticated by it, this is to certify that:

(a) as on (***insert date***), the Applicant Turnover in all types of Civil Engineering Construction works only. in the last five years is as below. The Turnover of last five years has been calculated in accordance with the terms in contract

	Total Annual Turnover/ revenues (Rupees in Crore)				
Year					
A. Turnover as per Audited P&L statement in Rupees Crore					
B. Adjustment factor @ 10%	1.61	1.46	1.33	1.21	1.1
C. Adjusted Turnover at _____(Yr of Invitation of Tender) prices (A x B) in Rupees Crore					
D. Number of years with Adjusted Turnover more than Rs. _____Crore					

(b) The Bidder is not

(i) been or being subject to proceedings for declaration of or been declared bankrupt, wound up, or had or having its affairs administered or conducted by any court, administrator, receiver;

(ii) been declared by a court or other competent authority as being unable to pay its debts, or made any composition or arrangements with creditors or had the repayment of its debts suspended;

(iii) been convicted or otherwise found responsible (or any of its directors, partners, trustees, officers or managers been convicted or found responsible) by any court, tribunal, regulatory, public or other competent authority for a breach of any laws or regulations which:

(A) related to any act of fraud or dishonesty for which a fine, penalty, damages, compensation or other payment was levied against the Bidder or any of its directors, partners, trustees, officers or managers; or

(B) resulted in the permanent or temporary suspension of the rights of the Bidder to provide any service or carry on any type of business or operations.

Name of the audit firm:

Seal of the audit firm:

Signature:

Name:

Membership Number:

Designation:

Date

APPENDIX -I

FORMAT FOR POWER OF ATTORNEY FOR SIGNING OF APPLICATION

Know all men by these presents, We…….. (name of the firm and address of the registered office) do hereby irrevocably constitute, nominate, appoint and authoriseMr/ Ms (name), …… son/daughter/wife of …… and presently residing at ……., who is presently employed with us/ the Lead Member of our Joint Venture and holding the position of ……. , as our true and lawful attorney (hereinafter referred to as the "Attorney") to do in our name and on our behalf, all such acts, deeds and things as are necessary or required in connection with or incidental to submission of our application for qualification and submission of our bid for the **(Name of the project to be inserted)** on **EPC Contract** proposed or being developed by the **Water Resources Department, Govt. of Odisha** through the **Chief Construction Engineer, Khairibhandan & Deo Irrigation Project, Karanjia** (the "Employer") including but not limited to signing and submission of all applications, bids and other documents and writings, participate in Pre-Applications and other conferences and providing information/ responses to the Employer, representing us in all matters before the Employer, signing and execution of all contracts and undertakings consequent to acceptance of our bid, and generally dealing with the Employer in all matters in connection with or relating to or arising out of our bid for the said Project and/ or upon award thereof to us and/or till the entering into of the **Project** with the Employer.

AND we hereby agree to ratify and confirm and do hereby ratify and confirm all acts, deeds and things done or caused to be done by our said Attorney pursuant to and in exercise of the powers conferred by this Power of Attorney and that all acts, deeds and things done by our said Attorney in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us.

IN WITNESS WHEREOF WE, ……., THE ABOVE NAMED PRINCIPAL HAVE

EXECUTED THIS POWER OF ATTORNEY ON THIS …… DAY OF ……. 2…..

For ……..

(Signature, name, designation and address)

Witnesses:

1.

(Notarised)

2.

Accepted

……

(Signature)

(Name, Title and Address of the Attorney)

Notes:

The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required, the same should be under common seal affixed in accordance with the required procedure.

Wherever required, the Applicant should submit for verification the extract of the charter documents and documents such as a board or shareholders' resolution/ power of attorney in favour of the person executing this Power of Attorney for the delegation of power hereunder on behalf of the Applicant.

APPENDIX - II

FORMAT FOR POWER OF ATTORNEY FOR LEAD MEMBER OF JOINT VENTURE

Whereas the **Water Resources Department, Govt. of Odisha** through the **Chief Construction Engineer, Khairibhandan & Deo Irrigation Project, Karanjia** ("the Employer") has invited applications from interested on parties for the **(Name of the project to be inserted)** on Percentage rate contract (the "Project").

Whereas, ……., ……., ……..and …….. (collectively the "Joint

Venture") being Members of the Joint Venture are interested in bidding for the Project in accordance with the terms and conditions of the Standard Bidding Document (SBD) and other connected documents in respect of the Project, and

Whereas, it is necessary for the Members of the Joint Venture to designate one of them as the Lead Member with highest share in the joint venture with all necessary power and authority to do for and on behalf of the Joint Venture, all acts, deeds and things as may be necessary in connection with the Joint Venture's bid for the Project and its execution.

NOW THEREFORE KNOW ALL MEN BY THESE PRESENTS

We, ……..having our registered office at ……., M/s. …….. ..... having our registered office at ……., M/s. ……. having our registered office at……., and ……..having our registered office at ……., (herein after collectively referred to as the "Principals") do hereby irrevocably designate, nominate, constitute, appoint and authorize M/S …….. having its registered office at ……., being one of the Members of the Joint Venture, as the Lead Member and true and lawful attorney of the Joint Venture (hereinafter referred to as the "Attorney"). We hereby irrevocably authorize the Attorney (with power to sub-delegate) to conduct all business for and on behalf of the Joint Venture and any one of us during the bidding process and, in the event the Joint Venture is awarded the contract, during the execution of the Project and in this regard, to do on our behalf and on behalf of the Joint Venture, all or any of such acts, deeds or things as are necessary or required or incidental to the qualification of the Joint Venture and submission of its bid for the Project, including but not limited to signing and submission of all applications, bids and other documents and writings, participate in bidders and other conferences, respond to queries, submit information/ documents, sign and execute contracts and undertakings consequent to acceptance of the bid of the Joint Venture and generally to represent the Joint Venture in all its dealings with the Employer, and/ or any other Government Agency or any person, in all matters in connection with or relating to or arising out of the Joint Venture's bid for the Project and/ or upon award thereof till the Contract is entered into with the Employer.

AND hereby agree to ratify and confirm and do hereby ratify and confirm all acts, deeds and things done or caused to be done by our said Attorney pursuant to and in exercise of the powers conferred by this Power of Attorney and that all acts, deeds and things done by our said Attorney in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us/ Joint Venture.

APPENDIX II

Page 2

IN WITNESS WHEREOF WE THE PRINCIPALS ABOVE NAMED HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS ……. DAY OF ……. 2…..

For ……..

(Signature)

……..

(Name & Title)

For ……..

(Signature)

……..

(Name & Title)

Witnesses:

1.

2.

……

(Executants)

(To be executed by all the Members of the Joint Venture)

Notes:

The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required, the same should be under common seal affixed in accordance with the required procedure.

Also, wherever required, the Applicant should submit for verification the extract of the charter documents and documents such as a board or shareholders' resolution/ power of attorney in favour of the person executing this Power of Attorney for the delegation of power hereunder on behalf of the Applicant.

APPENDIX III

FORMAT FOR JOINT BIDDING AGREEMENT FOR JOINT VENTURE

Refer Clause 14.8(H,M)

(To be executed on Stamp paper of appropriate value)

THIS JOINT BIDDING AGREEMENT is entered into on this the …… day of …… 20…

AMONGST

1. {…… Limited, a company incorporated under the Companies Act, 1956} and having its registered office at …… (herein after referred to as the "**First Party**" which expression shall, unless repugnant to the context include its successors and permitted assigns). The **"First Party"** is the lead partner with ..... % share in the joint venture.

AND

2. {…… Limited, a company incorporated under the Companies Act, 1956} and having its registered office at …… (herein after referred to as the "**Second Party**" which expression shall, unless repugnant to the context include its successors and permitted assigns).The "**Second Party"** is the lead partner with ..... % share in the joint venture..

WHEREAS,

(A) The**Water Resources Department, Govt. of Odisha** represented through the Chief Construction Engineer,.....and having its offices at Office of the……Odisha (hereinafter referred to as the "**Employer**" which expression shall, unless repugnant to the context or meaning thereof, include its administrators, successors and assigns) has invited applications (the **Applications**") by its Invitation for Bids (IFB) with Bid Identification No. …… dated ……(the "**SBD**") for qualification of bidders **(Name of the project to be inserted)** on Percentage rate Project (the "**Project**") through a Percentage rate Contract.

(B) The Parties are interested in jointly bidding for the Project as members of a Joint Venture and in accordance with the terms and conditions of the Bid document and other bid documents in respect of the Project, and

(C) It is a necessary condition under the Bid document that the members of the Joint Venture shall enter into a Joint Bidding Agreement and furnish a copy thereof with the Application.

NOW IT IS HEREBY AGREED as follows:

1. Definitions and Interpretations

In this Agreement, the capitalized terms shall, unless the context otherwise requires, have the meaning ascribed thereto under the Bid.

2. Joint Venture

2.1 The Parties do hereby irrevocably constitute a Joint Venture (the "**Joint Venture**") for the purposes of jointly participating in the Bidding Process for the Project.

2.2 The Parties hereby undertake to participate in the Bidding Process only through this Joint Venture and not individually and/ or through any other Joint Venture constituted for this Project, either directly or indirectly.

APPENDIX III

Page 2

3. Covenants

The Parties hereby undertake that in the event the Joint Venture is declared the selected Bidder and awarded the Project, it shall enter into a percentage Contract with the Employer for performing all its obligations as the Contractor in terms of the Contract for the Project.

4. Role of the Parties

The Parties hereby undertake to perform the roles and responsibilities as described below:

(a) The First Party shall be the Lead member of the Joint Venture and shall have the power of attorney from all Parties for conducting all business for and on behalf of the Joint Venture during the Bidding Process and until the Appointed Date under the Contract;

(b) The Second Party shall be {the Member of the Joint Venture; and}

5. Joint and Several Liability

The Parties do hereby undertake to be jointly and severally responsible for all obligations and liabilities relating to the Project and in accordance with the terms of the Bid and the Contract, till such time as the completion of the Project is achieved under and in accordance with the Contract.

6. Share of work in the Project

The Parties agree that the proportion of construction in the Contract to be allocated

among the members shall be as follows:

First Party:

Second Party:

Further, the Lead Member (First Party) shall itself undertake and perform at least 51 (Fifty-one) per cent or above and the Second party shall itself undertake and perform at least 25 (Twenty-five) per cent or above respectively of the total project if the Contract is allocated to the Joint Venture.

7. Representation of the Parties

Each Party represents to the other Party as of the date of this Agreement that:

(a) Such Party is duly organised, validly existing and in good standing under the laws of its incorporation and has all requisite power and authority to enter into this Agreement;

(b) The execution, delivery and performance by such Party of this Agreement has been authorized by all necessary and appropriate corporate or governmental action and a copy of the extract of the charter documents and board resolution/ power of attorney in favour of the person executing this Agreement for the delegation of power and authority to execute this Agreement on behalf of the Joint Venture Member is annexed to this Agreement, and will not, to the best of its knowledge:

(i) require any consent or approval not already obtained;

(ii) violate any Applicable Law presently in effect and having applicability to it;

(iii) violate the memorandum and articles of association, by-laws or other applicable organizational documents thereof;

(iv) violate any clearance, permit, concession, grant, license or other governmental authorization, approval, judgment, order or decree or any mortgage agreement, indenture or any other instrument to which such Party is a party or by which such Party or any of its properties or assets are bound or that is otherwise applicable to such Party; or

(v) create or impose any liens, mortgages, pledges, claims, security interests, charges or Encumbrances or obligations to create a lien, charge, pledge, security interest, encumbrances or mortgage in or on the property of such Party, except for encumbrances that would not, individually or in the aggregate, have a material adverse effect on the financial condition or prospects or business of such Party so as to prevent such Party from fulfilling its obligations under this Agreement;

(c) this Agreement is the legal and binding obligation of such Party, enforceable in accordance with its terms against it; and

(d) there is no litigation pending or, to the best of such Party's knowledge, threatened to which it or any of its affiliates is a party that presently affects or which would have a material adverse effect on the financial condition or prospects or business of such Party in the fulfillment of its obligations under this Agreement.

8. Termination

This Agreement shall be effective from the date hereof and shall continue in full force and effect until Project completion (the "Defects Liability Period") is achieved under and in accordance with the Percentage rate Contract, in case the Project is awarded to the Joint Venture. However, in case the Joint Venture is either not qualified for the Project or does not get selected for award of the Project, the Agreement will stand terminated in case the Applicant is not pre-qualified or upon return of the Bid Security by the Employer to the Bidder, as the case may be.

9. Miscellaneous

9.1 This Joint Bidding Agreement shall be governed by laws of {India/ Odisha}.

9.2 The Parties acknowledge and accept that this Agreement shall not be amended by the Parties without the prior written consent of the Employer.

APPENDIX III

Page 4

IN WITNESS WHEREOF THE PARTIES ABOVE NAMED HAVE EXECUTED AND DELIVERED THIS AGREEMENT AS OF THE DATE FIRST ABOVE WRITTEN.

SIGNED, SEALED AND DELIVERED SIGNED, SEALED AND DELIVERED

For and on behalf of

LEAD MEMBER by: SECOND PART

(Signature) (Signature)

(Name) (Name)

(Designation) (Designation)

(Address) (Address)

In the presence of:

1. 2.

Notes:

1. The mode of the execution of the Joint Bidding Agreement should be in accordance with the procedure, if any, laid down by the Applicable Law and the charter documents of the executants(s) and when it is so required, the same should be under common seal affixed in accordance with the required procedure.

2. Each Joint Bidding Agreement should attach a copy of the extract of the charter documents and documents such as resolution / power of attorney in favour of the person executing this Agreement for the delegation of power and authority to execute this Agreement on behalf of the Joint Venture Member.

3. Clause Deleted.

APPENDIX IV

Page 1

Statement of Legal Capacity

(To be forwarded on the letterhead of the Applicant/ Lead Member of Joint Venture)

Ref. Date:

To,

Dear Sir,

We hereby confirm that we/ our members in the Joint Venture (constitution of which has been described in the application) satisfy the terms and conditions laid out in the Bidding document.

We have agreed that …… (insert member's name) will act as the Lead Member of our Joint Venture. *

We have agreed that …….. (insert individual's name) will act as our representative/ will act as the representative of the Joint Venture on its behalf* and has been duly authorized to submit the Bidding Document.

Further, the authorized signatory is vested with requisite powers to furnish such letter and authenticate the same.

Thanking you,

Yours faithfully,

(Signature, name and designation of the authorised signatory)

For and on behalf of……..

**Please strike out whichever is not applicable.*

SECTION – IV

GENERAL CONDITIONS OF CONTRACT

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GENERAL CONDITIONS OF CONTRACT

A. GENERAL

1.0 INTERPRETATION

1.1 In interpreting these Conditions of Contract, singular also means plural, male also means female, and vice-versa. Headings have no significance. Works have their normal meaning under the language of the contract unless specifically defined. The Engineer-in-Charge will provide instructions clarifying queries about the conditions of Contract.

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

a) Articles of Contract
b) Letter of Acceptance, notice to proceed with the works
c) Agency's Bid (Technical bid)
d) Conditions of contract
e) Specifications
f) Drawings
g) Any other document listed as forming part of the Contract.

2.0 ENGINEER-IN-CHARGE'S DECISIONS

2.1 Except where otherwise specifically stated, the Engineer-in-Charge will decide the contractual matters between the Department and the Agency in the role representing the Department.

3.0 DELEGATION

3.1 The Engineer-in-Charge may delegate any of his duties and responsibilities to other officers and may cancel any delegation by an official order issued.

4.0 COMMUNICATIONS

4.1 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).

4.2 The agency at time of signing of Agreement shall furnish the permanent and temporary address of the firm for correspondence. He shall also designate his authorized representative for liasoning with the Department. In case of change of authorized representative, the new representative shall be promptly designated. The e-mail address, telephone number and Fax number of the firm & the representative shall also be furnished.

5.0 SUB-CONTRACTING

No part of the contract shall be sublet without written permission of the Employer nor shall transfer be made by power of attorney, authorizing others to receive payment on the contractor's behalf. If the prime contractor desires to sublet a part the work he should submit the same at the time of filing Bids itself or during execution giving the names of the proposed sub-contractor along with the details of his qualification and experience. The Bid accepting authority should verify the experience of the sub-contractor and if the sub-contractor satisfies the qualification criteria with reference to the value of work proposed to be sublet, he may permit the same. However, the total value of works to be awarded on subletting shall not exceed 50% of contract value. The extent of subletting shall be added to the experience of the sub-contractor and to that extent deducted from that of the main contractor.

6.0 OTHER AGENCIES

6.1 The Agency shall cooperate and share the site with other agencies, Public authorities, utilities, and the Department. The Agency shall also provide facilities and services for them as directed by the Engineer-in-charge.

7.0 PERSONNEL:

7.1 The Agency shall employ the required Key Personnel named in the Schedule of Key Personnel to carry out the functions stated in the Schedule or other personnel approved by the Engineer-in-charge. The Engineer-in-Charge will approve any proposed replacement of Key Personnel only if their qualifications, abilities, and relevant experience are substantially equal to or better than those of the personnel listed in the Schedule**.**

7.2 Failure to employ the required technical personnel including quality management staff by the agency, the employer would engage any quality assurance staff for implementing quality management Plan. The amounts spent on such deployment will be recovered from the agency over and above the provision made in part two of schedule-A from the agency's bills. However, this will not absolve the agency from the responsibility of quality management on contract works.

7.3 The technical personnel including quality assurance personnel should be on full time and available at site whenever required by Engineer in Charge to take instructions.

7.4 The names of the technical personnel including quality assurance personnel to be employed by the agency should be furnished in the statement enclosed separately.

7.5 In case the agency is already having more than one work on hand and has undertaken more than one work at the same time, he should employ separate technical and quality assurance personnel on each work.

7.6 If the agency fails to employ technical and quality assurance personnel the work will be suspended, department will engage technical and quality assurance personnel and recover the cost thereof from the agency. This will not absolve the agency from the responsibly of maintaining quality of work and implementing quality management plan.

7.7 If the Engineer-in-Charge asks the Agency to remove a person who is a member of Agency's staff or his work force stating the reasons, the Agency shall ensure that the person leaves the site forthwith and has no further connection with the work in the contract.

7.8 All Agency's personnel employed at the plant/work site at any time during the period covered by the present Contract will be provided by him. The Employer is not liable for personnel in any way and cannot be held responsible in the event of litigation of any sort between the Agency and members of plant personnel or their representatives

8.0 AGENCY'S RISKS:

8.1 All risks of loss or damage to physical property and of personnel injury and death, which arise during and in consequence of the performance of the Agency, are the responsibility of the Agency.

9.0 INSURANCE:

9.1 The Agency shall provide, in the joint names of the Department and the agency, insurance cover from the start date to the end of the Defects Liability Period i.e. for

11 months from the date of commencement & for maintenance period of 5 years or five Kharif /five Rabi crop seasons whichever is later for the following events.

i. Loss of or damage of property in connection with the Contract; and

ii. Personal injury or death of persons employed for construction

iii. Loss of or damage to the Works, Plant and Materials :

iv. Loss or damage to the Equipment.

9.2 Policies and certificates of insurance for events i. & ii. above shall be delivered by the Agency to the Engineer-in-Charge at the time of concluding Contract. The policies and certificates of insurance for the events (iii) & (iv) of above clause shall be delivered by the agency to Engineer-in-Charge on commencement of work& after finalization of planning & design. All such insurance shall provide for compensation to be payable to rectify the loss or damage incurred.

i. The agency shall furnish insurance policy in force in accordance with proposal furnished in the Bid and approved by-the Department for concluding the contract.
ii. The agency shall also pay regularly the subsequent insurance premium and produce necessary receipt to the Engineer-in-Charge, well in advance.
iii. In case of failure to act in the above said manner the department will pay the premium and the same will be recovered from the Agency's payments.

9.3 Alterations to the terms of insurance shall not be made without the approval of the Engineer-in-Charge.

Any amounts not insured or not recovered from the insurers shall be borne by the Agency in accordance with their responsibilities under relevant Clause.

The Agency shall, except if and so far as the Contract provides otherwise, indemnify the Employer against all losses and claims in respect of:

a. Death of or injury to any person, or,
b. Loss of or damage to any property (other than the Works),

Which may arise out of in consequent of the Operation and Maintenance of the Facility and the remedying of any defects therein, and against all claims proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

The insurance policy shall include a cross liability clause such that the insurance shall apply to the Agency and to the Employer as separate insurers.

The Employer shall not be liable for or in respect of any damages or compensation payable to any workman or other person in the employment of the Agency or any Sub-agency, The Agency shall indemnify and keep indemnified the employer against all such damages and compensation, other than those for which the Employer is liable as aforesaid, and against all claims, proceedings, damages, costs, charges, and expenses whatsoever in respect thereof or in relation thereto.

The Agency shall insure against such liability and shall continue such insurance during the whole of the time that any persons are employed by him on the Facility. Provided that, in respect of any persons employed by any Sub-agency, the Agency's obligations to insure asaforesaid under this Sub-Clause shall be satisfied if the Sub-agency shall have insured against the liability in respect of such persons in such manner that the Employer is indemnified under the policy, but the Agency shall require such Sub-agency to produce to the Employer, when required, such policy of insurance and receipt for the payment of the current premium.

In the event that the Agency or the Employer fails to comply with conditions imposed by the insurance policies affected pursuant to the Contract, each will indemnify the other against all losses and claims arising from such failure according to the Contract Conditions.

10.0 SITE INSPECTIONS:

10.1 The agency should inspect the site and also proposed quarries of choice for materials source of water and quote his bid price including quarrying, conveyance and all other charges etc.

10.2 The responsibility for arranging the land for borrow area rests with the Agency and no separate payment will be made for procurement or otherwise. The agency's quoted bid price will be inclusive of land cost.

11.0 AGENCY TO EXECUTE THE WORKS:

11.1 The Agency shall conduct Planning, designs, construction of all component, & Commissioning the Work in accordance with the approved specifications and Drawings and work programme.

12.0 DIVERSION OF STREAMS / NALLAS / DRAINS:

12.1 The agency shall at all time carry out construction of cross drainage works in a manner creating least interference to the natural flow of water while consistent with the satisfactory execution of work. A temporary diversion shall be formed by the agency at his cost where necessary. No extra payment shall be made for this work.

12.2 No separate payment for bailing out sub-soils, water drainage or locked up rain water for diversion, shoring, foundations, bailing of pumping water either from excavation of soils from foundations or such other incidental will be paid. The bid price to be quoted by the agency is for the finished item of work in situ and including all the incidental charges. The borrow pits are also to be de-watered by the agency himself at his expense, if that should be found necessary.

12.3 The work of diversion arrangements should be carefully planned and prepared by theagency and forwarded to the Engineer-in-Charge technically substantiating the proposals and approval of the Engineer-in-Charge obtained for execution.

12.4 The agency has to arrange for bailing out water, protection to the work in progress and the portion of works already completed and safety measures for men and materials and all necessary arrangements to complete the work.

12.5 All the arrangements so required should be carried out and maintained at the cost of the agency and no separate or additional payment is admissible.

12.6 Necessary coffer dams and ring bunds have to be constructed at the cost of agency and some are to be removed after the completion of the work. The agency has to quote his bid price keeping the above in view.

13.0 TEMPORARY DIVERSIONS (WORKS ON HIGHWAYS):

13.1 The agency shall at all time carryout work on the highway in a manner creating least interference to the flow of traffic while consistent with the satisfactory execution of the same. For all works involving improvements to the existing highway, the agency shall in accordance with the directions of the Engineer-in-Charge provide and maintain during the execution of the work a passage for traffic, either along a part of the existing carriage way under improvement or along a temporary diversion constructed close to the highway.

13.2 If in the opinion of the Engineer-in-Charge, it is not possible to pass the traffic on part width of the carriage-way for any reason, a temporary diversion close to the highway shall be constructed as directed. It shall be paved with the materials such as hard moorum, gravel and stone, metal to the specified thickness as directed by the Engineer-in-Charge. In all cases, the alignment, gradients and surface type of the diversion including its junctions, shall be approved by the Engineer-in-Charge before the highway is closed to traffic.

13.3 The agency shall take all necessary measures for the safety of traffic during construction and provide erect and maintain such barricades, including signs, markings, flags lights and information and protection of traffic approaching or passing through the section of the highway under improvement. Before taking up any construction, an agreed phased programme for the diversion of traffic on the highway shall be drawn up in consultation with the Engineer-in-charge.

13.4 The barricades erected on either side of the carriage way portion of the carriage way closed to traffic, shall be of strong design to resist violation and painted with alternative black and white stripe. Red lanterns or warnings lights of similar type shall be mounted on the barricades at night and kept lit throughout from sunset to sunrise.

14.0 RAMPS:

Ramps required during execution may be formed wherever necessary and some are to be removed after completion of the work. No separate payment will be made for this purpose.

15.0 MONSOON DAMAGES:

Damages due to rain or flood either in cutting or in banks shall have to be made good by the agency till the work is handed over to the Department. The responsibility of de-silting and making good the damages due to rain or flood rests with the agency. No extra payment is payable for such operations and the agency shall therefore, has to .take all necessary precautions to protect the work done during the construction period.

16.0 THE WORKS TO BE COMPLETED BY THE INTENDED COMPLETION DATE:

The Agency may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the programme submitted by the Agency at the time of agreement, with the approval of the Engineer-in-Charge, and complete the work by the Intended Completion Date i.e. by 11 months.

17.0 SAFETY:

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

18.0 DISCOVERIES:

Anything of historical or other interest or of significant value unexpectedly discovered on the Site is the property of the Government. The Agency is to notify the Engineer-in-Charge of such discoveries and carry out the Engineer-in-Charges instructions for dealing with them.

19.0 POSSESSION OF THE SITE.

The Department shall give possession of the site to the Agency. If possession of a part site is given, the Department will ensure that the part site so handed over is amenable to carry out the work at site by the Agency.

20.0 ACCESS TO THE SITE:

The Agency shall provide the Engineer-in-Charge any person authorized by the Engineer-in-Charge, access to the site and to any place where work in connection with the Contract is being carried out or is intended to be carried out.

21.0 INSTRUCTIONS:

The Agency shall carry out all instructions of the Engineer-in-Charge comply with all the applicable local laws where the Site is located.

22.0 SETTLEMENT OF DISPUTES:

22.1 If any dispute of difference of any kind whatsoever arises between the department and the Agency in connection with, or arising out of the Contract, whether during the progress of the works or after their completion and whether before or after the termination, abandonment or breach of the Contract, it shall in the first place, be referred to for settlement by the Engineer-in-Charge who shall, within a period of thirty days of receipt of request of the Agency to do so, give written notice of his decision to the Agency. Upon receipt of the written notice of the decision of the Engineer-in-Charge the Agency shall promptly proceed without delay to comply with such notice of decision.

22.2 If the Engineer-in-Charge fails to give notice of his decision in writing within a period of thirty days after being requested or if the Agency is dissatisfied with the notice of the decision of the Engineer-in-Charge, the Agency may within thirty days of receipt of the notice of decision appeal to the Chief construction Engineer who will give notice of his decision within thirty days of receipt of the appeal. In case of failure of Chief construction Engineer to give the decision within stipulated period or if the agency is dissatisfied with the decision, he may within thirty days of receipt of such notice, appeal to the Chief construction Engineer who shall offer an opportunity to the agency to be heard and to offer evidence in support of his appeal. Chief construction Engineer shall give notice of his decision within a period of thirty days after the Agency has given the said evidence in support of his appeal. Such decision of the Chief construction Engineer, in respect of every matter so referred shall be final and binding upon the Agency and shall forthwith be given effect to by the Agency, who shall proceed with the execution of the works with all due diligence whether he requires further appeal as hereinafter provided, or not. If the Chief construction Engineer fails to give notice of his decision, as aforesaid within a period of thirty days after being requested as aforesaid, or if the Agency be dissatisfied with any such decision, then the agency within thirty days may refer the matter or matters in dispute to Principal Secretary to Government in Department of Water Resources who shall decide within thirty days of receipt of such reference by the agency whose decision will be final & binding.

23.0 ARBITRATION:

In case the Agency is dissatisfied with any such decision of Government, then the agency within thirty days may refer the matter or matters of dispute for arbitration. The arbitration shall be conducted in accordance with the provisions of Indian Arbitration and Conciliation Act 1996 or any statutory modification thereof.

B. TIME FOR COMPLETION

24.0 TIME PERIOD FOR COMPLETION

24.1 Time is the essence of the contract. The total period of completion is 11 calendar months from the date of signing of Agreement which shall be the date of commencement of work. The period is inclusive of rainy seasons. After signing the contract, the Engineer-in-Charge shall forthwith notify the agency to go ahead with the work & the agency shall forthwith begin the work. The agency shall furnish a work programme containing CPM/PERT network within fifteen days of signing of contract so as to achieve the mile stones specified in the bid.

24.2 This being a EPC contract on turnkey basis, conducting of planning and design, are within the scope of the contract and the agency shall meticulously plan so as to obtain the required site for carrying out the work in the UGPL Scheme simultaneously. All the available field data shall be supplied by the department on written request of the agency for planning and design.

24.3 The agency shall bear all costs and charges for special or temporary way leases required by him in connection with access to the site. The agency shall also provide at his own cost any additional accommodation outside the site required by him for the purposes of the work.

24.4 Incentive for Early Completion: For availing incentive clause in any project which is completed before the stipulated date of completion, subject to other stipulations it is mandatory on the part of the concerned Executive Engineer to report the actual date of completion of the project as soon as possible through fax or e-mail so that the report is received within 7 days of such completion by the concerned SE, CE & the Administrative Department. The incentive for timely completion should be on a graduated scale of one percent to 10 percent of the contract value. Assessment of incentives may be worked out for earlier completion of work in all respect in the following scale:

Before 30% of contract period =10% of Contract Value
Before 20 to 30% of contract period=7.S% of Contract Value
Before 10 to 20% of contract period=5% of Contract Value
Before 5 to 10% of contract period=2.5% of Contract Value
Before 5% of contract period=1% of Contract Value, the codal provision as laid by Works Department in their letter No.5288/W Dt.04.05.2016 and OPWD Code Volume-I, Para 3.5.5. and subsequent amendment thereof shall be followed.

25.0 CONSTRUCTION PROGRAMME:

25.1 The Agency shall furnish within fifteen days of signing of the contract a work programme, containing CPM/PERT showing the sequence in which he proposes to carry out the work, monthly progress expected to be achieved, indicating date of procurement of materials plant and machinery. The schedule should be such that it is practicable to achieve completion of the whole work within the time limit fixed and in keeping with the Mile Stone programme specified and shall obtain the approval of the Engineer-in-charge. Further, rate of the progress as in the program shall be kept up to date. In case it is subsequently found necessary to alter this program, the agency shall submit sufficiently in advance the revised programme incorporating necessary modifications and get the same approved by the Engineer-in-Charge. The Engineer-in-Charge will get the program approval by the Chief construction Engineer before communicating to the agency.

The Engineer-in-Charge shall have all times the right, without any way violating this contract, or forming grounds for any claim, to alter the order of progress of the

works or any part thereof and the agency shall after receiving such directions proceed as per the order directed.

26.0 SPEED OF WORK:

26.1 The Agency shall at all times maintain the progress of work to conform to the latest operative progress schedule approved by the Chief Construction Engineer, Khairibhandan & Deo Irrigation Project. The agency should furnish progress report indicating the programme and progress once in a month.

26.2 Delays in Commencement or progress or neglect of work :

If, at any time, the Engineer-in-Charge shall be of the opinion that the Agency is delaying Commencement of the work or violating any of the provisions of the Contract or is neglecting or delaying the progress of the work, he shall so advise the Agency in writing and at the same time demand compliance in accordance with instructions to Bidder and conditions of Contract. If the Agency neglects to comply with such demand within seven days after receipt of such notice, it shall then or at any time thereafter, be lawful for the Engineer-in-Charge to take suitable action in accordance with relevant Clauses of contract**.**

27.0 SUSPENSION OF WORKS BY THE AGENCY:

27.1 If the Agency suspends the works, or sublet the work without sanction of the Engineer-in-Charge, or in the opinion of the Engineer-in-Charge shall neglect or fail to proceed with due diligence in the performance of his part of the Contract as laid down in the Schedule rate of progress, or if he shall continue to default or repeat such default, the Engineer-in-Charge shall take action in accordance with Clauses of termination of contract.

28.0 EXTENSION OF COMPLETION DATE:

28.1 No claim for compensation on account of delays or hindrances to the work from any cause whatever shall be accepted. Reasonable extension of time will be allowed by the Engineer-in-Charge or by the officer competent to sanction the extension, for unavoidable delays, such as may result from cause(s), which in the opinion of the Engineer-in-Charge are undoubtedly beyond the control of the agency. The Engineer-in-Charge shall assess the period of delay or hindrance caused by any written instructions issued by him.

28.2 The Agency shall give written notice to the Engineer-in-Charge whenever planning or progress of the works is likely to be delayed or disrupted unless any further drawings or order including a direction, instruction or approval is issued by the Engineer-in-Charge within a reasonable time. The notice shall include details of the drawing or order required and of why and by when it is required and of any delay or disruption likely to be suffered if it is late. If by reason of any failure or inability of the Engineer-in-Charge to issue within a reasonable time in all the circumstances, any drawing or order requested by the agency the Agency suffers delay, then the Engineer-in-Charge shall take such delay into account in determining any extension of time for which no compensation shall be claimed by the agency.

28.3 In the event of the Engineer-in-Charge failing to issue necessary instructions and thereby causing delay and hindrance to the agency, the latter shall have the right to appeal to the Chief Engineer of the project whose decision will be final and binding. The agency shall lodge in writing to the Engineer-in-Charge a statement for time

extension for any delay or hindrance referred to above, within fourteen days from its occurrence, otherwise no extension of time will be allowed.

28.4 Whenever authorized alterations or additions made during the progress of the work are of such a nature in the opinion of the Engineer-in-Charge as to justify an extension of time in consequence thereof, such extension will be granted in writing by the Engineer-in-Chargeorother competent authority when ordering such alterations or additions.

28.5 Application for extension of time for the completion of a work on the grounds of unavoidable hindrance or any other grounds shall be submitted by the agency within 30 days of such hindrance & the Engineer-in-Charge shall authorize or recommend such extension of time as deemed necessary or proper within fifteen days of the receipt of thesuch an application. In cases where the sanction of the higher authorities to the grant of extension of time is necessary, the Engineer-in-Charge should send his recommendation as expeditiously as possible. The higher authority should communicate his decision within 60 days from the date of receipt on recommendation in his office. If the orders of the competent authority are not received in time, the Engineer-in-Charge may grant extension of time under intimation to the concerned authorities so that the contract might remain in force, but while communicating this extension of time, he must inform the agency that the extension is granted without prejudice to Government's right to levy compensation under relevant clause of contract.

28.6 The power to grant extension of time vests with the authority who accepted the tender but the period of extension that can be granted by such an authority is limited to the period equivalent to the time originally stipulated in the Agreement for completion of the work beyond this, approval of next higher authority should be obtained before extension of time is granted.

28.7 The application for extension of time and sanction thereto should be made in the prescribed form.

28.8 The delay in completion of the work for which the reasons are attributable to the contractor, the extra amount required for extension of **PMC/ PEC/ TPIA** engaged for this work will be recovered from the contractor executing the EPC work.

29.0 DELAY ORDERED BY THE ENGINEER-IN-CHARGE.

The Engineer-in-Charge may instruct the Agency to delay the start or progress of any activity within the Work.

30.0 EARLY WARNING:

30.1 The agency is to bring to the notice of the Engineer-in-Charge at the earliest opportunity of specific likely future events or circumstances that may adversely affect the Execution of Works.

30.2 The Agency shall cooperate with the Engineer-in-Charge in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Engineer-in-Charge.

31.0 MANAGEMENT MEETINGS:

The Engineer-in-Charge may require the Agency to attend management meetings. The business of a management meeting shall be to review the programme for remaining work and to deal with matters raised in accordance with the early warning procedure. The minutes of the meeting shall be given in writing for follow up by the parties.

C. QUALITY CONTROL

32.0 IDENTIFYING DEFECTS:

32.1 The Engineer-in-Charge shall check the Agency's work and notify the Agency of any Defects that are found. Such checking shall not affect the Agency's responsibilities. The Engineer-in-Charge may instruct the Agency to verify the Defect and to uncover and test any work that the Engineer considers may be a Defect.

33.0 TESTS:

33.1 If the Engineer-in-Charge instructs the Agency to carry out a test not specified in the Specification to check whether any work has a Defect, the Agency shall promptly comply and pay for the test and any sampling.

34.0 ACTION IN CASE OF IMPROPER MATERIALS AND WORKMANSHIP:

34.1 If in the opinion of the Engineer-in-Charge any work or part thereof is executed with improper materials or defective workmanship the agency(s) shall when required by the Engineer-in-Charge , forthwith re-execute the same and substitute proper materials and workmanship and in case of default by the agency(s) in so doing within a week from the date of the requisition, the Engineer-in-Charge shall have full power to employ other person to re-execute the work and the cost thereof shall be borne by the agency(s). Every time notice of a Defect is given, the Agency shall correct the notified defect within the length of time specified by the Engineer-in-Charge's notice

35.0 ACTION AND COMPENSATION PAYABLE IN CASE OF BAD WORK:

35.1 If at any time before security deposit is refunded to the agency it shall appear to the Engineer-in-Charge or his subordinate in charge of the work that any work has been executed with unsound, imperfect or unskillful workmanship or with materials of inferior quality or that any materials or article provided by him for the execution of the work are unsound or of a quality inferior to that contracted for or are otherwise not in accordance with contract, it shall be lawful for Engineer-in-Charge to intimate this fact in writing to the agency and then notwithstanding the fact that the work, materials or article complained of may have been inadvertently passed, certified and paid for, the agency shall be bound forthwith to rectify or remove and reconstruct the work so specified in whole or in part as the case may require or if so required shall remove the materials or articles so specified and provide other proper and suitable materials or articles at his own charge and cost and in the event of his failing to do so within a period to be specified by the Engineer-in-Charge in the written intimation aforesaid, the agency shall be liable to pay compensation at the rate of one percent on the amount of the estimate for every day not exceeding ten days during which the failure so continues and in the event of any such failure as aforesaid, the Engineer-in-Charge may rectify or remove and re-execute the work or remove and replace the materials or articles complained, at the cost of the agency. If the Engineer-in-Charge considers that such inferior work or materials as described above may be accepted or made use of it shall be within his discretion to accept the same at such reduced rates as he may fix therefore.

35.2 The Engineer-in-Charge may also introduce check lists which shall be kept in Bound registers by the construction supervision staff. The agency may be required to fill up these lists in the First instance & shall be subsequently checked by the Construction/Quality Control Engineers.

36.0 QUALITY CONTROL :

Quality control monitoring reports, test results, reports of corrective action etc, shall be furnished to the employer at regular intervals.

Quality Audit shall get conducted by the Engineer-in-Charge departmentally or by other organization and the agency shall extend the testing facilities to them also.

The agency shall produce the Quality records maintained by him to the department or his authorizing agent for the quality audit.

D. COST CONTROL

37.0 CONTRACT PRICE:

37.1 The contract price shall be the total value of work on EPC turnkey basis of the UGPL system as detailed in the scope of work which includes Operation and Maintenance of the total UGPL Network for five years or five kharif five Rabi seasons whichever is later from the date of commissioning of the system.

37.2 The essence of the contract is to develop irrigation network for the command areas under UGPL system. At the stage of detailed planning of the UGPL scheme, care will be taken for achieving irrigation to the total CCA of 10671 ha.

37.3 The Contract Price shall be related to the CCA of the system and break up of contract price shall be made based on the approved CCA after the stage of approval of Planning and Design of the UGPL system (CCA in Ha).

37.4 The agency will be paid a firm contract price for completion of all works as specified under the scope of the work under the contract.

37.5 Notwithstanding anything that is stated, the contract price once accepted by the employer shall be final and shall not be subject to any claims on any ground what so ever of the Agency.

37.6 The contract price of the total work is divided among different component of works as per the percentages specified in Price Bid - Break up of Bid amount and payments will be regulated accordingly.

37.7 The agency shall pay all duties and taxes in consequence of his obligations under the contract and the contract price shall not be adjusted for such costs.

37.8 Contract price will be paid to the Agency in Indian Rupees only.

38.0 CHANGES IN THE QUANTITIES:

38.1 Being on EPC-Turnkey contract, the agency is bound to complete the entire work under the contract on a firm lump sum price quoted and on a single source responsibility basis. The Agency shall be deemed to have satisfied himself as to the correctness and sufficiency of the contract price. Therefore the agency is bound to execute all supplemental works that are found essential, incidental and inevitable for completion of work in all respect during execution of the system and also Operation and Maintenance for a period of five years or five Kharif and Rabi seasons whichever is later at no extra cost to the employer subject to the stipulation of variation of CCA in clause stated below.

38.2 Variation in CCA: As stated in clause 37.4, there could be variation of CCA in the system after the detailed planning is done and approved by competent authorities.

38.3 In case of variation of CCA, payment shall be made as per actual CCA on ha. basis to the agency after joint verification by Water Resources and Revenue authorities .

38.4 Entrustment of additional items :

38.4.1 Wherever additional items not contingent on the main work and outside the scope of original contract are to be entrusted to the original agency, entrustment of such items and the price to be paid shall be referred to a committee proposed by Government for final decision and it shall be binding on the contactor.

38.4.2 Entrustment of the additional items contingent on the main work will be authorized by the employer and the contactor shall be bound to execute such additional items at no extra cost to the employer and the cost of such items shall be deemed to have been included in the contract price quoted.

39.0 CASH FLOW FORECASTS:

When the program is updated, the agency is to provide the Engineer-in-Charge with an updated cash flow forecast.

40.0 PRICE BID & PAYMENT SCHEDULES:

40.1 The bidder shall quote Bid Price for the entire work and O&M in the prescribed format given in APPENDIX- FB of Price Bid.

40.2 The total work specified under EPC turnkey contract is divided into different components of work to facilitate payments component wise as specified in Appendix-F1 to F2under Price Bid. The cost of each of the above components is specified as percentage of the total Bid price & O&M is Appendix-F3 to F4 year wise.

40.3 The payment for each of the components of works shall be limited to the respective amounts arrived on the basis of percentages specified in Appendix – F1 to F2.

40.4 The components shown in Appendix-FB have been further sub-divided into appropriate stages for the purpose of stage payment as specified in Appendix F1 to F4.

40.5 This stage payment shall be limited to the respective amounts arrived on the basis of percentages specified in the Appendix F1 to F2.

40.6 The stage payment mentioned in F1 to F2 may be further sub-divided into sub components as percentages by the agency which shall be duly approved by the Chief Engineer before signing of agreement. However, after entering into agreement, the sub-components of payment schedule, if necessary, shall be mutually decided between the Engineer-in-Charge and the agency which should be duly approved by the Chief Engineer. The sub-component should have relation to the programme of construction taking due cognizance of interdependency of various activities. The sum of payment for the sub-components shall be limited to the respective stage amounts arrived on the basis of percentages specified Appendix F1 to F2.

40.7 Payment shall be released only on the basis of completion of work of respective component / sub-component.

40.8 The Engineer-in-Charge shall check the Agency's monthly statement within 7 days of submission.

40.9 The value of work executed shall be determined by the Engineer-in-charge.

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

40.11 The agency shall be permitted to submit their work bills once in a month by 25th of every month and payment will be made after proper check of quantity and quality within seven days.

40.12 The Chief Engineers empowered to modify the percentage of components, on approval of design and drawing based on the detailed investigation, detailed drawings and detailed estimation done by the agency keeping the total price bid unaltered.

40.13 The ChiefEngineers empowered to modify the sub components stage-wise keeping the percentages of stages unaltered.

40.14 The agency shall give "Bill of Quantities" based on the detailed estimates prepared on the basis of approved designs; drawings and items of the estimate shall be suitably clubbed or grouped for assessment of value of work done.

41.0 MEASUREMENT & PAYMENTS:

41.1 The agency shall execute the various components of work as per approved drawings and specifications. The agency shall arrange to take and record all measurements of work done of various components of work in the Measurement Books/Level field books issued and plotted in the cross section sheets and quantities arrived as per actual execution as and when required.

41.2 In respect works, Measurement Books/Level field books have to be issued for recording measurements and levels jointly by department and agency. The bills are to be submitted to the Engineer-in-Charge by the Agency along with a true extract of the entire set for checking and making payment. The Engineer-in-Charge has to keep the full set of true extract with him and return the originals to the agency for further use. The entire original record shall be finally handed over for record to the Engineer-in-Charge by the Agency.

41.3 Measurements will be recorded jointly by the agency and department for the finished work only for which all tests are conducted and work done in accordance with specifications and contract conditions by using the materials specified in the contract.

41.4 The agency shall prepare monthly work bills based on the measurements of work done already recorded as stated above and submit to Engineer-in-Charge duly signed by them or his authorized signatory for arranging payment. Only completed portions of the works will be billed as per Break up of components & sub components by the agency.

41.5 The Engineer-in-Charge shall exercise check to see that the bill submitted by the Agency is in accordance with Agreement conditions & certified by the Department quality control authority and or 3rd party quality control monitors if both are deployed on the work.

41.6 The Engineer in Charge should check the claim with reference to the measurements recorded to see that the percentage at which the bill is claimed is clearly traceable into the documents on which payments are to be made. Payments shall be adjusted for recovery of advance payments, liquidated damages in terms of agreement conditions, security deposit for due fulfillment of the contract. Recoveries shall be affected towards royalty charges on the material used and other statutory recoveries as per State and Central Government rules and Acts.

41.7 In case of over payments or wrong payment if any made to the agency due to wrong interpretation of the provisions of the contract or Contract conditions etc.,

such unauthorized payment will be deducted in the subsequent bills or final bill for the work or from the bills under any other contracts with the Government or at any time thereafter from the deposits available with the Government.

41.8 Any recovery or recoveries advised by the Government Department either state or central, due to non-fulfillment of any contract entered into with them by the agency shall be recovered from any bill or deposits of the agency.

41.9 No claim shall be entertained, if the same is not represented in writing to the Engineer-in-Charge within 15 days of its occurrence.

41.10 The agency is not eligible for any compensation for inevitable delay in handing over the site or for any other reason. In such case, suitable extensions of time will be granted after considering the merits of the case.

41.11 The Employer shall within 28 days of receiving a statement and supporting documents, give to the Agency notice of any items in the Statement with which the Engineer in charge disagrees, with supporting particulars. Payments due shall not be withheld, except that;

a) If anything supplied or work done by the Agency is not in accordance with the Contract, the cost of rectification or replacement may be withheld until rectification or replacement has been completed; and / or

b) If the Agency was or is failing to perform any work or obligation in accordance with the contract and as notified by the Engineer in charge, the value of this work, or obligation may be withheld until the work or obligation has been performed.

The Employer may, in any payment, make any correction or modification that should properly be made, to any amount previously considered due. Payment shall not be deemed to indicate Engineer-in-Charge acceptance, approval, consent or satisfaction.

41.12 All progressive payments made to the Agency shall be reviewed on quarterly basis and reconciled with the break-up of the schedule. Over payments/under payments made, if any, shall be adjusted in the next interim/final payments

41.13 Measurement shall be signed and dated by both parties on the Site. If there is any dispute in any of the measurements a note to the effect shall be made in the measurement record against the disputed items and such note shall be signed and dated by both parties engaged in taking the measurements and the Parties shall discuss and resolve the same in accordance with relevant clauses of the contract.

42.0 INTEREST ON MONEY DUE TO THE AGENCY :

42.1 No omission by the Engineer-in-Charge to pay the amount due upon certificates shall vitiate or make void the contract, nor shall the agency be entitled to interest upon any guarantee fund or payments in arrears, nor upon any balance which may, on the final settlement of his accounts, found to be due to him.

43.0 COMMISSIONING OF PROJECT:

After completion of a scheme it shall be run for testing and commissioning in consultation with Engineer-in-Charge and the defects are to be rectified promptly. The date of commissioning of the scheme is to be notified by the Engineer-in-Charge in consultation with the agency considering the availability of water, crop standing in the field and drainage of the surplus water.

On the completion or part completion of the work, the completed pipe line distribution system shall be subjected to trial run for 24 hours up to 30 days to locate any defect and excessive seepage, if any. The trial run shall not be deemed as commissioning of the distribution system.

The Engineer-in-Charge shall notify the date on which the system was finally commissioned, to all concerned. This date of commissioning of the system shall be considered as the start date of defect liability period and Operation & Maintenance of the system.

44.0 CERTIFICATE OF COMPLETION OF WORKS:

44.1 On request of agency, on completion of the work, the agency (s) shall be furnished with a certificate by the Engineer-in-Charge of such completion. But no such certificate shall be given nor shall the work be considered to be complete until the agency(s) have rectified the defects, removed from the premises on which the work shall have been executed, all scaffoldings, surplus materials and rubbish and shall have cleaned of dirt from all wood work, doors, windows wall floors or other parts of any structures in or upon which the work has been executed or of which he / they may have had possession for the purpose of executing work, nor until the work shall have been measured by the Engineer-in-Charge or where the measurements have been taken by his subordinate until they receive the approval of the Engineer-in-Charge , the measurements being binding and conclusive against the agency(s).

The completion certificate of the Engineer-in-Charge showing the final balance due or payable to the agency(s) shall be conclusive evidence of the work having been duly completed and that the agency(s) shall be entitled to receive payment of the final balance in accordance with such certificate, but without prejudice to the liability of the agency(s) under the provisions of the clause.

44.2 Similarly, the Agency may request and the Engineer-in-Charge shall issue a Certificate of Completion in respect of :

a) Any section of the permanent works in respect of which a separate time for completion is provided in the Contract, and

b) Any substantial part of the Permanent Works which has been both completed to the satisfaction of the Engineer-in-Charge and occupied or used by the Department.

44.3 If any part of the Original/Permanent Works shall have been completed and shall have satisfactorily passed any final test that may be prescribed by the Contract, the Engineer-in-Charge may issue such certificate, and the Agency shall be deemed to have undertaken to complete any outstanding work in that part of the works during the period of Maintenance.

44.4 Issue of completion certificate shall not free the agency of its obligation to the execution of the works that may be pointed out by the Engineer-in-charge as essential for the fulfillment of the scope of work in a later date during maintenance period.

45.0 TAXES INCLUDED IN THE BID:

45.1 The Bid price quoted by the agency shall be deemed to be inclusive of all taxes on all materials excluding GST that the agency will have to purchase for performance of this contract.

46.0 PRICE ADJUSTMENT (As per Works Department OM No.15847/W dt.19.11.2019)

46.1 Contract price shall be adjusted for increase or decrease in rates and price of labour, materials, fuels and lubricants in accordance with the following principles and procedures and as per formula given in following Paras.

(a) The price adjustment shall apply for the work done from the start date given in the contract data up to end of the initial intended completion date or extensions granted by the Engineer and shall not apply to the work carried out beyond the stipulated time for reasons attributable to the contractor.

(b) The price adjustment shall be determined during each month from the formula given in following Paras

(c) Following expressions and meanings are assigned to the work done during each month:

R= Total value of work done during the month. It would include the amount of secured advance granted, if any, during the month, less the amount of secured advance recovered, if any during the month. It will exclude value for works executed for extra items under variations.

46.2 To the extent that full compensation for any rise or fall in costs to the contractor is not covered by the provisions of this or other clauses in the contract, the unit rates and prices included in the contract shall be deemed to include amounts to cover the contingency of such other rise or fall in costs The formula (e) for adjustment of prices are:

i)Adjustment of Other Materials Component

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

Vm= 0.85 x Pm/100 x R x (M1-M0)/M0

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

M0= The all India wholesale price index (all commodities) on 28 days preceding the date of opening of Bids, as published by the Ministry of Commerce and Industry, Government of India, New Delhi.

M1= The all India wholesale price index (all commodities) for the month under consideration as published by the Ministry of Commerce and Industry, Government of India, New Delhi.

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

ii)Adjustment for Cement Component

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

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

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

C0= The all India wholesale price index for Ordinary Portland Cement (OPC) on 28 days preceding the date of opening of Bids, as published by the Ministry of Commerce and industry, Government of India, New Delhi.

C1= The all India wholesale price index for Ordinary Portland Cement (OPC) For the month under consideration as published by the Ministry of Commerce and industry, Government of India, New Delhi.

Pc= Percentage of Cement component of the work.

iii)AdjustmentforSteelComponent

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

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

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

S0= The all India wholesale price index for steel (mild Steel long products) on 28 days preceding the date of opening of Bids, as published by the Ministry of Commerce and industry, Government of India, New Delhi.

S1= The all India wholesale price index for steel (mild Steel long products) for the month under consideration as published by the Ministry of Commerce and industry, Government of India, New Delhi.

Ps= Percentage of steel component of the work.

Note: For the application of this clause, index of (Mile Steel long products) has been chosen to represent steel group.

iv)Adjustment of Bitumen Component

Price adjustment for increase or decrease in the cost of bitumen shall be paid in accordance with the following formula.

Vb= 0.85 x Pb/100 x R x (B1-B0)/B0

Vb= Increase or decrease in the cost of work during the month under consideration due to changes in rates for bitumen.

B0= The official retail price of bulk bitumen IOC/BPCL depot at nearest center on the day 28 days prior to date of opening of Bids.

B1= The official retail price of bulk bitumen at IOC/BPCL depot at nearest center for the 15th day of the month under consideration.

Pb= Percentage of bitumen component of the work

v):Adjustmenttowardsdifferentialcostof Pipes.

Price adjustment for increase or decrease in the cost of pipe shall be paid in accordance with the following formula.

Vpi= 0.85 x Ppi/100 x R x (Pi1-Pi0)/Pi0

Vpi= Differential cost of pipe i.e. amount of increase or decrease in rupees to be paid or recovered during the month under consideration..

Ppi= Percentage of pipe component of the work

Pi1= AII India Whole sale price index of pipe for the period under consideration as published by the Ministry of Commerce and Industry, Government of India, New Delhi.

Pi0= All India Whole sale price index of pipe on 28 days preceding the date of opening of Bids as published by the Ministry of Commerce and Industry, Government of India, New Delhi.

46.3 Adjustment of LabourComponent

Price adjustment for increase or decrease in the cost due to labour shall be paid in accordance with the fallowing formula:

VL= 0.85 x P1/100 x R x (L1-L0)/L0

VL= Increase or decrease in the cost of work during the month under consideration due to changes in rates for local labour.

L0= the minimum wages for unskilled labour as Notified by Government of Odisha as prevailed on the last stipulated date of receipt of tender including extension, if any.

L1= The minimum wages for unskilled labour as Notified by Government of Odisha as prevailed on the last date of the Month previous to the one under consideration.

P1= Percentage of labour component of the work

46.4 Adjustment of POL (fuel and lubricant)Component

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

Vf= 0.85 x Pf/100 x R x (F1-F0)/F0

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

F0= the official retail price of High Speed Diesel (HSD) at the existing consumer pumps of IOC / BPCL/ HPCL at nearest center on the day 28 days prior to the date of opening of Bids.

F1= The official retail price of High Speed Diesel (HSD) at the existing consumer pumps of IOC / BPCL/ HPCL at nearest center for the 15thday of the month under consideration.

Pf= Percentage of fuel and lubricant component of the work

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

46.5 Adjustment for Plant and Machinery Spares Component

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

Vp= 0.85 x Pp/100 x R x (P1-P0)/P0

Vp= Increase or decrease in the cost of work during the month under consideration due to changes in the rates for plant and machinery spares.

P0= The all India wholesale price index for manufacture of machinery for mining, quarrying and construction on 28 days preceding the date of opening of Bids as published by the Ministry of Commerce and Industry , Government of India, New Delhi.

P1= The all India wholesale price index for manufacture of machinery for mining, quarrying and construction for the month under consideration as published by the Ministry of Commerce and Industry, Government of India, New Delhi.

Pf= Percentage of plant and machinery spares component of the work.

Note: For the application of this clause, index of manufacturing of machinery for mining, quarrying and construction has been chosen to represent the Plant and machinery Spares group.

Regarding wholesale price Index (WPI) for appropriate commodity for payment of price adjustment, due to change of base year of WPI from 1993-94 to 2004-05 & 2011-12, it is observed that, the commodity 'Bars and Rod','Cement', 'Heavy machinery and parts' included in the list of WPI 1993-94 series are not mentioned as such in the WPI 2004-05 & 2011-12 series. Therefore, the following items in the WPI 2004-05 & 2011-12 series shall be considered corresponding to items in WPI 1993-94series:

Sl. No	ItemInWPI1993-94 series	ItemInWPI2004-05 series	ItemInWPI2011-12 series
1.	Cement	Grey Cement	Ordinary Portland cement
2	Bars&rods	Rebars	Mild steellong products
3.	HeavyMachinery&parts	Construction Machinery	Manufacture of Machinery for mining, quarrying &construction.

46.6 APPLICATION OF ESCALATION CLAUSE:

The contractor shall for the purpose of availing reimbursement/refund of differential cost of steel,bitumen,cement,pipe,POL and wages,, keep such books of account and other documents as are necessary to show that the amount of increase claimed or reduction available and shall allow inspection of the same by a duly authorized representative of Government and further ,shall at the request of the Engineer-in-Charge, furnish documents to be verified in such a manner as the Engineer-in-Charge may require any document and information kept. The contractor shall within a reasonable time of15days of his becoming aware of any alteration in the price of such material, wages of labourand/or price of P.O.L.give notice thereofto the Engineer-in-Charge stating that the same is given pursuant to this condition along with informationrelating to there to which he may be in a position to supply.

Percentage Table

Sl. No	Category of work		% Component (cost wise		
			Labour (P1)	POL (Pf)	Steel (Ps +Cement (Pc) +Bitumen (Pb)+ Pipe (Ppi)+Plant & Machinery Spare & Component (Pp) + other Materials*
1	R&B works (% of component)	Road Works	5	5	90
		Bridge Works	5	5	90
		Building Works	5	5	90
2	Irrigation Works (% of component)	Structural Work	5	5	90
		Earth, Canal & Embankment work	5	5	90
3	P.H. Work	Structural Work	5	5	90
		Pipeline work	5	5	Pipe-70% *Machinery +Other material-20%
		Sewer Line	5	5	Pipe-70% *Machinery +Other material-20%

Note:-Further break up may be worked out considering the consumption of Cement, Steel, Bitumen, pipe and Plant &Machinery Spare Component in the concerned works and shall be provided in the bid document in shape of "Schedule **of Adjustment Data"** as an **"Appendix to Bid".**(enclosed herewith**)**

Appendix to Bid
Schedule of Adjustment Data

[For all works, adjustment factor for Labour and POL shallbe considered @ 5% each .Steel, Cement, Pipes, other Materials and Machinery shall contribute to 90% of Price Adjustment and shall be calculated for each work separately during preparation of estimate, shall be approved by the authority during technical sanction as a" Schedule of Adjustment Data" and shall form part of the Bid Document]

Cl. No-31 of F2/P1 Contracts Sl. No	Index description	Source of index	Base value*	Base Date*	Weight age of item**
31 (a) (i)	Other Materials	All India whole sale price index (all commodities) as published by the Economic Advisor to the Govt. of India, Ministry of Commerce and industry.			
31 (a) (ii)	Cement	Whole sale price index for Cement (Ordinary Portland Cement) as published by the office the Economic Advisor to the Govt. of India, Ministry of Commerce and Industry.			
31 (a) (iii)	Steel	Whole sale price index for Steel (Mild Steel-Long Products) as published by the office the Economic Advisor to the Govt. of India, Ministry of Commerce and Industry.			
31 (a) (iv)	Bitumen (VG-30)	Official retail price of bulk bitumen at the nearest IOC/HPCL depot			
31 (a) (v)	Pipes	Whole sale price index for the type of Pipe under consideration, as published by the office the Economic Advisor to the Govt. of India, Ministry of Commerce and industry.			
31 (b)	Labour	Minimum Wage notified by the Labour and Employees State Insurance Department of Government of Odisha, India			5%
31 (c)	POL	Official retail price of HSD at nearest IOCL/ HPCL/ BPCL Consumer pump depot			5%
31 (d)	Plant and Machinery	Whole sale price index for Manufacture of Machinery for Mining, Quarrying and Construction			

		as published by the office the Economic Advisor to the Govt. of India, Ministry of Commerce and Industry.			
			Total		100%

*Values to be filled up at the time of drawl of contract
**Values to be filled up in the bid document.

47.0 LIQUIDATED DAMAGES FOR DELAY:

47.1 If for any reason, which does not entitle the agency to an extension of time, the rate of progress of works, or any section of works is at any time, in the opinion of the Engineer-in-Charge too slow to ensure completion by the prescribed time or extended time for completion, Engineer-in-Charge shall so notify the agency in writing and the agency shall there upon take such steps as are necessary to expedite progress so as to complete the works or such section by the prescribed time or extended time. The agency shall not be entitled to any additional payment for taking such steps. If as a result of any notice given by the Engineer-in-Charge under this clause the agency shall seek the Engineer-in-Charge's permission to do any work at night or on Sundays, if locally recognized as days or rest, or their locally recognized equivalent, such permission shall not be unreasonably refused.

47.2 If the Agency fails to complete the work substantially under contract by the stipulated date, he shall pay liquidated damages at the rate of 0.05 percentage of the contract value per day from the date of delaying the said work up to the date of completion and handing over to the Government.

47.3 However also if the agency fails to complete any part of the work as designated in the mile stone, by the time indicated against such part, he shall pay Liquidated damages at rate of 0.05 percentage of value of that part per day from the date of delaying the said part of the work up to the date of completion of the said designated part.

47.4 The aggregate maximum of liquidated damages payable under this clause shall not exceed 0.05 percentage of contract value per day and shall be subject to the maximum amount of 10% (ten percent) of the contract amount.

47.5 Delays requiring payment of liquidated damages amounting to 10% of the contract amount shall be sufficient cause for termination of contract and for forfeiture of security deposit.

47.6 If abnormal delay arises and not attributable to the agency, extra time will be allowed to complete the work and liquidated damage for delay for the stated reasons will not be levied without any additional financial benefit to the agency.

48.0 RESCISSION OF CONTRACT

Delays requiring payment of 10% of contract amount as liquidated damages shall be one of the cause for rescission of contract.

To rescind the contract (of which the recession notice in writing to the agency under the hand of the Engineer-in-Charge shall be conclusive evidence) 20% of the value of left over work will be realized from the agency as penalty.

In the Event of any of the above courses being adopted by the Engineer-in-Charge, the agency

shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials, or entered into any engagements, or made any advances
on account of or with a view to the execution of the work or the performance of the contract. and in case the contract shall be rescinded under the provision aforesaid, the agency shall not be entitled to recover or be paid any sum for any work thereto for actually performed under this contract, unless and until the Engineer-in-Charge shall have certified in writing the performance of such work and the value payable in respect thereof and he shall only be entitled to be paid the value so certified. (Works Dept No.10639 dated 27.05.2005).

49.0 MOBILIZATION ADVANCE:

49.1 The agency is permitted to avail the facility of mobilization advance equivalent to 10% of the contract amount in phases. Payment of the advance will be made on application of agency and under certification by the Engineer-in-Charge after (i) Execution of the form of contract by the parties there to (ii) provision by the agency of a Bank Guarantee from any nationalized Bank located at _____ or Bhubaneswar acceptable to the Engineer-in-Charge for an amount equal to the mobilization advance applied for. Such bank guarantee shall remain valid until the said advance loan has been completely repaid by the agency out of the current earnings under the contract and certified accordingly by the Engineer-in-Charge.

49.2 A form of Bank Guarantee acceptable to Engineer-in-Charge is indicated in Section III under Forms & Annexures. The advance mobilisation loan shall be used by the agency exclusively formobilization expenditures, including the mobilisation of constructional plant, in connection with the works.

49.3 The mobilization advance shall be released by the Engineer-in-Charge in three phases. On signing of the contract, the agency, on request, may be allowed to avail mobilization advance amounting to 2% of the contract amount to mobilize the men & machineries for planning & design work, 4% on approval of Planning & Design & the balance 4% of the mobilization advance may be released on commencement of work against Bank Guarantee.

49.4 Should the agency misappropriate any portion of the advance loan, it shall become due to the Engineer-in-Charge and payable immediately in one lump by the agency and no further loan will be considered thereafter.

49.5 The above advance shall bear an interest of 12% per annum. The interest on the amounts paid as advance is chargeable from the date, the amount is paid. However if completion is delayed by circumstances beyond control of the agency for which an extension has been granted by the competent authority the interest charges on such advances shall be waived for the period of extension.

49.6 The value of Bank Guarantee for the advance payment given to the agency can be progressively reduced by the amount repaid by the agency as certified by the Engineer-in-Charge.

49.7 Recovery of advances

a. The advance loan together with interest at the rate of **12%** shall be repaid by way of deductions from the intermediate payments under the contract. Deduction shall commence in the next interim payment following that in which the total of all such payments to the contractor have reached 20 percent of the contract amount. The

mobilization advance along with interest shall be recovered in such a way that the full amount is recovered, **by the time 80% work is completed.**

b. Each installment of mobilization advance shall be repaid by the contractor not later than 365 (Three hundred & sixty five) days from the respective date of mobilization advance payment. The contractor shall repay each installment/phase of the advance payment on or before the due date of repayment. The parties expressly agree that for any delay in repayment of the mobilization advance payment, the contractor shall pay interest to the employer for each day of delay, such interest to be calculated @ 18% (eighteen) per annum. In the event of the contractor's failure to make the repayment on time, the employer shall be entitled to encash the bank guarantee for recovery of mobilization advance along with interest.

c. If the advance payment has not been fully repaid prior to termination as per the agreement, the whole of the balance mobilization advance, along with interest, outstanding against the contractor shall immediately become due & payable by the contractor to the employer. Without prejudice to the provisions of clause of termination for contractor's default, the advance payment along with interest @**12%** per annum from the date of advance payment to the date of recovery by encashment shall be recovered from the contractor by encashment of the bank guarantee. For the avoidance of doubt, the aforesaid interest shall be payable on each installment/phase of the advance payment regardless of whether the installment or any part thereof has been repaid to the employer prior to termination.

50.0 SECURITIES DEPOSIT:

50.1 Performance Security Deposit: The department shall retain from each payment due to the agency, 5% of gross bill amount until completion of the whole of the works. The retention amount so accumulated may be on request of the agency converted to interest bearing Fixed Deposits, pledged in favour of **the Superintending Engineer, Deo Head Works Division Karanjia**, on any Nationalized Bank located in ……/Bhubaneswar. The performance security so retained shall be released only after the defect liability period and the Engineer-in-Charge has certified that all the defects notified by the Engineer-in-Charge to the Agency have been corrected before the end of this period.

All compensation, Liquidate damages or other sums or money payable by the agency to Government under the terms of this contract shall be deducted from or recouped by the realization of a sufficient part of his security deposit, or from the interest arising there from or from any sums which may due or may become due by Government to the Agency on any account whatsoever whether in respect of this contract, or any other contract, or otherwise. In the event of his security deposit being reduced by reason of any such deduction or recoupment as aforesaid, the agency shall within ten days thereafter, make good the sum or sums required to make good the shortfall in the amount of the security deposit.

All dues under this contract or other contract, or otherwise; shall be recovered from the aforesaid amount of security deposit and the balance shall be refunded after the completion of the defect liability period. While releasing the securities beyond the defect liability period, the sufficiency of securities for the recovery of cost for excess energy consumption beyond the guaranteed power consumption shall be taken into consideration.

51.0 COST OF REPAIRS:

Loss or damage to the Works or materials to the Works between the Start Date and the end of the Defects Correction Periods shall be remedied by the Agency at the Agency's cost if the loss or damage arises from the Agency's acts or omissions.

E. FINISHING THE CONTRACT

52.0 COMPLETION:

52.1 On completion of the work, the agency (s) shall be furnished with a certificate by the Engineer-in-Charge of such completion. But no such certificate shall be given nor shall the work be considered to be complete until the agency(s) have rectified the defects, removed from the premises, on which the work shall have been executed, all scaffoldings, surplus materials and rubbish and shall have cleaned of dirt from all wood work, doors, windows wall floors or other parts of any structures in or upon which the work has been executed or of which he / they may have had possession for the purpose of executing work, nor until the work shall have been measured by the Engineer-in-Charge or where the measurements have been taken by his subordinate until they receive the approval of the Engineer-in-Charge , the measurements being binding and conclusive against the agency(s). If the agency(s) shall fail to comply with the requirements of this clause as to the removal of scaffolding, surplus materials and rubbish and cleaning of dirt on or before the date fixed for the completion ofthe work, the Engineer-in-Charge may at the expense of the agency (s) remove such scaffolding, surplus materials and rubbish and dispose of the same as he thinks it and clean off such dirt as aforesaid, and the agency(s) shall forthwith bear all the expenses to be incurred, but shall have no claim in respect of any such scaffolding or surplus materials as aforesaid except for any sum actually realized by the sale thereof.

52.2 The completion certificate of the Engineer-in-Charge showing the final balance due or payable to the agency(s) shall be conclusive evidence of the work having been duly completed and that the agency(s) shall be entitled to receive payment of the final balance in accordance with such certificate, but without prejudice to the liability of the agency(s) under the provisions of the clause.

53.0 TAKING OVER:

The Department shall take over the site and the Works within fifteen days of the Engineer-in-Charge issuing a certificate of successful completion of Operation & maintenance work.

54.0 FINAL ACCOUNT:

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

55.0 TERMINATION:

The Department may terminate the Contract if the agency causes a fundamental breach of the Contract.

55.1 Fundamental breaches of Contract include, but shall not be limited to the following.

a) The Agency stops work for 28 days when no stoppage of work is shown on the current program and the stoppage has not been authorized by the Engineer-in-Charge.

b) The agency is made bankrupt or goes into liquidation other than for a reconstruction or amalgamation.

c) The Engineer-in-Charge gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Agency fails to correct it within a reasonable period of time determined by the Engineer-in-Charge; and

d) The Agency does not maintain a security which is required and

e) The Agency has delayed the completion of works by the number of days for which the maximum amount of liquidated damages is to be paid as defined.

f) If the agency, in the judgment of the Department has engaged in corrupt or fraudulent practices in competing for or in the executing the contract.
For the purpose of this paragraph: "corrupt practice" means the offering, giving, receiving or soliciting of anything 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 o the Government and includes collusive practice among Bidders (prior to or after Bid submission) designed to establish Bid prices at artificial non-competitive levels and to deprive the Government of the benefits of free and open competition.

55.2 Notwithstanding the above the Department or Engineer-in-Charge or Employer may terminate the contract for convenience.

55.3 If the Contract is terminated, the Agency shall stop work immediately, make the site safe & secured and leave the site as soon as reasonably possible.

56.0 PAYMENT UPON TERMINATION:

If the Contract is terminated because of a fundamental breach of Contract by the Agency, the Engineer-in-Charge shall issue a certificate for the value of the work done less advance payments received upon the date of the issue of the certificate, less other recoveries due in terms of the Contract, less taxes due to be deducted at source as per applicable laws and less 20 percent of the value of work not completed. Additional Liquidated Damages shall not apply. If the total amount due to the Department exceeds any payment due to the Agency the difference shall be a debt payable to the Department. In case of default for payment within 28 days from the date of issue of notice to the above effect, the agency shall be liable to pay interest at 12% per annum for the period of delay.

57.0 PROPERTY:

All materials on the site, plant, equipment, Temporary works and works are deemed to be the property of the Department if the Contract is terminated because of Agency's default.

58.0 RELEASES FROM PERFORMANCE:

If the Agency is frustrated by the outbreak of war or by any other event entirely outside the control of either the Department or the Agency the Engineer-in-Charge shall certify that the contract has been frustrated. The Agency shall make the site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all works carried out before receiving it and for any work carried out after wards to which commitment was made.

F. OTHER GENERAL CONDITIONS

59.0 WATER SUPPLY

The Agency has to make his own arrangements for water required for the work and to the colonies and work sites, which are to be established by the Agency.

60.0 ELECTRICAL POWER

The Agency will have to make their own arrangements for drawing electric power from the nearest power line after obtaining permission from the concerned Electricity Authority at his own cost. In case of failure of electricity, the Agency has to make alternative arrangements for supply of electricity by Diesel Generator sets of suitable capacity at place of work. The agency shall satisfy all the conditions and rules required as per Indian Electricity Act 1910 and under rule-45(1) of the Indian Electricity Rules, 1956 as amended from time to time and other pertinent rules.

The power shall be used for bona-fide Departmental works only.

60.1 Electric Power for Domestic Supply:

a) The agency has to make his own arrangements for the supply of electric power for domestic purposes and the charges for this purpose have to be paid by him at the rates as fixed by the concerned Electricity Authority from time to time.

b) The agency will have to make his own arrangements to lay and maintain the necessary distribution lines and wiring for the camp at his own cost. The layout and the methods of laying the lines and wiring shall have the prior approval of the Engineer-in-Charge. All camp area shall be properly electrified. All lines, streets, approaches for the camp etc., shall be sufficiently lighted for the safety of staff and labour of the agency, at the cost of the Agency and it will be subject to the approval of the Engineer-in-Charge.

61.0 LAND:

61.1 Land for Agency's use:

The agency will be permitted to use Government land for his site office and colony if available. The agency shall have to make his own arrangements for acquiring and clearing the site, leveling, providing drainage and other facilities for labour staff colonies, site office, work- shop or stores and for related activities. The Agency shall apply to the Department within reasonable time after the award of the contract and at least 30 days in advance of its use, the details of land required by him for the work at site and the land required for his camp. Should any private land, which has not been acquired, be required by the agency for his use, the same may be acquired by the agency at his own cost by private negotiations and any claim shall not be admissible to him on this account.

The Engineer-in-Charge reserves the right to refuse permission for use of any government land for which no claim or compensation shall be admissible to the agency. The agency shall, however, not be required to pay cost or any rent for the Government land given to him.

61.2. Surrender of Occupied Land:

a) The Government land as here in before mentioned shall be surrendered to the Engineer-in-Charge within seven days, after issue of completion

certificate. Also no land shall be held by the agency longer than the Engineer-in-Charge shall deem necessary and the agency shall on the receipt of due notice from the Engineer-in-Charge, vacate and surrender the land which the Engineer-in-Charge may certify as no longer required by the Agency for the purpose of the work.

b) The agency shall make good to the satisfaction of the Engineer-in-Charge any damage to areas, which he has to return or to other property or land handed over to him for purpose of this work Temporary structures may be erected by the agency for storage sheds, offices, residences etc., for non-commercial use, with the permission of the Engineer-in-Charge on the land handed over to him at his own cost. At the completion of the work these structures shall be dismantled site cleared and handed over to the Engineer-in-Charge. The land required for providing amenities will be given free of cost from Government lands if available otherwise the agency shall have to make his own arrangements.

62.0 APPROACH ROADS AND ROADS IN WORK AREA:

In addition to existing public roads and roads Constructed by Government, if any, in work area all additional approach roads inside work area and camp required by the Agency shall be constructed and maintained by him at his own cost. The layout design, construction and maintenance etc. of the roads shall be subject to the approval of the Engineer-in-Charge. The agency shall permit the use of these roads by the Government free of charge.

It is possible that work at, or in the vicinity of the work site will be performed by the Government or by other agency engaged in work for the Government during the contract period. The agency shall without charge permit the government and such other agency and other workmen to use the access facilities including roads and other facilities, constructed and acquired by the agency for use in the performance of the works.

The agency's heavy construction traffic or tracked equipment shall not traverse any public roads or bridges unless the agency has made arrangement with the authority concerned. In case agency's heavy construction traffic or tracked equipment is not allowed to traverse any public roads or bridges and the agency is required to make some alternative arrangements, no claim on this account shall be entertained.

The agency is cautioned to take necessary precautions in transportation of construction materials to avoid accidents.

63.0 PAYMENT FOR CAMP CONSTRUCTION:

No payment will be made to the agency for construction, operation and maintenance of camp and other camp facilities.

64.0 EXPLOSIVE MAGAZINES & FUEL STORAGE TANKS:

No explosive shall be stored within 1/2 (half) KM of the limit of the camp sites. The storage of gasoline and other fuel oils or of Butane, Propane and other liquefied petroleum gases, shall confirm to the regulations of Odisha State Government and Government of India. The tanks, above ground and having capacity in excess of 2000 litres, shall not be located within the camp area, nor within 200m of any building.

65.0 LABOUR:

The agency shall, make his own arrangements for the engagement of all staff and labour, local or other, and for their payment, housing, feeding and transport.

Labour importation and amenities to labour and agency's staff shall be to the agency's account. His bid cost shall include the expenditure towards importation of labour amenities to labour and staff.

65.1 Transportation of Labour:

The agency shall make his own arrangement for the daily transportation of the labour and staff from labour camps colonies to the work site at his own cost. No extra payment will be made to the agency for the above transportation of the labour.

The agency will at all times duly observe the provisions of the Employment of Children Act- XXVI of 1938 and any enactment or modification of the same and will not employ or permit any person to do any work for the purpose under the provisions of this contract in contravention of **said Act.** The agency here by agrees to indemnify the department from and against all claims, penalties which may be suffered by the department or any person employed by the department by any default on the part of the agency in the observance and performance of the provisions of the Employment of Children Act- XXVI of 1938 or any enactment or modification of the same.

The agency shall obtain the insurance at his own cost to cover the risk on the works to labour engaged by him during period of execution against fire and other usual risks and produce the same to the Engineer-in-Charge concerned before commencement of work.

66.0 SAFETY MEASURES:

The agency shall take necessary precautions for safety of the workers and preserving their health while working in such jobs, which require special protection and precautions. The following are some of the measures listed but they are not exhaustive and agency shall add to and augment these precautions on his own initiative where necessary and shall comply with directions issued by the Engineer-in-Charge or on his behalf from time to time and at all times.

1. Providing protective foot wear to workers situations like mixing and placing of mortar or concrete sand in quarries and places where the work is done under much wet conditions.
2. Providing protective head wear to workers at places like underground excavations to protect them against rock falls.
3. Providing masks to workers at granulates or at other locations where too much fine dust is floating about and sprinkling water at frequent intervals by water hoses on all stone crushing area and storage bins abate to dust.
4. Getting the workers in such jobs periodically examined for chest trouble due to too much breathing in to fine dust.
5. Taking such normal precautions like fencing and lightening in excavation of trenches, not allowing rolls and metal parts of useless timber spread around, making danger areas for blasting providing whistles etc.
6. Supply work men with proper belts, ropes etc., when working in precarious slopes etc.
7. Avoiding named electrical wire etc. as they would electrocute the works.

8. Taking necessary steps towards training the workers concerned on the machinery before they are allowed to handle- them independently and taking all necessary precautions in around the areas where machines hoists and similar units are working.

67.0 FAIR WAGE CLAUSE:

The agency shall not employ for the purpose of this contract any person who is below the age of fourteen (14) years and shall pay to each labourer for work done by such labourers fair wages. (PWD No.-22059 Dtd-16.08.77)

Explanation – "Fair Wage" means wages, whether for time or piece work prescribed by the state Public Works Department provided that where higher rates have been prescribed under the Minimum Wages Act'1948 wages at such higher rates should constitute fair wages.

A. The Engineer-in-Charge shall have the right to enquire into and decide ant complaints alleging that wages paid by the agency to pay labourer for work done by such labourer is less than the wages as per the sub-paragraph (1) above.

B. The agency shall not withstanding the provisions of any contract to contrary, cause to be paid a fair wages to labourers indirectly engaged on the work including any labour engaged by his sub agency in connection with the said work, as if the labourers had been immediately employed by him.

C. In respect of all labour directly or indirectly employed in the works for the performance of the agency's part of this agreement, the agency shall comply with or cause to be complied with all regulations made by Government in regard to payment of wages period deductions from wages, recovery of wages not paid and deductions unauthorizedly made, maintenance of wage register, wage cards, publications of scale of wages and other terms of employment, inspection and submission of periodical return and all other matters of a like nature.

D. The Engineer-in-Charge or Sub-divisional Officer concerned shall have the right to deduct, from the money due to the agency, any sum required or estimated to be required for making good the loss suffered by a worker or workers by reason of non-fulfillment of conditions of the contract for the benefit of the workers, non-payment of
wages or of deductions made from his or their wages, which are not justified by their terms of the contract or non-observance of the regulations. Money so deducted should be transferred to the workers concerned.

E. Vis-à-vis, the Government of Odisha, the agency shall be primarily liable for all payments to be made under and for the observance of the regulations aforesaid without prejudice to his right to claim indemnity from his sub-agency.

F. The regulations aforesaid shall be deemed to be a part of this contract and ant breach thereof shall be breach of this contract.

G. Under the provisions of the Minimum Wages Act' 1948 and the Minimum Wages (Central Rules 1950) the agency is bound to allow or cause to be allowed to the labourers directly or indirectly employed in the work one day rest for six days continuous work and pay wages at the same rate as for duty. In the event of default the Engineer-in-Charge or Sub-divisional Officer concerned shall have the right to deduct the sum not paid on account of wages for weekly holiday to any labourers and pay the same to the person entitled there to from any money due to the agency.

H. The agency shall at his own expense provide or arrange for the provision of foot wear for any labour doing cement mixing work and black topping of roads (The agency has undertaken to execute under this contract) to the satisfaction of the Engineer-in-Charged on his failure to do so, Government shall be entitled to provide the same and recover the cost from the agency.

I. The agency shall submit by the 4th & 10th every month to the Engineer-in-Charge true statement showing in respect of the second half of the preceding month and the first half of the current month respectively (1)the number of labours employed by him on the work (2)their working hours(3) the wages paid to them (4)the accident that occurred during the said fortnight showing the circumstances under which they happened and the content of damage injury caused by them and (5) the number of female workers who have been allowed maternity benefit according to clause K and the **amount** paid to them failing which the agency shall be liable to pay to Government a sum not exceeding Rs.50/- for each default to materially incorrect statement. The decision of the Engineer-in-Chargeshall be final in deducting from any bill due to agency amount levied as fine.

J. In respect of all labour directly or indirectly employed in the words for the performance of the agency's part of this agreement, the agency shall comply with or cause to be complied with all the rule, framed by Government employed by the Odisha Public Works Department and its agencies. This will apply to work places having 50 or more workers.

67.1 Odisha P.W.D Agency's Labour Regulation.

Short Title – These regulations may be called "The Odisha Public Works Department/Electricity Department Agency's Regulations."

1. **Defination**– In these Regulations, unless otherwise expressed or indicated the following words and expressions shall have the meaning hereby assigned to them respectively that is to say –

(i) "Labour" means works employed by a agency of the Odisha Public Works Department/Electricity Department directly or indirectly through a sub-agency or other person, by an agent on his behalf.

(ii) "Fair wages" means wages whether for the time of piece work described y the State Public Works Department/Electricity Department for the area in which the work is done.

(iii) "Agency" shall include every person whether a sub-agency or headman or agent employing labour on the work taken on contract.

(iv) "Wages" shall have the same meaning as defined in the payment of Wages Act. and include time and piece rate wages, if any –

2. ***Display of notices regarding wages, etc.***

The agency shall –

(a) Before he commences his work on contract display and correctly maintain and continue to display, in a clean and legible condition, in conspicuous places on the work, notices in English and in the local Indian language spoken by the majority of the workers, giving the rate of wage prescribed by the State Public Works Department for the district where the work is done.

(b) Send a copy of such notices to the Engineer-in-Charge of the work.

3. Payment of Wages

(i) Wages due to every worker shall be paid to him direct.

(ii) All wages shall be paid in current coin or currency or in both.

4. Fixation of wage period

(i) The agency shall fix the wage period in respect of which wages be payable.

(ii) No wage period shall exceed one month.

(iii) Wages of every workman employed on the contract shall be paid before expiry of 3 days, after the last day of the wage period in respect of which the wages are payable.

(iv) When the employment of any worker is terminated by or on behalf of the agency, the wages earned by him shall be paid before the expiry of the day succeeding the one on which his employment is terminated.

(v) All payment of wages shall be made on a working day.

5. Wages book and wage cards, etc.

(i) The agency shall maintain a wage book of each worker in such form as may be convenient, but the same shall include the following particulars –

(a) Rate of daily or monthly wages.

(b) Nature of work on which employed.

(c) Total number of days of work during each wage period.

(d) Total amount payable for the work during each wage period.

(e) All deductions made from the wages with an indication in each case of the ground for which the deduction is made.

(f) Wage actually paid for each wage period.

(ii) The agency shall also maintain a wage card for each worker employed on the work.

(iii) The Engineer-in-Charge may grant an exemption from the maintenance of wage bond, wage cards to a agency who, in his opinion may not directly or indirectly employ more than 10 persons on the work.

6. *Fines deduction which may be from wages*

(i) The wages of a worker shall be paid to him without any deduction of any kind except the following.

(a) Fines

(b) Deductions for absence from duty, i.e. from the place or place where by the terms of his employment he is required to work. The amount of deductions shall be in proportion to the period for which he was absent.

(c) Deductions for damages for damage to or loss of good expressly entrusted to the employed person for custody or for loss of money for which he is required to account where such damage or loss is directly attributable to his neglect or default.

(d) Any other deductions which the Odisha Government may from time to time allow.

(i) No fines shall be imposed on a worker and no deduction for damage or loss shall be made from his wages until the worker has been given an opportunity or showing cause against such fines or deductions.

(ii)The total amount of fines which may be imposed in any one wage period on a work shall not exceed an amount equal to five paise in rupee of the wages payable to him in respect of that wage period.

(iii)No fine imposed on any worker shall be recovered from him by installments, or after the expiry of 60 days from the date on which it was imposed.

7. Register of Fines, etc.

(i) The agency shall maintain a register of fines and of all deductions for damage or loss. Such Register shall mention the reason for which fine was imposed or deduction for damage or loss was made.

(ii) The agency shall maintain a list in English and in the local Indian language, clearly defining acts and omissions for which penalty or fine can be imposed. It shall display such list and maintain it in a clean and legible condition in conspicuous places in the work.

8. Preservation of Register

The wage register, the wage cards and the register of fines, deduction required to be maintained under these regulations shall be preserved for 12 months after date of the last entry made in them.

9. Power of Labour Welfare Officer to make investigation or enquiry –

The Labour Welfare Officer or any other persons authorized by the Government of Odisha on their behalf shall have power to make enquiries with a view to ascertaining and enforcing due and proper observance of the fair wage clauses and the provision if these of these regulations. He shall investigate into any complaint regarding default made by the agency, sub-agency in regard to such provisions.

10. Report of Labour Welfare Officers-

The Labour Welfare Officers or others authorised as aforesaid shall submit a report of the results of his investigation or enquiry to the Engineer-in-Charge concerned, indicating the extent, if any, to which the default has been committed with a note that necessary deduction from the agency's bill be made and the wages and other dues be paid to the labourers concerned.

11. Appeal against the decision of Labour Welfare Officers-

Any persons aggrieved by the decision and recommendation of the Labor Welfare Officer or other person so authorised may appeal against such decision to the Labour Commissioner within 30 days from the date of decision forwarding simultaneously a copy of his appeal to the Engineer-in-Charge concerned but subject to such appeal, the decision of the officer shall be final and binding upon the agency.

12. Inspection of registers –

The agency shall allow inspection of the wage book and wage cards to any of his workers or to his agent at a convenient time and place after due notice is received, or to the Labour Commissioner or any other person authorised by the Government of Odisha on his behalf.

13. Submission of return –

The agency shall submit periodical returns as may be specified from time to time.

14. Amendments –

The Government of Odisha may from time to time, add to or amend these regulations and on any question as to the application, interpretation of effect of the regulations, the decision of the Labour Commissioner or any other person authorised by the Government of Odisha in that behalf shall be final.

67.2 Maternity benefit rules for female workers employed by Agency.

Leave and pay during leave shall be regularized as follows.

1. Leave : i) In case of delivery : Maternity leave not exceeding 8 weeks up to and including the day of delivery or 4th weeks following that day.

ii) In case Miscarriage: Up to 3 weeks from the date of miscarriage.

2. Pay: i) In case of delivery: Leave pay during maternity leave will be at the rate of the woman's average daily earning calculated on the total wages earned on the days when full time work was done during a period of three months immediately proceedings the date of which she gives notice that the excepts to be confirmed or at the rate of daily wage whichever is greater.

ii) In case of Miscarriage : Leave pay at the rate of daily earnings calculated on the total wages earned on the date when full time work was done during a period of 3 months immediately preceding the date of such miscarriage.

Condition of the grant of Maternity Leave: No maternity leave benefit shall be admissible to a woman unless she has been employed for a total period not less than 8 months immediately preceding the date on which she proceeds on leave.

MODEL RULES FOR HEALTH AND SANITARY ARRANGEMENTS FOR WORKERS EMPLOYED BY ODISHA P.W.D ON ITS AGENCY.

1. Application: These rules shall apply to construction work in charge of Odisha Public Works Department which are expected to continue for a year or more.

2. Definitions: (i) "Work Place" means a place at which averages of fifty or more workers are employed in connection with construction work.
(ii) Large work place means a place at which an average of 500 or more workers is employed in connection with construction work.

3. First Aid: (a) At every work place there shall be maintained in readily accessible place First-Aid appliances including an adequate supply or sterilizer dressings and sterilized cotton wool. The appliances shall be kept in good order and in large work place they shall be readily available during working hours.

(b) At large works places, where hospital facilities are not available within easy distance of the works, First-Aid posts shall be established and run by a trained compounder.

(c) Where large work places are remote from regular hospital an indoor ward shall provided with one bed for every 250 employees.

(d) Where large work places are situated in cities, towns or in their surplus and no beds are considered necessary owing to the proximity of city town hospital and ambulance shall be provided to facilitate removal of urgent cases to these hospitals. At the work place, some conveyance facilities such as a car shall be kept ready to take injured person or persons suddenly taken seriously ill, to the nearest hospitals.

4. Drinking Water: (a)In every work place, there shall be provided and maintained at suitable place easily accessible to labour, a sufficient supply of water fit drinking.

(b) Where drinking water is obtained from an intermittent public water supply each work place shall be provided with storage where such drinking water shall be stored.

(c) Every water supply of storage shall be at a distance of not less than 60 feet from any latrine, drain or other sources of pollution. Where water has to be drawn from an existing well which is within such proximity of latrine drain or any other source of pollution, the well shall be properly chlorinated before water is drawn from it for drinking. All such wells be entirely closed in and be provided with a trap door which shall be dust and water proof.

(d) A reliable pump shall be fitted to each covered well, the trap door shall be kept locked open only for cleaning or inspection which shall be done at least once 2 months.

(e) The temperature of drinking water supplied to workers shall not exceed 90^0 F.

5. Washing and Bathing Place:

(i) Adequate washing and bathing place shall be provided separately for man and women.

(ii) Such places shall be kept in clean and drained condition.

6. Scale of accommodation in latrines and Urinals: There shall be provided within the premises of every work place latrines and urinals in an accessible places and the accommodation, separately for each of them shall not be less than the following.

(a) Where the number of persons employed does not exceed 50.No. of seats 1.
(b) Where the number of persons employed exceeds 50 but does not exceed 100. No. of seats 3 per 100.
(c) For every additional 100, 3sets

(In particular cases the Engineer-in-Charge shall have the power to vary the scale where necessary). Latrines and Urinal for women: If women are employed, separate latrines and urinal for women. If women are employed, separate latrines separate from that for women and marked in the vernacular in conspicuous letter. For women only shall be provided on the scale laid in rule.

7. Latrines and Urinals: Except in work places provided with water flushed latrines connection with a water borne sewerage system, all latrines shall be provided with receiptable on dry earthen system which shall be cleaned and at least four times daily and at least twice during working hours and kept in a strictly sanitary condition. The receipt tables shall be tarred inside and outside at least once a year.

8. Constructions of latrines: The inside wall shall be constructed of masonry or stone materials and shall be cement washed inside and outside at least once a year. The dates of cement washing shall be noted in register maintained for this purpose and kept available for inspection.

9. Disposal of Excreta : Unless otherwise arrange for by the local sanitary authorities, arrangement for a proper disposal of excreta by incineration at the work place shall be made by means of a suitable incinerator approved by Asst. director of Public Health or Municipal Medical Officer of Health as the case may be, in whose jurisdiction the work place is situated. After natively excreta may be disposed of putting of a layer of.

10. Night soil at the bottom of pucca tank prepared for the purpose and covering it with a layer of waste or refuse and then covering it up with a layer of 6" of wasteor refuse and then covering it up with a layer of each for a fortnight (when it will turn in to manure).

11. Provision of shelters during rest-at every work place, there shall be provided free of cost two suitable sheds and for meals and the other for rest the use of labourers. The height of the shelter shall not be less than 11 feet, from the floor level to the lowest of the roof.

12. Creche: (a) At every work place at which more than 50 women workers are employed, there shall be provided only one creche for the use of children under the age of 6 years, belonging to such women and shall be used for infant's games and play and their bed room. The huts shall not be constructed on a lower standard than the following:

i) Thatched roofs
ii) Mud floors and walls
iii) Planks spread over the mud floor and covered with matting

The hut shall be provided with suitable and sufficient openings for light and ventilation. There shall be adequate provision for sweepers to keep the place clean. There shall be two dhais in attendance, sanitary, utensils shall be provided to the satisfaction of the Health Officer of the area concerned. The use of the hut shall be restricted to children, their attendants and mothers of the children.

(b) Where the number of women workers is more than 50, the Agency shall provide one hut and a Dai to look after the children of women workers.
(c) The size of crèche shall vary according to the number of women workers.

(d) The creche shall be properly maintained and necessary equipment like toys etc. shall be provided.

13. Canteen: A cooked food Canteen on moderate scale shall be provided for the benefits of workers whenever it is considered expedient.

68.0 INDEMNITY BOND:

The agency has to furnish the bond at the signing of the Agreement.

Name of work-

I _____ agency S/o_____ aged _____ Resident of _____ do hereby bind myself to pay all the claims may come (a) under Workmen's Compensation Act' 1933 with any statutory modification thereof and rules there under or otherwise for or in respect of any damage or compensation payable in connection with any accident or injury sustained (b) under Minimum wages Act'1948 (c) under payment of wages Act'1936 (d) under the Agency labour (Regulation and Abolition) Act' 1970 by workmen engaged for the performance of the business relating to the above contract i.e., failing such payment of claims of workmen engaged in the above work, I abide in accepting for the recovery of such claims, effected from any of my assets with the departments.

69.0 COMPLIANCE WITH LABOUR REGULATIONS:

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

The employees of the Agency and the Sub-agency in no case shall be treated as the Department of the Department at any point of time.

70.0 SALIENT FEATURES OF SOME MAJOR LABOUR LAWS APPLICABLE TO ESTABLISHMENT ENGAGED IN BUILDINGS AND OTHER CONSTRUCTION WORK:

a) Workmen compensation Act' 1923: The Act provides for compensation in case if injury by accident arising out of and during the course of employment.

b) Payment of Gratuity Act' 1972: Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if any employee has completed 5 years service or more, or on death, the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments, employing 10 or more employees.

c) Employees P.F. and Miscellaneous provision Act' 1952: The Act provides for monthly contributions by the Department plus workers @ 10% or 8.33%. The benefits payable under the Act are:

   i) Pension or family pension on retirement or death, as the case may be.

   ii) Deposit linked insurance on the death in harness of the worker.

   iii) Payment of P.F. accumulation on retirement/death etc.,

d) Maternity Benefit Act' 1951: The Act provides for leave and some other benefits to women employees in case of confinements or miscarriage etc.

e) Contract Labour (Regulation & Abolition) Act' 1970: The Act provides for certain welfare measures to be provided by the agency to contract labour and in case the Agency fails to
provide, the same are required to be provided by the Principal Department by Law. The Principal Department is required to take certificate of Registration and the agency is required to take license from the designated Officer. The Act is applicable to the establishments or Agency of Principal Department if they employ 20 or more contract labour.

f) Minimum wages Act' 1948: The Department is supposed to pay not less than the Minimum wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment construction of Buildings, Roads, Runways are scheduled employments.

g) Payment of wages Act' 1936: It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.

h) Equal Remuneration Act' 1979: The Act provides for payment of equal wages for work of equal nature to Male or Female workers and for not making discrimination against Female employee in the matters of transfers, training and promotions etc.

i) Payment of Bonus Act'1965: The Act is applicable to all establishments employing 20 or more employees. The Act provides for payment of annual bonus subject to a minimum of 8.33% of wages and maximum of 20% of wages to employees drawing `3500/- per month or less. The bonus to be paid to employees getting `2500/- per months or above and up to `3500/- per month shall be worked out by taking wages as `2500/- per monthly only. The Act does not apply to certain establishments. The newly set-up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of this Act.

j) Trade Unions Act' 1926: The Act lays down the procedure for registration of trade unions of workmen and Departments. The Trade Unions registered under the act have been given certain immunities from civil and criminal liabilities.

k) Child Labour (Prohibition & Regulation) Act' 1986: The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes, Employment Child Labour is prohibited in Building and Construction Industry.

l) Inter-State Migrant workmen's (Regulation of Employment & Conditions of service) Act' 1979: The Act applicable to an establishment, which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another State). The inter State migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.

m) The Building and Other Construction workers (regulation of Employment and conditions of service) Act' 1996 and the Cess Act of 1996: All the establishments who carry on any building or other construction work and employs 10 or more workers are covered underthis Act. All such establishments are required to pay cess at the rate not exceeding 2% of the cost of construction as may be modified by the Government. The Department of the establishment is required to provide safety measures at the Building or construction work and other welfare measures, such as Canteens, First-Aid facilities, Ambulance, Housing accommodations for workers near the work place etc. The Department to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.

71.0 LIABILITIES OF THE AGENCY:

71.1 Accident Relief and workmen compensation:

The agency should make all necessary arrangements for the safety of workmen on the occurrence of the accident, which results in the injury or death of any of the workmen employed by the agency, the agency shall within 24 hours of the happenings of the accident and such accidents should intimate in writing to the concerned Asst. Engineer / Asst. Engineer-in-Charge of the Department the act of such accident. The agency shall indemnify Government against all loss or damage sustained by the Government resulting directly or indirectly from his failure to give a intimation in the manner aforesaid including the penalties or fines, if any, payable by Govt. as a consequence of Govt. failure to give notice under Workmen's Compensation Act or otherwise conforming to the provisions of the said Act in regard to such accident.

71.2 In the event of an accident in respect of which compensation may become payable under the Workmen's Compensation Act VIII 23 whether by the agency, by the Government it shall be lawful for the Engineer-in-Charge to retain such sum of money which may in the opinion of the Engineer-in-Charge be sufficient to meet such liability. The opinion of the Engineer-in-Charge shall be final in regard to all matters arising under this clause.

71.3 The agency shall at all times indemnify the Govt. of Odisha. Against all claims which may be made under the workmen's compensation act or any statutory modification thereafter or rules there under or otherwise consequent of any damage or compensation payable in consequent of any accident or injuries sustained or death of any workmen engaged in the performance of the business relating to the agency.

72.0 AGENCY'S STAFF, REPRESENTATIVES AND LABOUR:

(a) The agency shall, at all times, maintain on the works, staff of qualified Engineers, and Supervisors of sufficient experience of similar other jobs to assure that the

quality of work turned out shall be as intended in the specifications. The agency shall also maintain at the works, a Work Manager or sufficient status, experience and office and duly authorize him to deal with all aspects of the day-today work. All communications to any commitments by the Work Manager shall be considered as binding on the Agency.

(b) The Agency shall at all times submit details of skilled and unskilled labour and equipment employed to the Engineer-in-Charge in prescribed proforma as he may require to assess and ensure the proper progress of work.

(c) If the agency does not employ the technical person agreed to on the work a fine of Rs.25,000/- will be imposed. If he does not employ for 30 days, thereafter it becomes a fundamental breach of contract.

(d) The Agency shall at all times, maintain on the work a staff of qualified Engineers and Supervisors of sufficient experience of similar other jobs to ensure that the quality of work turned out shall be as intended in these-specifications and they shall be present at the work spot during working hours and at the time of inspection by the Department Officers. All orders and direction given to such supervisory or other staff of the agency to be present on any specified inspection and the agency shall comply with such requisitions.

(e) The agency shall supply to the Engineer-in-Charge details of name, qualifications and

experience in regard to all supervisory staff employed by the agency and notify the changes when made and satisfy the Engineer-in-Charge regarding the quality and adequacy of staff thus employed.

(f) The Engineer-in-Charge will have the unquestionable right to ask for change in the agency's supervisory staff and to other removal from the work and connection herewith of any of such staff. The agency shall comply with such order and effect replacement to the satisfaction of the Engineer-in-Charge.

(g) The Agency shall not without written authorization permit entry on site of work of any person authorized agents, engaged in connection with work.

(h) All vehicles used by the agency shall be clearly marked with agency's name.

73.0 ACCOMMODATION AND FOOD:

The agency should arrange accommodation he needs, at his own cost. The agency shall make his own arrangements for supply of food grains, fuel and other provision to his staff and labourers including controlled commodities.

74.0 RELATIONSHIP:

Agency shall have to furnish information along with Bid, about the relationship he is having with any officer of the Department Government of Odisha of the rank Assistant Engineer and above engaged in the work and any officer of the rank of Assistant Secretary and above of the Department of Government of Odisha.

75.0 PROTECTION OF ADJOINING PREMISES:

The agency shall protect adjoining sites against structural, decorative and other damages that could be caused by the execution of these works and make good at his cost any such damages.

76.0 WORK DURING NIGHT OR ON SUNDAYS AND HOLIDAYS:

The works can be allowed to be carried out during night, Sundays or authorised holidays in order to enable him to meet the schedule targets and the work shall require almost round the clock working keeping in view:

i) The provisions of relevant labour laws being adhered to:

ii) Adequate lighting, supervision and safety measures are established to the satisfaction of the Engineer-in-Charge and

iii) The construction programme given by the Agency and agreed upon by the Engineer-in-Charge envisages such night working or working during Sundays or authorised holidays.

77.0 LAYOUT OF MATERIALS STACKS:

The agency shall deposit materials for the purpose of the work on such parts only of the ground as may be approved by the Engineer-in-Charge before starting work. A detailed survey, clearly indicating position and areas where materials shall be stacked and sheds built is to be conducted by the agency at his own cost and only after obtaining necessary approval of the plan for use of sites by the Engineer-in-Charge, the Agency can use the sites accordingly.

78.0 USE OF BLASTING MATERIALS:

Procurement of blasting materials and its storage is the responsibility of the agency. The agency shall engage licensed blaster for blasting operation. The agency is to act in accordance with Indian Explosive Act and other rules prevailing, during the execution of work. It is the responsibility of the agency to see, that works by other agencies in the vicinity are not hampered, in such cases if any claim is made by other agencies that should be borne by the agency. Carriage of blasting materials, from the magazine to the work site, is the responsibility of the agency.

79.0 PLANT AND EQUIPMENT:

79.1. The agency shall have sufficient plant, equipment and labour and shall work such hours and shifts as may be necessary to maintain the progress on the work as per the approval progress schedule. The working and shifts hours shall comply with the Govt. Regulations in force.

79.2 It is to expressly and clearly understand that agency shall make his own arrangements to equip himself with all machinery and special tools and plant for the speedy and proper execution of the work and the department does not undertake responsibility towards their supply.

79.3 The department shall supply such of the machinery that may be available on hire basis but their supply cannot be demanded as matter of right and no delay in progress can be attributed to such non-supply of the plant by the department and the department cannot be made liable for any damage to the agency. The Agency shall be responsible for safe custody of the departmental machinery supplied to him (which will be delivered to agency at the machinery yard at site of work) and he has to make good all damages and losses if any other than fire, wear and tear to bring it to the conditions that existed at the time of issue to the agency before handing over the same to the department. The hire charges for the machinery handed over to the agency will be recovered at the rate prevalent at the time of supply. The agency will have to execute supplemental contract with Engineer-in-Charge at the time of supply of the machinery.

79.4 The acceptance of departmental machinery on hire is optional to the agency.

80.0 STEEL FORMS:

Steel forms should be used for all items involving use of centering and shuttering. They shall be such that the concrete surface obtained after removal of centering and shuttering shall be single plane without any dents and undulations.

81.0 INCONVENIENCES TO THE PUBLIC:

The agency shall not deposit materials at any site, which will cause inconvenience to public. The Engineer-in-Charge may direct the agency to remove such materials or may undertake the job at the cost of the agency.

82.0 CONTRACT DOCUMENTS AND MATERIALS TO BE TREATED AS CONFIDENTIAL:

All documents, correspondences, decisions and orders, concerning the contract shall be considered as confidential and/or restricted in nature by the agency and he shall not divulge or allow access to them by any unauthorized person.

83.0 GENERAL OBLIGATIONS OF AGENCY:

83.1 The agency shall, subject to the provision of the contract and with due care and diligence, execute and maintain the works in accordance with specifications and drawings.

83.2 The agency shall promptly inform the Department and the Engineer-in-Charge of any error, omission and fault and to rectify the defect in the design or specifications for the works which are discovered when reviewing the contract documents or in the process of execution of the works.

84.0 SECURITY MEASURES

a) Security requirements for the work shall be in accordance with the Governments general requirements including provisions of this clause and the Agency shall conform to such requirements and shall be held responsible for the actions of all his staff, employees and the staff and employees of his sub-agencies.

b) All agencies' employees, representatives and sub-agency's employees shall wear identifications badges provided by the agency. Badges shall identify the agency, showing and employee's number and shall be worn at all times while at the site. Individual labour will not be required to wear identification badges.

c) All vehicles used by the agency shall be clearly marked with agency's name.

d) The agency shall be responsible for the security of the works for the duration of the contract and shall provide and maintain continuously adequate security personnel to fulfill these obligations. The requirements of security measures shall include, but not limited to maintenance of order on the site, provision of all lighting, fencing, guard flagmen and all other measures necessary for the protection of the works within the colonies, camps and elsewhere on the site, all materials delivered to the site, all persons employed in connection with the works continuously throughout working and non working period including nights, Sundays and holidays for duration of the contract.

e) Other agencies working on the site concurrently with the agency will provide security for their own plant and materials. However, their security revisions shall in no way relieve the agency of his responsibilities in this respect.

f) Separate payment will not be made for provision of security services and the cost of this work shall be deemed to have been included in the bid.

85.0 FIRE FIGHTING MEASURES:

a) The agency shall provide and maintain adequate firefighting equipment and take adequate fire precaution measures for the safety of all personnel and temporary and permanent works and shall take action to prevent damage to destruction by fire of trees shrubs and grasses at his own cost.

86.0 SANITATION:

The agency shall implement the sanitary and watch and ward rules and regulations for all employees employed under this contract and if the Agency fails to enforce these rules, the Engineer-in-Charge may enforce them at the expenses of the Agency.

87.0 TRAINING OF PERSONNEL:

The agency, shall, if and as directed by the Engineer-in-Charge provide free of any charge adequate facilities, for vocational training of Government Officers, students, Engineers, supervisors, foremen, skilled workmen etc. not exceeding six in number at any one time on the agency's work. Their salaries, allowances etc. will be borne by the Government and the training schemes will be drawn up by the Engineer-in-Charge in consultation with the agency.

88.0 ECOLOGICAL BALANCE:

a) The agency shall maintain ecological balance by preventing de-forestation, water pollution and defacing of natural landscape. The agency shall so conduct his construction operation as to prevent any unnecessary destruction, scarring, or defacing of the natural surroundings in the vicinity of the work. In respect of the ecological balance, agency shall observe the following instructions.

i) Where unnecessary destruction, scarring, damage or defacing may occur, as result of the operation, the same shall be repaired replanted or otherwise corrected at the agency’s expense. The agency shall adopt precautions when using explosives, which will prevent scattering of rocks or other debris outside the work area. All work are including borrow areas shall be smoothened and graded in a manner to conform to the natural appearance of the landscape as directed by the Engineer-in-charge.

ii) All trees and shrubbery which are not specifically required to be cleared or removed for construction purposes shall be preserved and shall be protected from any damage that may be caused by the Agency’s construction operation and equipment. The removal of trees and shrubs will be permitted only after prior approval by the Engineer-in-Charge. Special care shall be exercised where trees or shrubs are exposed to injuries by construction equipment, blasting, excavating, dumping, chemical damage or other operation and the agency shall adequately protect such trees by use of protective barriers or other methods approved by the Engineer-in-Charge. Trees shall not be used for anchorages. The agency shall be responsible for injuries to trees and shrubs caused by his operations. The term “injury” shall include, without limitation bruising, scarring, tearing and breaking of roots, trunks or branches. All injured trees and shrubs be restored as nearly as practicable without delay to their original condition at the agency’s expense.

iii) The agency's construction activities shall be performed by methods that will prevent entrance or accidental spillage of solid matter contaminants, debris and other objectionable pollutants and wastage into river. Such pollutant and waste include

earth and earth products, garbage, cement concrete, sewage effluent, industrial wastes, radio-active substances, mercury, oil and other petroleum products, aggregate residuals, mineral salts and thermal pollutants. Pollutants and wastes shall be disposed off in a manner and at sites approved by the Engineer-in-Charge.

iv) In conduct of construction activities and operation of equipments the agency shall utilize such practicable methods and devices as are reasonably available to control, prevent and otherwise minimize the air pollution. The excessive omission of dust in to the atmosphere will not be permitted during the manufacture, handling and storage of concrete aggregates and the agency shall use such methods and equipment as a necessary for collection and disposal or prevention of dust during these operations. The agency's methods of storing and handling cement shall also include means of eliminating atmospheric discharges of dust, equipment and vehicles that give objectionable omission of exhaust gases shall not be operated. Burning of materials a resulting from clearing of trees, bushes, combustible construction materials and rubbish may be permitted only when atmospheric conditions for burning are considered favorable.

b) Separate payment will not be made for complying with the provisions of this clause and all cost shall be deemed to have been included in the unit rates and prices included in the contract if any provision is not complied with within a reasonable time even after issue of a notice in this respect, the necessary operations would be carried out by the Engineer-in-Charge at the cost of the Agency, Orders of the Engineer-in-Charge in this respect would be final and binding on the agency.

89.0 PRESERVATION OF EXISTING VEGETATION:

a) The agency will preserve and protect all existing vegetation such as trees, on or adjacent to the site which do not unreasonably interfere with the construction as may be determined by the Engineer-in-Charge. The agency will be held responsible for all unauthorized cutting or damage of trees, including damage due to careless operation of equipment, stockpiling of materials or trekking of grass areas by equipment Care shall be taken by the Agency in felling trees authorized for removal to avoid any unnecessary damages to vegetation and trees that are to remain in place and to structures under construction or in existence and to workmen.

b) All the produce from such cutting of trees by the agency shall remain the property of Government and shall be properly stacked at site, approved by the Engineer-in-Charge. No payment whatsoever shall be made for such cutting and its stacking by the Agency. If any produce from such cutting is not handed over to the Government by the agency, he shall be charged for the same at the rates to be decided by the Engineer-in-Charge. The recovery of this amount shall be made in full from the intermediate bill that follows.

c) The agency shall also make arrangements of fuel deposits for supply of required fuel for the labourers to be employed for cooking purpose at his own cost in order to prevent destruction of vegetation growth in the surrounding area of the work site.

90.0 POSSESSION PRIOR TO COMPLETION:

The Engineer-in-Charge shall have the right to take possession of or use any completed part of work or works or any part thereof under construction either temporarily or permanently. Such possession or use shall not be deemed as an acceptance of any work either completed or not completed in accordance with the contract within the interest of Clause 28 of

Standard specification except where expressly otherwise specified by the Engineer-in-charge.

91.0 ACCESS TO THE AGENCY'S BOOKS:

Whenever it is considered necessary by the Engineer-in-Charge to ascertain the actual cost of execution of any particular extra item of work or supply of the plant or material on which advance is to be made or of extra items or claims, he shall direct the agency to produce the relevant documents such as payrolls, records of personnel, invoices of materials and any or all data relevant to the item or necessary to determine its cost etc. and the agency shall when so required furnish all information pertaining to the aforesaid items in the mode and manner that may be specified by the Engineer-in-Charge.

92.0 DRAWING TO BE KEPT AT SITE:

The agency is to supply seven sets of corrected drawings for approval of the Competent Authority. The approving authority will forward four sets of approved drawing to the Engineer-in-Charge and two sets to the agency for his/their own use. The agency shall keep one complete set of drawings and specifications in the site in charge of the agency's agent to whom the instructions can be given by the Engineer-in-Charge.

93.0 B.I.S BOOKS AND STANDARD SPECIFICATION / OPWD CODE TO BE KEPT SITE:

A complete set of Indian Standard specification referred to in "Technical Specifications" and OPWD Code shall be kept at site for reference.

94.0 SITE ORDER BOOK:

An order book shall be kept at the site of the work. As far as possible, all orders regarding the work are to be entered in this book. All entries shall be signed and dated by the Department Officers in direct charge of the work and by the agency or by his representative. In important cases, the Engineer-in-Charge or the Chief Engineer will countersign the entries, which have been made. The order book shall not be removed from the worksite, except with the written permission of the Engineer-in-Charge. The Site Order Book shall be issued by the Engineer-in-Charge for use at site.

95.0 VARIATIONS BY WAY OF MODIFICATION, OMISSIONS OR ADDITIONS:

The agency(s) shall not vary or deviate from the drawings or specifications except upon the express authority of the Engineer-in-Charge which shall be obtained by an order in writing of the Engineer-in-Charge or by plan or drawing expressly given or signed by him or by any subsequent written approval signed by him. For example the foundation shall be carried to the depths in suitable strata, shown in the drawing. But if the Engineer is of opinion that they should be shallower or deeper and so directs the agency in writing the instruction of the Engineer-in-Charge shall be binding on the agency.

95.1 THE POWER TO MAKE ADDITIONS AND ALTERATION IN DRAWING OR SPECIFICATION ETC.: The Chief Engineer shall have power to make any alternations in or additions to the original specification, drawing, designs and instructions that may appear to him to be necessary or advisable during the progress of the work and the agency(s) shall be bound to carry out the work in accordance with the instructions which may be given to him/them in writing signed by the Engineer-in-Charge and such alterations shall not invalidate the contract, and any additional work beyond the scope of the work which the agency may be directed to do in the manner above specified as part of the work or any curtailment of the work from the scope of the work as designed, which may be found necessary during the period of construction shall be carried out or omitted by the agency(s) on the same

conditions in all respects on which he/they agreed to do the main work. If the additional or altered work for which no rates can be arrived from the main work then the agency shall within seven days of the date of the receipt by him/them of the order to carry out the work, inform the Engineer-in-Charge of the rate which he/they propose to charge for such class of work. If the Engineer-in-Charge does not agree to this rate he shall by notice in writing be at liberty to cancel his order to carry out such a class of work and arrange to carry it out in such manner as he may consider it advisable. In the event of dispute the decision of the Chief Engineer concerned shall be final. The time limit for the completion of the work shall be extended or curtailed in the proportion to the increase or decrease in its costs. As alteration or curtailment bears to the cost of the original contract work, the certificate of the Engineer-in-Charge as to such proportion shall be conclusive.

96.0 CARE AND DIVERSION OF RIVER / STREAM. :

The agency shall submit details regarding the diversion and care of river or stream during construction of the work along with a separate print-out of the time table showing earliest and latest start and finish dates of various activities. He should submit a detailed labour plan with drawings for the diversion and care of river during construction of work. The above arrangements shall be at agency's cost.

97.0 INCOME TAX:

a) During the currency of the contract, deduction of income tax as per Income tax Rule shall be made from the gross value of each bill of the contract.

b) The agency's staff, personnel and labour will be liable to pay personnel income taxes in respect of their salaries and wages as are chargeable under the laws and regulations for the time being in force; and the agency shall perform such duties in regard to such deductions thereof as may be imposed on him by such laws and regulations.

98.0 ROYALTY CHARGES:

The agency shall pay the royalty to the competent authority / local body as per rules. The agency shall furnish quarterly statement showing quantity of quarried materials from whom purchased (with full address of the seller) & copies of bills for purchase to the District Officer of the Revenue Department authority competent to levy royalty in the area of work. Agency shall also furnish such additional information as regards royalty payment to the royalty collecting Authority as may be called for. The royalty charges paid shall be borne by the agency & shall not be reimbursed by the Engineer-in-Charge.

99.0 GOODS & SERVICES TAX (GST)

99.1 GST as applicable, shall be deducted at source during the currency of the contract while making payments to the agency.

99.2 The agency should produce a valid GST Certificate before the payment of the final bill; otherwise payment to the agency will be withheld.

99.3 The tax structure is liable for revision as per the orders of the Government issued from time to time and in such case; the same tax will be deducted at source at the revised rates only while making payment to the agency.

99.4 Excess recovery due to downward revision in sales tax rates as per orders of Government from time to time will be reimbursed.

100.0 LABOUR WELFARE CESS.

Labour welfare cess @ 1% of gross bill amount is to be deducted during currency of contract subject to the amendments made by Govt. from time to time.

101.0 SUPPLY OF CONSTRUCTION MATERIALS:

The agency(s) is/are to provide every article or thing which may be necessary and requisite for the due and proper execution of all the works to satisfactory completion of the contract in all respect.

102.0 SETTING OUT:

The agency shall be responsible for the true and proper setting out of the works and the correctness of positions, levels, dimensions and alignments of all parts of the work and for the provisions of all necessary instruments, appliances and labour in connection therewith, If, at any time, during the progress of the work, any errors, appear or arise in the positions, levels, dimensions or alignments of any part of the work, the agency, on being required to rectify such errors by the Engineer-in-Charge shall at his own expense do so to the satisfaction of the Engineer-in-charge. The checking of and setting out of any line or level by the Engineer-in-Charge or his representative shall not in any way, relieve the agency of his responsibilities for their correctness and other things used in setting out of the work. The agency shall carefully protect and observe all bench-marks, site-nails, pegs and other things used in setting out of the work.

103.0 SUFFICIENCY OF THE CONTRACT PRICE:

The Agency shall be deemed to have satisfied himself as to the correctness and sufficiency of the Contract Price. Unless otherwise stated in the Contract, the Contract price covers all the Agency's obligations under the Contract (including those under provisional sums, if any) and all things necessary for the proper planning & design, execution and completion of the Works and the remedying of any defects during construction and maintenance period.

104.0 UNFORESEEABLE DIFFICULTIES:

Except as otherwise stated in the Contract:

a. the Agency shall be deemed to have obtained all necessary information as to risks, contingencies and other circumstances which may influence or affect the Works:
b. by signing the Contract, the Agency accepts total responsibility for having foreseen all difficulties and costs of successfully completing.
c. the Works; and the Contract Price shall not be adjusted to take account of any unforeseen difficulties or costs.

105.0 RIGHTS OF WAY AND FACILITIES:

The Agency shall bear all costs and charges, other than the statutory charges, for special and/or temporary rights-of-way, which he may require, including those for access to the Site. Department shall bear the statutory charges for R. O. R. The Agency shall also obtain, at his risk and cost, any additional facilities outside the site, which he may require for the purposes of the Works.

106.0 AVOIDANCE OF INTERFERENCE:

The Agency shall not interfere unnecessarily or improperly with:

a) The convenience of the public, or

b) The access to and use and occupation of all roads and footpaths, irrespective of whether they are public or in the possession of the Employer or of others. -

The Agency shall indemnify and hold the Employer harmless against and from all -damages, losses and expenses (including legal fees and expenses) resulting from any such unnecessary or improper interference.

107.0 ACCESS ROUTE:

The Agency shall be deemed to have been satisfied as to the suitability and availability of access routes to the Site. The Agency shall use reasonable efforts to prevent any road or bridge from being damaged by the Agency's traffic or by the Agency's Personnel. These efforts shall include the proper use of appropriate vehicles and routes.

Except as otherwise stated in these Conditions:

the Agency shall (as between the Parties) be responsible for any maintenance which may be required for his use of access routes; the Agency shall provide all necessary signs or directions along access routes, and shall obtain any permission which may be required from the relevant authorities for his use of routes, signs and directions; the Employer shall not be responsible for any claims which may arise from the use or otherwise of any access route, the Employer does not guarantee the suitability or availability of particular access routes, and Costs due to non-suitability or non-availability, for the use required by the Agency, of access routes shall be borne by the Agency.

108.0 TRANSPORT OF GOODS:

a) The Agency shall give the Employer, not less than 21 days' notice, of the date on which any Plant or a major item of other Goods will be delivered to the Site;

b) The Agency shall he responsible for packing, loading, transporting, receiving. Unloading, storing and protection all Goods and other things required for the Works; and

c) The Agency shall indemnify and hold the Employer harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from the transport of Goods, and shall negotiate and pay all claims arising from their transport.

109.0 AGENCY'S EQUIPMENT:

The Agency shall be responsible for all his/their equipment. When brought on to the Site, Agency's Equipment shall be deemed to be exclusively intended for the execution of the Works.

1) All Constructional Plant, Temporary Works and materials provided by the Agency shall,

when brought on to the site, be deemed to be exclusively intended for the execution of the Works and the Agency shall not remove the same or any part thereof, except for the purpose of moving it from one part of the site to another, without the consent, in writing, of the Engineer, which shall not be unreasonably withheld.

2) Upon completion of the works the Agency shall remove from the site all the said Constructional Plant and Temporary Works remaining thereon and any unused materials provided by the Agency.

3) The Employer shall not at any time be liable for the loss of or damage to any of the said Constructional Plant, Temporary Works or materials.

110.0 PROGRESS REPORTS:

Monthly progress reports shall be prepared by the Agency and submitted to the Employer in six copies. The first report shall cover the period up to the end of the first calendar month following the Commencement Date. Reports shall be submitted monthly thereafter, each within 5 days after the last day of the period to which it relates.

Reporting shall continue until the Agency has completed all work. The work which is known to be outstanding at the completion date is to be completed stated in the Taking-Over Certificate for the Works.

Each report shall include:

(a) Charts and detailed descriptions of progress, including each stage of design, Agency's Documents, procurement, manufacture, delivery to Site, construction, commissioning and trial operation;

(b) Digital photographs showing the status of progress on the Site;

(c) For the manufacture of each main item of Plant and Materials, the name of the manufacturer, manufacture location, percentage progress, and the actual or expected dates of:

(i) Commencement of manufacture,
(ii) Agency's inspections,
(iii) Tests, and
(iii) Shipment and arrival at the Site;

(d) The details of Agency's Personnel and Equipments.

(e) Copies of quality assurance documents, test results and certificates of Material;

(f) List of Variations, notices given

(g) Safety statistics, including details of any hazardous incidents and

Activities relating to environmental aspects and public relations; and

(h) Comparisons of actual and planned progress, with details of any events or circumstances which may jeopardize the completion in accordance with the Contract, and the measures being (or to be) adopted to overcome delays.

111.0 DESIGN:

111.1 General Design Obligations:

The Agency shall be deemed to have scrutinized, prior to the Base Date, the Employer's Requirements (including design criteria and calculations, if any). The Agency shall be responsible for the planning and Design of the Works and for the accuracy of such Employer's Requirements (including design criteria and calculations), except as stated below.

The Employer shall not be responsible for any error, inaccuracy or omission of any kind in the Employer's Requirements as originally included in the Contract and shall not be deemed to have given any representation of accuracy or completeness of any data or information. Any data or information received by the Agency, from the Employer or otherwise shall not relieve the Agency from his responsibility for the Planning, design and execution of the Works.

111.2 Agency’s Documents:

The Agency’s Documents shall comprise the technical documents specified in the Employer's Requirements, documents required to satisfy all regulatory approvals, and the documents.

The Agency shall prepare all his Documents, and shall also prepare any other documents necessary to instruct his Personnel.

If the Employer's Requirements describe the Agency's Documents which are to be submitted to the Employer for review, they shall be submitted accordingly, together

with a notice as described below. In the following provisions of this Sub-Clause, (i) "review period" means the period required by the Employer for review, and (ii) "Agency's Documents" exclude any documents which are not specified as being required to be submitted for review.

The Employers may give notice to the Agency that his Document fails (to the extent stated) to comply with the Contract. If his Document so fails to comply, it shall be rectified, resubmitted and reviewed in accordance with this Sub-Clause, at his cost.

For each part of the Works, and except to the extent that the Parties otherwise agree:

(a) Execution of such part of the Works shall not commence prior to the expiry of the review periods for all the Agency's Documents which are relevant to its design and execution.

(b) execution of such part of the Works shall be in accordance with these Agency's Documents, as submitted for review; and if the Agency; wishes to modify any design or document which has previously been submitted for review, the Agency shall immediately give notice to the Employer. Thereafter, the Agency shall submit revised documents to the Employer in accordance with the above procedure.

(c) If the Employer's Representative instructs that further Construction Documents are necessary for carrying the works, the Agency shall upon receiving the Employer's Representative Instructions, prepare such construction documents and shall not be considered as variation. Any such contract (under the preceding paragraph) or any review (under this Sub-Clause - or otherwise) shall not relieve the Agency from any obligation or responsibility.

111.3 As-Built Documents:

The Agency shall prepare, and keep up-to-date, a complete set of 'as-built' records of the execution of the Works, showing the exact as-built locations, sizes and details of the work as executed. These records shall be kept on the Site and shall be used exclusively for the purposes of this Sub-Clause. Two copies shall be supplied to the Employer prior to the commencement of the quantity checks / Verification Tests on Completion.

In addition, the Agency shall supply to the Employer as-built drawings of the Works, showing all Works as executed, and submit them to the Employer for review under Sub-Clause [Agency's Documents]. The Agency shall obtain the consent of the Employer as to their size, the referencing system, and other relevant details.

Prior to the issue of any Taking-Over Certificate, the Agency shall supply to the Employer the specified numbers and types of copies of the relevant as-built drawings, in accordance with the Employer's Requirements. The Work shall not be considered to be completed for the purposes of taking-over [Taking Over of the Works and Sections] until the Employer has received these documents.

111.4 Design Error:

If errors, omissions, ambiguities, inconsistencies, inadequacies or other defects are found in the Agency's Documents, they and the Works shall be corrected at the Agency's cost, notwithstanding any consent or approval under this Clause.

112.0 PROGRAMME:

112.1 The Agency shall submit a work programme to the employer within 15 (fifteen) days after the conclusion of contract / commencement date whichever is earlier and the programme shall be based on the basic time period for completion and milestone as indicated in the Contract Document. His programme shall be considered effective upon acceptance by the Engineer-in-Charge.

The Agency shall also submit a revised work programme whenever the previous programme is inconsistent with actual progress or with the Agency's obligations. Unless otherwise stated in the contract each work programme shall include:

(a) The order in which the Agency intends to carry -out the Works, including the anticipated timing of each major stage of the Works.

(b) The periods for reviews under Clause [Agency's Documents],

(c) The sequence and timing of inspections and tests specified in the Contract, and

(d) A supporting report which includes:

(i) A general description of the methods which the Agency intends to adopt for the execution of each major stage of the Works, and

(ii) The approximate number of each class of Agency's Personnel and of each type of Agency's Equipment for each major stage.

112.2 Rate of Progress:

If, at any time:

(a) actual progress is too slow to complete within the Time for Completion, and/or

(b) progress has fallen (or will fall) behind the current programme under Sub-Clause [Programme], then the Employer may instruct the Agency to submit, under Sub Clause, a revised programme and supporting report describing the revised methods which the Agency proposes to adopt in order to expedite progress and complete within the Time for Completion of the mile stone and the work.

Unless the Employer notifies otherwise, the Agency shall adopt these revised methods, which may require increases in the working hours and/or in the numbers of Agency's Personnel and/or Goods, at the risk and cost of the Agency.

113.0 CHARGE OF SITE

From the commencement of the works to the completion of the same, they are to be under the agency (s) charge. The Agency(s) is / are to be held responsible for and to make good all injuries, damages and repair occasioned or rendered necessary to the same by fire or other causes and they are to hold the employer harmless from any claims for injuries to persons or for structural employer harmless from any claims for injuries to persons or for structural damage to property happening from any neglect, default, want of proper care or misconduct on the part of the agency's(s) or of any one in his/their employees during the execution of the works.

114.0 CHANGES IN DRAWING

If at any time before or after the commencement of the work the employer shall for any reason whatsoever.

a) Cause alterations, omissions or variation in the drawings and specification involving any curtailment of the works as originally contemplated or

b) Not required the whole of work as specified in the Bid to be carried out, the agency(s) shall have no claim to any payment or compensation whatsoever on account of any profit or advantage which he/they might have derived from the

execution of the work in full as specified in the Bid but which he/they did not derive in consequence of the curtailment of the works by reason of alterations, omissions or variations or in consequence of the full amount of the work not having been carried out.

SECTION - V

SPECIAL CONDITIONS OF CONTRACT

SECTION – V

SPECIAL CONDITIONS OF CONTRACT

1.0 GENERAL

The data and information given in the Contract Document are based on the preliminary survey & investigation carried out by the Department. The Agency shall receive all the available data/information from the Department on his written request. The Contractor shall therefore, satisfy himself about the adequacy and accuracy of the said data/information and interpretation thereof and collect fresh data/additional data/information and carry out/conduct further investigations and studies. The Employer shall not be responsible for the accuracy/adequacy of the data/information and interpretation thereof by the Contractor.

2.0 SUFFICIENCY OF BID

2.1 The Agency shall be deemed to have visited and carefully examined the Project site and it's surrounding to have satisfied himself to the nature and conditions of the means of transport and communications, whether by land or air, as available at present and as to possible interruptions thereto including the access and regress conditions for the Site. The Agency is also deemed to have made enquiries, examined and satisfied himself as to the sites source for obtaining sand, stones, bricks and other materials, the sites for disposal of surplus materials and accommodation for depots, colonies, workshops and other infrastructure facilities as may be necessary for executing and completing the Works, as also the sub-soil water and variations thereof, storms, prevailing winds, climatic conditions and all other similar matters affecting the works including law & order.

2.2 Any neglect or omission or failure on the part of the Agency in obtaining necessary and reliable information upon the foregoing or any other matter affecting the Contract shall not relieve him from any risks or liabilities or the entire responsibility for the completion of the works in accordance with the Contract.

2.3 No verbal agreement or inference from conversation with any officer or employee of the Employer either before or after the signing of the Contract shall in any way affect or modify any of the terms or obligations herein contained. The Agency shall also be deemed to have inspected and examined the Site and to have satisfied himself, before submitting his Bid, as to the form and nature thereof including the sub-surface conditions and other local conditions, the hydrological, geological and climatic conditions, the extent and nature of work and materials necessary for the completion of the Works of all schemes under the cluster, the means of access to the Site and the land for accommodation etc. he may require and, in general, shall be deemed to have obtained all necessary information, as to risks, contingencies and all other circumstances which may influence or affect his Bid.

3.0 MAJOR PROJECT COMPONENTS AND PROJECT BASIC PARAMETERS

3.1 The major components as proposed by the Employer along with the basic project design parameters fixed by the Employer for the UGPL Irrigation System(Gravity) is indicated below:

Major components are:

a. Distribution Network through underground pipe line and accessories.
b. Command Area Development Network for 1 ha sub-chak through underground pipe line and accessories.
c. PIM byownresourcesofEPC/engaginglocalNGO/institutiondealingwithsimilar works to integrate formation of WUAs, training, capacity building, market linkage etc.
d. Operation & Maintenance of UGPL network.

4.0 SCOPE OF WORK

4.1 General

4.1.1 The major components of works to be executed by the agency under this contract shall be as described section - wise as follows.

4.1.2 Any requirements of work whether requested by the Employer or otherwise and whether specifically described in the Contract or not but are necessary or required for the proper completion and functioning of the Works in accordance with the Contract including remedying of any gaps and deficiencies in the Works shall not be deemed to be considered as any change in the Scope of Work and shall not entitle the agency for any extra payment.

4.2 Planning, Design and Execution:

4.2.1 The planning & design for UGPL network consists of various control & regulation valves and turnout structures, which includes providing, supplying, laying, jointing etc. complete in all respects for UGPL Irrigation System in Branch canals, Distributaries, Minors, Sub minors & CAD works up to 1 hasub-chak. Moreover, providing off-take structures, control structures, air valves, blow off assemblies, flush valves, turnout structures etc. what so ever required for serving the total command of 467 ha efficiently up to 1 Hasub-chak (including micro irrigationfor _____Ha/without micro irrigation/compatiblewithmicro irrigationfor _____Ha) as per the provision to "HarKhetaKoPani" under AIBP-PMKSY / CAD Project.

4.2.2 Civil Works

The scope of work under this section are Pipe laying including jointing for UGPL Irrigation System of branch canals, distributaries, Minors, Sub-Minors & CAD works up to 1 ha sub-chak (including micro irrigationfor _____Ha /without micro irrigation/compatible with micro irrigation for _____Ha) providing off take structures, control structures, turnout structures, air valves, blow off assemblies, flush valves, etc. whatever required for serving the total command of 467 ha efficiently up to 1 ha sub-chakas per the provision to "Har Kheta Ko Pani" under AIBP-PMKSY / CAD Project.

4.2.3 PUMPS & ELECTRO MECHANICAL EQUIPMENTS

The UGPL irrigation system shall be provided for entire command area of the project. In case of deficit in command area due to less driving head or high patches of land, Solar generators of required capacity will be provided

for Drip / Sprinkler irrigation. The cost of such arrangements shall be borne by the agency.

4.3 Design and Engineering

4.3.1 The present proposal is based on Department's preliminary assessment and design. The contractor is free to change the concept and designs provided the irrigation facility is planned and provided to the designed command area in each scheme so that total CCA in the cluster is achieved. The planning and design shall have to aim for minimum life cycle cost of the schemes. The Contractor shall submit design of intake works, pump house and appurtenant works, pumps, Rising main/Pressure main, Delivery Chamber(Optional),(When Delivery Chamber is not provided, the Rising Main should be consider upto the last off take of Minor)distribution system and inline structures, flow measuring devices and pipes for network keeping in view the safety, cost and time effectiveness provided always that the design of the pumps, Rising main/Pressure main, Delivery Chamber(Optional)s(When Delivery Chamber is not provided, the Rising Main should be consider upto the last off take of Minor) and distributions system shall be always in conformity with the basic parameters and in accordance with the Nationally/Internationally accepted practice and for the optimal performance of the works as warranted under the Contract. This shall not entitle the Contractor to additional cost, whatsoever, other than the contract price. The number of copies of the Reports and other Documents to be submitted to the Engineer-in-Charge by the contractor is also specified in Contract Document.

4.3.2 Data and information related to the Project have been furnished in the bid documents for reference. All additional survey, investigation and testing data and any other data relevant to design shall be collected by the Contractor without any financial burden to the Employer. The data pertaining to the detailed survey made by the contractor to achieve the designed command area shall be used.

5.0 TESTS AND QUALITY CONTROL

5.1 The Agency shall be required to carry out all tests in accordance with relevant Clauses of the Conditions of contracts and the Technical Specifications and as per relevant I.S. Codes, IRC codes & Manuals.

Employer's authorized representative and/or an outside inspection agency acting on behalf of the Employer shall have access to the site and shall have the power to inspect and examine all works, the materials and workmanship of the project works, during execution. The Agency shall provide necessary labours, tools, or any other assistance as desired by the Employer's authorised representative without any extra payment. Necessary test results of the pipes and its appliances should be submitted to the department prior to laying at site. The agency has to make arrangements from time to time for inspection of testing of materials at work site.

5.2. Where the field quality assurance plan provided for witnessing tests/inspection on behalf of the Engineer, the Contractor shall give the Engineer-in-Charge adequate written notice of any inspections/tests.

5.2.1 Where the Engineer or his Representative attends the tests as provided in clause 5.2.1 above, and has any objection to any works or workmanship which in his opinion is not in accordance with the Contract he shall advise the Contractor of his objection during tests/inspections. The Contractor shall give due consideration to such objections and shall make modifications that may be necessary to meet the said objective. The inspection/tests by Engineer/ Engineer's Representative/Agency and/or his countersigning inspection/test certificate(s) thereon shall in no way limit the liabilities and responsibilities, of the Contractor as stipulated in the Contract. The Contractor shall maintain and record all measurements and test results and submit the same to the Employer after completion of such inspection/tests.

6.0 MEASUREMENTS AND PAYMENTS

6.1 The Contractor is entitled for interim payment under various sections of the work in accordance with **Clause 41** of the General Conditions of Contract. Measurement/verification for interim payment certificate of various items, under various sections of the works, shall be made jointly by the Engineer-in-Charge or his Subordinate Staff and the Contractor or his authorized representative for verifying the claims of the Contractor's interim payment/running bills.

7.0 SUPPLEMENTARY REQUIREMENTS

7.1 Drawings and Designs:

The Contractor shall formulate submission of proposals for all components of the above work individually. The designs, drawings and estimates of Intake Works, , Rising main/Pressure main, Delivery Chamber(Optional), distribution system, excavation/earthwork and inline concrete structures to the Engineer-in-Charge for approval. All soft copies and software used for computation shall be made available to the Engineer-in-Charge for vetting of the designs, drawings and estimates by the competent authority. Contractor shall supply to the Engineer-in-Charge 6 (six) copies & CD/DVD/Pen drive and each of the design calculations and drawings for approval. The Contractor shall incorporate all necessary comments of the Engineer's Representative in the above design and drawings, if any, and shall re-submit further 6 (six) copies & CD/DVD/Pen drive each of the revised design and drawings within 10 (ten) days for final approval. The Contractor shall thereafter submit 10 (Ten) copies each of the approved design and 10 (Ten) copies each of the approved drawings together with one copy each of the reproducible tracings to Engineer-in-Charge. Further design calculations and drawings shall be submitted in sequence as per a schedule to be drawn and agreed upon mutually.

The documents and drawings shall be in sufficient detail for review. The scale of the drawing has to be chosen in coordination with the Engineer-in-Charge. The drawings shall be of standardized sizes and as instructed by the Engineer-in-Charge. The drawings shall contain the following basic information in the nameplate:

a) Project name
b) Name and number of the Contract
c) Contractor's name
d) Number and title of the drawing
e) Date and scale

f) Draftsman's name and signature
g) Name of the designer responsible and signature
h) Revision Number (R0 for drawing submitted initially and R1, R2, etc., for Drawings submitted subsequently).
i) Name and designation of checking official and space for signature.
j) Approving authorities name and designation as specified by the Engineer-in-Charge and space for the signature.

A blank space 90 x 50 mm shall be provided immediately above the title block for the approval stamp. If required by the Approving Authority, the detailed design and the execution drawings shall be submitted by the contractor to the Approving Authority only after verification and vetting by the Consultant(s) notified by the Engineer-in-Charge.

The Contractor shall be responsible for preparation of working drawings and the construction documents for works, as specified in the Contract. Drawings given are indicative, but will form part of the contract.

The contractor shall carry out alignment studies including cost economics by examining all possible alternatives to prepare detailed layout, designs and drawings of all components of the work stated in scope of work. The contractor shall use guidelines in the relevant IS codes, IRC publications and circulars issued by the department from time to time for various components of the works.

All the studies of individual schemes, layout drawings and modifications if required to be prepared for taking up execution of the work, shall be prepared by the contractor and shall be got approved from the competent authority. The contractor will have to submit detailed drawings of each component with appropriate scales, measurements, Reduced Levels, full dimensions, index map locations of components such as godown, dumping area, internal roads, etc., The contractor is expected to organize his work to the best of his knowledge so that final draft of various types of designs and layouts will be submitted to competent authority within stipulated time period.

All the studies layouts, drawings, design notes, which have been submitted to the department, shall become the absolute property of department under the copy right act and the contractor shall not use the same in whole or part thereof elsewhere for any purpose without explicit written permission from the department. In all difference of opinion on technical matters between the contractor and the Engineer-in-Charge, the decision given by the Chief Engineer shall be final and binding on the contractor.

7.2 Contractor's Work Programme

7.2.1 Within 15 (fifteen) days from the Date of Commencement, the Contractor shall submit to the Employer a work programme showing the sequence in which he proposes to carry out various components for completing the Works as per the Master Control Network within the Time For Completion. The Master Control Network shall indicate the sequence of various activities and highlight the critical activities including delivery of equipment. Such work programme shall be subject to review and revision by the Employer/Engineer in consultation with the Contractor from time to time in order to achieve completion of the Works within the **TIME FOR COMPLETION**. The contractor shall also use computer aided project management software to generate Bar Chart based on network technique.

The contractor shall also submit to the Employer/Engineer the information on detailed methodology of carrying out investigation surveys, design engineering, detailed construction methodology along with schedule for deployment of plant & machineries, which shall successively be adjusted in order to meet the actual requirement to complete the works within the TIME FOR COMPLETION along with the work programme.

All the survey & investigation, planning, designs, approval processes, procurement and construction works of individual Schemes shall be taken up simultaneously; so that the work can be completed within time for completion.

7.2 Effort should be made to execute and complete the work from upstream to downstream of the pipe line distribution system simultaneously. All works should be taken up in a systematic manner such that the objective of providing irrigation supply in the entire command area of the system is achieved.

7.3 Action when the progress of any crucial item of work is unsatisfactory :

If the progress of a crucial item of work, which is important for timely completion of work is unsatisfactory, the Engineer-in-Charge shall, not withstanding that the general progress of work is satisfactory, in accordance with relevant clause, be entitled to take action under this clause after giving the contractor 15 days notice in writing and the contractor will have no claim for compensation for any loss sustained owing to such action.

7.4 Programme – Scheduling / Re-Scheduling

7.4.1 The Works shall be executed and performed in accordance with the Master Control Network (Work Programme) which shall clearly indicate the interlinking / interdependencies of all the works of the Contract including relative activities of Civil Works and Electro-Mechanical Works and the Power System Connectivity for the cluster. The Programme shall be reviewed jointly by the Employer/ Engineer and the Contractor, at least once in a month where-in the hold ups/delays, if any, in the progress of Works, with reference to the agreed Schedule shall be given Special Attention. Necessary modifications (updating / Revisions) of the Programme, within the overall Time for Completion, shall be carried out by mutual agreement between the Employer/ Engineer and the Contractor.

7.4.2 If for any reason, any parts of the Works of the Project are delayed, then the total programme may be re-scheduled by mutual agreement between the Employer/ Engineer and the Contractor, if necessary, keeping the overall completion schedule of the project unaltered. No extra cost whatsoever, on account of such re-scheduling shall be payable to the contractor.

7.4.3 Progress Report

The Contractor shall submit to the Engineer, Engineer's Representative and Engineer-in- Charge monthly progress report by 5th day of following months in such form and details as prescribed by Engineer-in-Charge.

8.0 INSPECTION AND TESTS

Except as otherwise provided , all materials and workmanship. If not otherwise designated by the specifications shall be subject to inspection, examination and test by the Engineer-in-Charge at any and all times during manufacture and/or construction and at any/all places

where such manufacture or construction are carried on. The Engineer-in-Charge shall have the right to reject defective material and workmanship or require its corrections. Rejected workmanship shall be satisfactorily replaced with proper material without charge thereof and the contractor shall properly segregate and remove the rejected material from the premises, if the contractor fails to proceed at once with the replacement of the rejected material and / or the construction of defective workmanship, the Engineer-in-Charge may replace such material and / or correct such workmanship and charge the cost thereof to the contractor.

The Contractor shall be liable for replacement of all defective equipment/machineries/works during the contract period including extended time and Operation and Maintenance period.

The contractor shall furnish promptly without additional charge, all facilities, labour and material necessary for the safe and convenient inspection and tests that may be required by the Engineer-in-Charge.

All inspections and tests by the department shall be performed in such a manner as not to unnecessarily delay the work.

9.0 DAMAGE TO WORKS

The works, whether fully completed or incomplete in any scheme under the cluster, all the works, materials, machinery, plants, tools, temporary buildings and other things connected there with, shall remain at the risk and in the sole charge of the contractor until whole of the completed work scheme wise under the Contract has been delivered to the Engineer-in-Charge. Until such delivery of the entire completed work the contractor shall at his own cost take all precautions reasonably to keep all the aforesaid works, materials, machinery, plants, temporary buildings and other things connected there with free from any loss or damage and in the event of the same or any part thereof being lost or damaged, he shall forth with reinstate and make good such loss or damage at his own cost. The complete system shall be insured against all possible risks.

10.0 EXAMINATION AND TESTS ON COMPLETION

On the completion of the work the Engineer-in-Charge shall make such examination and tests of the work as may then seem to him possible, necessary or desirable, and the contractor shall furnish free of cost any materials, equipments and labour which may be necessary thereof, and shall facilitate in every way all operations required by the Engineer-in- Charge, in making examination and tests.

11.0 TRIAL RUN OF PIPE LINE SYSTEM

On the completion or part completion of the work, the completed pipe line distribution system shall be subjected to trial run for 24 hours up-to 30 days or as decided by Engineer-in-Charge to locate any defect and excessive seepage, if any. The trial run shall not be deemed as commissioning of the distribution system.

12.0 HAUL ROADS

The Contractor shall have to make the work sites accessible to the departmental officers for inspection by way of constructing/maintaining all weather roads/approaches, the cost of which shall be borne by the Contractor.

13.0 LAYOUT OF CONSTRUCTION OF ROAD

The Contractor shall have to submit detailed plan to the Engineer-in-Charge showing the layout of the work site, roads and approach roads proposed by him, before he starts the actual work. Such a road layout plan will be scrutinized by the Engineer-in-Charge and any modifications suggested by him shall be binding on the contractor. If it is decided by the Engineer-in-Charge to have some of the roads proposed by the Contractor as common road for common use of department and other contractors or convenient and for compact and planned layout of work site, the Contractor will be bound to construct them and allow them to be used simultaneously by other Contractors and departments. In case of disputes, the decision of the Engineer-in-Charge shall be final and the binding on the Contractor.

- **14.0 REGULATIONS AND BYE-LAWS**

The contractor shall conform to the regulation, bye-laws, any other statutory rules made by any local Authorities or by the Government and shall protect and indemnify Government against any claim or liability arising from or based on the violation of any such laws, ordinance, regulations, orders, decrees, etc.,

- **15.0 PASSING OF FOUNDATION, CENTERING, REINFORCEMENT ETC.**

After the completion of the work of excavation, the same will be checked and passed by the competent authority. No masonry or concrete or back filling shall be laid unless the foundations are so passed. No concreting shall commence, unless the centering and the reinforcement is checked and passed by the Engineer-in-charge.

- **16.0 SIGNING FIELD BOOKS, LONGITUDINAL SECTIONS, CROSS- SECTIONS AND MEASUREMENT BOOKS**

Before starting the work, and at the end before the work is covered, levels for plotting the longitudinal sections (along the axis as decided by Engineer-in-Charge or his authorised representative) and cross section of the portion of the work shall be taken by authorised Engineer of the contractor in the presence of the Engineer-in-Charge or his authorised representative and the same shall have to be got attested from the Engineer-in-Charge or his authorised representative in token of acceptance.

If the contractor fails to take measurements and sign them, then the measurements recorded by the Engineer-in-charge, or his authorized representative in the authorised books shall be final and binding on the contractor. For this purpose, suitable date or dates shall be fixed by the Engineer-in-Charge and intimated to the contractor. If the contractor, or his duly – authorised agent fails to attend on the appointed date or dates, the levels and measurements shall be taken in his absence and such levels and measurements and longitudinal sections and cross sections based there on shall be final and binding on the Contractor. The levels will be taken on such alignments and cross sections as will be useful for reference permanently. The point of the locations for the levels will depend upon the roughness of the area and will also be at least in conformity with the requirement of specifications for “Excavation” as for as possible.

Similar procedure for record of measurements shall hold good for all other items and activities involved in execution of the work. All the levels/measurements shall be recorded by the Engineer-in-Charge or his authorised representatives in the authorised level / measurement books.

- **17.0 QUALITY CONTROL**

The contractor shall produce results of quality control tests carried out on the works by his staff and the quality audit conducted by the department or by Engineer's Representative on these works. If the test result do not fulfil the stipulated criteria laid down in specifications the payment will be limited as per the provisions in the specification(s) and if number of results fail beyond the limit of acceptance, then the contractor shall not be paid unless he rectified all such imperfect work(s). The decision of the Engineer-in-Charge in respect of the matters pertaining to the quality control shall be final and binding on the Contractor.

- **18.0 CLEANING UP**

a) The Contractor shall at all time keep the construction areas and his colony and storage free from accumulation of waste or rejected materials.

b) Prior to the completion of the work, the Contractor shall remove all rubbish from and around the premises and all tools, scaffolding equipment and material which are

not part of permanent structures executed or otherwise asked for or as provided under any other Clauses of this contract. The premises will be left in a manner fully satisfactory to the Engineer-in-Charge.

- **19.0 COMPENSATION FOR DELAY BY DEPARTMENT IN APPROVAL OF DESIGN DRAWING**

The contractor shall not be entitled to claim any compensation from department for the loss suffered by him on account of delay by department in approval of alignment, designs & drawings. However this may be considered for grant of time extension.

- **20.0 WORKS TO BE EXECUTED IN ACCORDANCE WITH SPECIFICATIONS, DRAWINGS, ORDERS ETC.,**

The Contractor shall execute the whole and every part of the work in the most substantial and workmen like manner and both as regards materials and otherwise in every respect in strict accordance with specifications. The Contractor shall also confirm exactly, fully and faithfully to the designs, drawings and instructions in writing relating to the work signed by the Engineer or Engineer-in-Charge and lodged in his office, and to which the contractor shall be entitled to have access at such office or on the site of the work for the purpose of inspection during office hours, and the contractor shall, if he so requires, be entitled at his own expense to make or cause to be made copies of specifications and of all such designs, drawings and instructions as aforesaid.

- **21.0 ALTERATIONS IN SPECIFICATIONS AND DESIGNS**

All the Executive Engineers connected with work shall have power to make any alterations in, or omissions from, addition to, or substitutions for the original specifications and approved drawings, designs and instructions that may appear to him to be necessary or advisable during the progress of the work and the contractor shall be bound to carry out the work in accordance with any such instruction which may be given to him in writing signed by the Executive Engineer or Engineer-in-Charge and such alterations omissions, additions or substitutions shall not invalidate the contract and any altered, additional or substituted work, which the contractor may be directed to do in the manner above specified as part of the work, shall be carried out by the contractor on the same conditions, in all respects on which he agreed to do the main work and at the same contract cost.

- **22.0 TIME LIMIT FOR UNFORESEEN CLAIMS**

Under no circumstances whatsoever, shall the Contractor be entitled to any compensation from Government on any account unless the Contractor shall have submitted claim in writing to the Engineer-in-Charge within one month of cause of such claim occurring.

- **23.0 RECOVERY OF DUES FROM THE CONTRACTOR**

Whenever any claim, against the Contractor for the payment of a sum of money arises out of or under the Contract. Government shall be entitled to recover such sum by appropriating, in part or whole, the Security deposit and performance security deposit of the Contractor and to sell any Government promissory notes etc., forming the whole or part of such security. In the event of the security being insufficient or if no security has been taken from the Contractor, then the balance or the total sum recoverable, as the case may be, shall be deducted from any sum then due or which at any time thereafter may become due to the Contractor under this or any other contract with Government. Should this sum be not sufficient to cover the full amount recoverable from the Contractor ***then it shall be recovered from him as arrears of land revenue.***

- **24.0 WORKS TO BE OPEN FOR INSPECTION**

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 Engineer-in-Charge 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 Engineer-in-Charge or his subordinate to visit the work shall have been given to the contractor, either he himself be present to receive orders and instructions, or have a responsible agent duly accredited in writing, present for that purpose. Orders given to the contractor's agent shall be considered to have the same force as if they had been given to the contractor himself.

- **25.0 NOTICE TO BE GIVEN BEFORE WORK IS COVERED UP**

The contractor shall give not less than fifteen days notice in writing to the Engineer-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 verified/checked and correct dimensions thereof be taken before the same is so covered up or placed beyond the reach of verification/checking of any work without the consent in writing of the Engineer-in-Charge of the work, and if any work shall be covered up or placed beyond the reach of verification/checking without such notice having been given or consent obtained, the same shall be uncovered at the contractor's expense or in default thereof, no payment or allowance shall be made for such work or materials with which the same was executed.

- **26.0 CONTRACTOR TO SUPPLY PLANT, LADDERS, SCAFFOLDING ETC.**

The contractor shall supply at his own cost materials, plant, tools appliances, implements, tackle, scaffolding and temporary works requisite for the proper execution of the work, whether original, altered or substituted and whether included in the specifications or other documents forming part of the contract or referred to in these conditions or not, or which may be necessary for the purpose of satisfying or complying with the requirements of the Engineer-in-Charge as to any matter as to which under these conditions he is entitled to be satisfied, or which he is entitled to require together with carriage to and from the work. The contractor shall also supply without charge the requisite number of persons with the means

and materials necessary for the purpose of setting out works and counting, weighing & assisting in the checking measurement or examinations at any time and from time to time of the work or materials. Failing his so doing, the same may be provided by the Engineer-in-Charge at the expense of the contractor and the expenses may be deducted from any money due to the contractor under the contract, or from his security deposit or the proceeds of sale thereof, or of a sufficient portion thereof. Contractor is liable for damages arising from non provisions of lights, fencing etc., The contractor shall also provide at his own cost, except when the contract specifically provided other wise and except, for payment due, all necessary fencing and lights required to protect the public from accidents, and shall be bound to bear the expenses or 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 be paid to compromise any claim by any such person.

27.0 AUDIT AND TECHNICAL EXAMINATIONS:

Government shall have the right to cause any audit and technical examination of the works and the final bills of the Contractor including all supporting vouchers, abstracts etc to be made after payment of the final bill and if as a result of such audit and technical examinations any sum is found to have been overpaid in respect of any work done by the contractor under the contract or any work claimed by him to have been done by him under the contract and found not to have been executed, the contractor shall be liable to refund the amount of overpayment and it shall be lawful for Government to recover the same from him in the manner prescribed in clause "Recovery of dues from contractor" and if it is found that the contractor was paid less than what was due to him under the contract in respect of any work executed by him under it, the amount of such under payment shall be duly paid by Government to the contractor. Provided that Govt. shall not be entitled to recover any sum overpaid, nor the Contractor shall be entitled to payment of any sum paid short where such payment has been agreed upon between the Engineer-in-Charge on one hand and the Contractor on the other hand under any terms of the Contract, permitting payment for work after assessment by the Engineer-in-Charge.

- **28.0 PERMISSION FOR CROSSING RAILWAY, NH/SH/ROADS/CANALS/PIPE LINES ETC.**

The works of the pipe line systems is likely to have several crossings for Railway, State Highway, Other Roads, other pipelines etc., and as such necessary letter to grant the permission for crossing those premises shall be issued by the respective authorities to the Engineer-in- Charge. The contractor will have to process, follow-up and obtain timely clearance from the concerned authorities. ***Statutory costs of those crossings will be paid by the Government or will be reimbursed to the contractor if paid by him on production of receipt.***

- **29.0 LAND ACQUISITIONS**

a) Processing of land acquisition – After the alignments are finalised, the contractor with the help of Engineer-in-Charge of the work shall start the process of land acquisition. As such the Engineer-in-Charge will submit necessary proposals to the respective authority. However preparing proposals and futher follow up for timely acquisition is to be done\watched by the contractor.

b) For any private land, Govt. land and property, required for this work, the process of Land and property acquisitions is to be carried out by the contractor with the help of department. Necessary proposals\letters to concern department will be given by the Engineer in charge, further follow-up for timely acquisition is to be done\watched by the contractor. Except cost of temporary land acquisition or early mutually agreed acquisition of land and crop compensation, the department shall make payments for acquiring permanent land and property as per Odisha LA Act & Rules. The contractor shall pay cost of temporary land acquisition and crop compensation, if any. Pursuing the land and property acquisition cases, getting the award\approval from competent authority, within the time shall be the whole responsibility of the contractor, the land required for construction before award will be arranged by the contractor to ensure timely completion of the scheme for which no claim shall be entertained from the contractor. No cost compensation shall be allowed for delay in LA.

c) Acquiring of forest land is to be avoided while planning & designing of the system. However in unavoidable cases if permission is required to use any such forest land, it shall be the responsibility of the contractor. The case of such proposals shall be forwarded by the contractor through the Engineer-in-Charge to the competent authority and the contractor shall submit all documents and reports and pursue for approval. The department shall make payment only for the cost of forest land acquisition as per the Forest authority requisitions. All other cost shall be borne by the contractor.

d) Cost of land acquisition as per Land Acquisition Act and Statutory Charges for obtaining the clearance of ROW/ROU from other Govt/semi govt/corporate bodies shall be borne by Govt. Time extension for delay in land acquisition shall be considered by Govt. as per rule on its merit by the competent authority. Liquidated damages shall not be imposed if the delay is not attributable to the contractor and the revised milestone is approved by the competent authority.

- **USE OF SITE**

a) All land required for use of Contractor facility shall be arranged by the Contractor from private land owner/revenue department at his own cost and no claim on this account shall be entertained.

b) All areas of operation including those of his staff and labour colonies in case handed over to the contractor by department shall be cleared and handed over back in good condition to the Engineer-in-Charge except the areas under works constructed. The Contractor shall make good to the satisfaction of the Engineer-in-Charge any damage or alterations made to areas which he has to hand over back or to other property or land handed over to him for the purpose of this work.

c) The lands shall as herein before mentioned be handed over back to the Engineer-in-charge immediately after completion of the work under this contract or the termination of the contract whichever is earlier. Also no land shall be held by the Contractor longer than the Engineer-in- Charge shall deem necessary and the Contractor shall on due notice by the Engineer-in-Charge vacate and return the land which the Engineer- in-Charge may certify as no longer required by the Contractor for the purpose of the works. In case the lands are not handed over back to the department within the time limit specified above, penal rent as may be decided by the Engineer-in-Charge will be recovered from the contractor.

d) The vegetation and forest is noticeable in project area. The Contractor should take utmost care for the preservation of this vegetation and forest. Any damage in this vegetation and forest will have to be compensated by the Contractor and decision of Engineer-in-Charge will be final and binding on Contractor.

- **30.0 WATER USER ASSOCIATION (PANI PANCHAYAT)**

30.1 The Contractor shall prepare Command Area maps on the village maps for minor, sub-minor, system wise, with due demarcation of area of WUA with territorial areas on basis of hydraulic boundary.

30.2 The Contractor shall collect name of cultivators, their area under command area as per revenue records and prepare Voter's List of WUA/territorial constituency wise as per the OdishaPaniPanchayat Act & Rules.

30.3 The Department will take responsibility in conducting PaniPanchayat election and formation of PaniPanchayat under prevailing Act & Rules. The election process for the PaniPanchayat office bearers will be conducted/taken up by the Department with the support of WALMI and / or any other Government Institution / Private entity having experience of PaniPanchayat Activities and cost of which will be borne by the Department . Engagement of WALMI or any other institution for the purpose will be as per Government norms. The agency has to take responsibility to impart proper training for operation & Maintenance for the above UGPL system for the above command area of the project & the cost involved for this purpose shall be borne by the agency up to 5 years or five kharif/ five Rabi season beyond the commissioning of the system. The agency will take the support of WALMI for training for operation and Maintenance with the norms and specification as approved by Government from time to time (CAD-PIM Directorate)

- **31.0 OTHER SPECIAL CONDITIONS**

In order to check the accuracy of the investigation work the equipment, labour, required transport and other materials etc., at site of work have to be supplied to the Engineer's Representative without extra cost.

31.1 Cultivator wise register for outlets at 1.0 ha Chalk level with hydraulic particulars has to be prepared and maintained.

31.2 No extra payment will be made to the bidder if there is any change in type of structure, specifications, variation in quantities as per actual site conditions.

31.3 Display Boards should be displayed of size 1.2m x 1.00m on Rising main/Pressure main at change of reaches, off- take structures, road crossing or where ever necessary or by engraving on the structure with enamel painting. Boards / direction boards should also be displayed to facilitate for inspection both at investigation and execution stages.

During soil exploration by drilling boreholes for foundations, the contractor shall take required no. of Un-disturbed Samples and normal samples and obtain soil classification soil properties and bearing capacity by getting them tested in the soil testing laboratories of Government Labs/Engineering Colleges or other reputed institutes. The contractor shall provide certain U.D. Samples and normal samples to the Engineer-in-Charge also so as to get them tested parallel at any other lab to be

selected by the Engineer-in- Charge, if required. The cost of such testing shall be borne by the Contractor.

31.4 The Contractor shall furnish draft reports on design Engineering, drawings, in six copies and soft copy in CD for obtaining the approval of the competent authority. After approval the contractor shall furnish 11 copies of booklets and 1 soft copy in C.D. for record of the department at his cost and no separate payment will be made towards this.

The contractor shall furnish 12 (twelve) copies of Land plan schedules and Land acquisition proposals for obtaining approval of competent authorities.

The contractor shall fix enamel-coated metallic measuring gauges both on U/s and D/s side of all the structures and at suitable locations as suggested by the Engineer-in- Charge. (See clause 6.0 Appendix D&E)

31.5 The Contractor shall provide and fix chain age cum boundary stone of standard design at a interval of 30 meter along the Rising main/Pressure main, distributaries and minors/sub-minors, 0.2 km of Kilometre stones of standard design along all roads and cost thereof is deemed to be included in the quoted contract price.

Construction of approach road if required for connecting to the nearest service road. The bidder is to assess the length of road from field verification. The section of the road is to be followed as per the site condition and IRC standards for meeting the requirements of pumping station which will be approved by the employer.

31.6 Catch drains are to be provided wherever necessary to facilitate drainage all along the pipe lines within the scope of the contract at no extra cost.

31.7 All the crossings of pipe line system of State Highways, District Roads, Village roads and all other roads/ Cart tracks shall be provided with suitable bridges as per standards of the respective departments and as per the permissions granted by them. The approaches to these bridges shall be provided as per the standard of their respective departments. The cost of these bridges shall be deemed to have been included in the contract price quoted.

31.8 Wherever the pipe line system is crossing Railway line, the contractor has to prepare necessary proposals for seeking permissions of Railway authorities. The Engineer-in-Chargewillprocesssuchproposalstotherailwayauthoritiesconcernedfortakingup the work by the masa deposit work duly paying the amount demanded by the railway authorities by the Dept and shall be recovered from the next running bill of the Contractor. The Contractor shall include such cost in the bid price. The contractor is to process for all permissions. Statutory charges will be borne by Department. Delay in getting the permissions will be suitably considered on merit while giving time extension. No other compensation shall be paid. Only the statutory charges shall be paid by Govt. The cost of works shall be borne by contractor. Application for permission is to be made only after the approval of Planning and Designs made by the contractor based on detailed survey.

31.9 If the proposed pipe line system is crossing any existing irrigation canals or channels, supply channels or Sources / Streams to Minor Irrigation tanks, suitable structures are to be provided within the quoted contract price by the contractor.

31.10 If the pipe line system is crossing oil pipe lines, gas pipe lines, water supply pipeline, or any other pipe lines, the contractor shall provide suitable crossing in consultation with the authorities concerned after obtaining the approval either by himself or getting them executed by the concerned authorities as a deposit work duly depositing the requisite amount to them. The Engineer-in-Charge will help in processing the proposals to the authorities concerned to obtain their permission. The cost of such crossings shall be deemed to be included in the contract price.

Diversion of streams that are crossing the proposed pipe line system into nearby stream(s) is not permitted in general. However in exceptional cases, the Engineer-in-Charge may consider such proposals depending upon their feasibility, if the distance between them is not much (i.e., less than 200 m) and also if such diversion will not affect the riparian rights of existing or contemplated sources on D/s side.

R.R. Masonry / CR Masonry / Brick Masonry Structures shall not be permitted.

31.11 The contractor has to make his own arrangement for diversion of flow and dewatering of foundation etc. wherever necessary within the quoted contract price.

31.12 The concrete mixes to be adopted for all the structures shall be design mixes only and these design mixes shall be conducted in the reputed laboratories and got approved by the Engineer-in-Charge before adoption.

31.13 In case of pipe line crossing works, drainage works, the contractor shall excavate necessary approach/ Tail channels to these structures to have smooth drainage through the structure. The cost of excavation of such channels shall be borne by the Contractor within quoted contract price. The cost of Land Acquisition for such channels will be borne by the department.

31.14 Operation Schedule for the opening and closing of valves, multiple outlets of the distribution system is to be provided by the contractor. It should be such that it can be adopted easily by the WUA.

Plantation of selected trees with tree guards of two meter height of brick masonry at an interval of 5 meter on sides of approach road and at selected places as decided by the Engineer-in-Charge shall be carried out. The Contract price quoted by the Contractor shall include all these items.

31.15 Milestone to be finalized by Competent Authority after receipt of work programme from the Agency.

i. A tentative work programme with approximate quantity with showing the general methods, arrangements and timing for all the activities in the Works along monthly cashflow forecast should be furnished by the Agency within 15 days of the signing of the contract with respect to preliminary general arrangement drawing (GAD).
ii. If the Agency fails to furnish the tentative work programme with approximate quantity, within 15 days of the signing of the contract, the Engineer-in-Charge may withhold the amount of 1% of the contract value from the next payment certificate and continue to withhold this amount until the next payment after the date on which the over due Programme has been submitted. However, no interest whatsoever shall be payable on such withheld amount.
iii. However, the revised work programme with exact quantity should be furnished by the Agency within 15 days of approval of drawing and design and such work programme necessary to ensure

completion of the works within the time for completion. The revised work programme should be realistic adhering to the milestone of the work.

iv. If the Agency fails to furnish the revised work programme with exact quantity, within 15 days of approval of drawing and design, the Engineer-in-Charge may withhold the amount of 1% of the contract value from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Programme has been submitted. However, no interest whatsoever shall be payable on such withheld amount.

v. If the Agency further fails to furnish the revised work programme with exact quantity, within 3 (Three) months of approval of drawing and design, it will attract the clause (c) & (d) of Codal Provisions of Blacklisting Contractors Appendix-XXXIV of Vol-II, OPWD Code,Vol-II. This may be treated as an important condition of contract.

Codal Provisions for Blacklisting Contractors:

(c)Constant non-achievement of milestones on insufficient and imaginary grounds and non-adherence to quality specifications despite being pointed out.

(d)Persistent and intentional violation of important conditions of contract.

- **32.0 MODERN TECHNOLOGY**

The Contractor should adopt the latest/modern methodologies and State of Art Techniques in the investigation, planning, design of pipeline distribution system, structures, better water management etc. and also construction, measuring devices, operation and maintenance, monitoring mechanism using computers/RTU/SCADA up to 1 Ha.

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SECTION VI

CONDITIONS OF CONTRACT FOR OPERATION & MAINTENANCE

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CONDITIONS OF CONTRACT FOR OPERATION & MAINTENANCE

1.0 INTRODUCTION:

After completion and commissioning of the UGPL irrigation System, the Agency shall be responsible for the operation and maintenance of the system for a period of five years or five Kharif/five Rabi crop seasons whichever is later from the date of issue of commissioning certificate of the system, under the Agreement for O&M of the UGPL irrigation System. The Agency shall be responsible for the operation & maintenance of all components of the project including associated works in accordance with prudent utility practice&PIM activities. The O&M contract will overlap with the defect liability period of five calendar years or five Kharif/ five Rabi crop seasons from the certified date of commissioning of the system whichever is later.

The UGPL irrigation System is primarily aimed for supplementation of Kharif water demand. Normally the Kharif water supply starts after 15th July and ends by 31st October& each year depending on water availability and rainfall. Rabi Irrigation starts from 15th December to 30th April and shall be provided only on availability of water and Rabi crop planning duly approved by competentauthority.

2.0 ADMINISTRATIVE PROVISIONS:

The following additional clauses shall apply during the Operation & Maintenance period.

DEFINITIONS :

In this Agreement the following words and expressions shall have the meanings hereby assigned to them, except where the context otherwise requires:

1. "Operation and Maintenance" shall mean O&M of the whole system and delivery of water to the 1Hasub-chak of the command area&PIM activities.
2. "Operation and Maintenance period" shall mean five years or five Kharif /five Rabi crop seasons whichever is more from the certified date of commissioning of the UGPL irrigation system.
3. "Contract" shall mean the agreement between the Employer and the Agency along with all documents incorporated therein by reference and all documents incorporated by these Conditions of Contract.
4. "Agency's Equipment" shall mean all equipment, instruments, tools, machinery and other appliances and things of whatsoever nature required for the fulfillment of the Contract or of the Agency's Obligations, but not including those items which are intended to form, or which form part of the Facility.
5. "Agency's Obligations" shall mean the obligation to execute the Project in its entirety and shall, without limitation, include the Agency's Operation and Maintenance.
6. "Date of Taking Over" shall mean the date of Successful Completion of operation & maintenance period as per agreement clause and taking over of the entire work & process by Department.
7. "Defects Liability Period" shall mean the Defects Liability Period of FIVE years for all works commencing on and from Date of commissioning of system including satisfactorily passing tests on completion during which the Agency shall undertake the responsibilities, and have the liability for the facility.
8. "Facility" shall mean the entire system to be designed and constructed in accordance with the provisions hereof, including the structures, ramps, pits, pipes, fencing, lighting, testing and analysis equipment, tools, computers, software programs, safety equipment, plant machinery, supplies, instruments and inventory incorporated therein, as well as all open areas within the site, and including any

additions, modifications, alterations, replacement and repairs as may be made thereto from time to time.

9. "Governmental Authority" shall mean any Indian entity, authority or body exercising executive, legislative, judicial, regulatory or administrative functions, including, without limitation, any government authority, agency, department, board, commission or instrumentality of Indian or any political subdivision thereof, court and tribunal.
10. "Law" shall mean and include all the provisions of all Indian statutes, regulations, ordinances, codes, official or other standards, administrative or other rules, zoning and other plans and restrictions, building and other permits, judgments awards and decrees of, or agreements with any Governmental, semi-Governmental or quasi-Governmental Authority as currently in effect or as may be in effect from time to time and /or as may be amended or supplemented from time to time.
11. "Maintenance Standard" shall mean the requirements for operating, maintaining, repairing, and renewing the Facility:
    i. As set forth in the O & M Manual; bidder shall furnish this before commissioning of scheme.
    ii. Required pursuant to applicable Law;
    iii. As may be necessary for keeping the facility in a satisfactory condition such that the Facility will continuously, comply with the Operation Standard; and
    iv. As may be necessary to ensure that the Facility shall continuously be in an optimum condition and state in relation with the lifetime of the Facility.
12. "O&M Manual" shall mean the final Manual for the Operation and Maintenance of the entire system of pumping schemes to be prepared in accordance with the Bid Documents.
13. "Operation and Maintenance Obligations" shall mean the obligation of the Agency pursuant to the Agreement to operate and maintain the Facility on and from the Date of commissioning of the system until the date of completion of this Agreement.
14. "Operation and Maintenance Price" shall mean the amount payable by the Employer to the Agency, for the fulfillment of the Agency's Operation and Maintenance Obligations. This price is the price derived from the Break of the bid Amount of the contract document.20% of the total O & M cost shall be considered as cost of PIM
15. "Operation Standard" shall mean: a) The Performance Guarantees; b) All applicable Laws; c) All of the requirements, policies and procedures set forth in the O & M Manual d) All other operational requirements set forth in this Agreement.
16. "Site" shall mean that specific area specified in the Bid Documents and shall include any other places as may be specifically designated by the Employer from time to time as forming part of the Site.

2.1 SCOPE OF SERVICES

A. The scope of services during defects liability period of five years after the certified date of commissioning of the system.

2.1.1 During the defect liability period, the agency will have to bear additional responsibility in addition to normal O & M as defined under clause 2.1. B below.

2.1.2 The responsibility of the agency during defect liability period will be at par with other general contracts.

2.1.3 During the defect liability period the soundness, longevity, performance and defects will be under scrutiny and observation & any defects noticed

will be repaired, replaced and brought to perfect running condition by the agency at his own cost as per the direction of the Engineer-in-charge. This responsibility will be in addition to the O & M operation as envisaged in the agreement.

B. The duties and responsibility of the agency under the O & M agreement will be as under.

2.1.4 To maintain the UGPL canal system & CAD network including its structures, valves, turnouts.

2.1.5 To provide all services necessary to maintain the project efficiently, maximize the availability of the project, optimize the useful life of the project etc. to maintain the system efficiently.

2.1.6 To provide requisite numbers of qualified (and if required licensed) personnel to perform the services.

2.1.7 To carryout maintenance of the total water conductor system including distribution pipeline and carryout repair and preventive maintenance in accordance with the recommendations of the employer.

2.1.8 To carry out any maintenance or repairs or rectification work in case of any problem or emergency that may arise while the system is in operation during the maintenance period of five years or five Kharif / five Rabi crop seasons whichever is later as directed by the employer/ Engineer-in-Charge

2.1.9 To provide technical and other assistance to the employer, for managing operational and maintenance problems.

2.1.10 Maintain all roads, yards, walkways, housekeeping and security of the project.

2.1.11 Operation and Maintenance Schedule needs improvement for better performance.

2.1.12 To prepare Annual Operation Plan and submit to the Employer for approval.

3.0 OBJECTIVES OF CONTRACT

3.1 Risks and Obligation of the Agency

For the duration of O&M period of 5(five) years or five khariff/five Rabi season crops, Agency shall render and make available to the Employer the following services:

i. Preparation of Operation & Maintenance manual covering the water supply schedule to be furnished prior to commissioning of the system.

ii. Preparation of training manual for training of the staff and the Department & Pani Panchayat to be furnished prior to commissioning of the system.

iii. To provide equipments, tools & plant, spares required for smooth Operation & Maintenance list to be furnished along with the Bid.

iv. To provide deployment schedule of personnel to be employed by the agency for Operation & Maintenance to be furnished along with the Bid.

v. Control and Operation of UGPL irrigation system.

vi. Maintenance of all components of the UGPL system.

vii. Supply of water to the requirements of crops as per the Operation & Maintenance manual & water supply schedule of the crop seasons every year.

viii. Developing MIS for management of the scheme and furnishing it before commissioning of the system.

The Agency shall take full responsibility for the care of the Facility and materials of the project from the date of commissioning of the system until the date of completion of the Operation and Maintenance period, when the responsibility for the care shall pass to the Employer.

If any loss or damage happens to the Facility, or any part thereof, or materials for incorporation therein, during the period for which the Agency is responsible for the care thereof, from any cause whatsoever, other than the risks defined in Sub-Clause of Risks and obligation of the employer, the Agency shall, at his own cost, rectify such loss or damage so that the Facility conform in every respect with the provisions of the Contract to the satisfaction of the Employer. The Agency shall also be liable for any loss or damage to the Works occasioned by him in the course of any operations carried out by him for the purpose of complying with his obligation under Sub-Clause Risks and Obligation of the Agency.

3.2 Risks and Obligation of the Employer

In case of non availability of sufficient quantum of water in the reservoir the Engineer-in-Charge and the Employer will revise the water drawl program which shall be followed by the agency and the agency shall not be held responsible for the water availability and consequent less coverage of command area during Operation & Maintenance period.

4.0 COMMENCEMENT AND DURATION OF O&M:

The trial & commissioning of the system shall be taken up as per relevant conditions of contract. Should the Engineer-in-Charge wish to propose an extension to the O & M Period, he will give 180 days prior notice of its intention to exercise such option. Extension of the O&M Period would involve a negotiated revision to the Terms and Conditions of the Agreement. The decision of theGovernment/ Departmentshall be final whether to extend or not the O & M period.

5.0 MAINTENANCE PERSONNEL

The Agency shall deploy experienced personnel for maintenance of the UGPL System. The deployment schedule indicating the number of the Managers, Supervisors, Helpers/Fitters, Mechanics, & other support staff etc. for O&M of the system as a whole in general, responsibility assigned to each of them shall be furnished along with the bid. For effective O&M, local people of the villages preferably PaniPanchayat representatives of the command area may be selected by the agency and are to be trained during the construction stage for their deployment during the O&M period. The bio-data of all O&M personnel shall be provided to Engineer-in-charge before commencement of operation and maintenance for approval.

Additional staff required for smooth and efficient operation of the system is to be deployed by the agency as per requirement for which no extra payment will be admissible.

All Agency's personnel employed at the work site at any time during the period covered by the present Contract will be provided by him. The Employer is not liable for personnel in any way and cannot be held responsible in the event of litigation of any sort between the Agency and members engaged by him. All decisions related to staff numbers and qualifications should be approved by the Employer. The Agency undertakes to comply with applicable legislation and the code of labour law on matters of health, hygiene and safety, and shall assume responsibility for works required in the event of any change in applicable regulations.

6.0 RIGHT TO PERFORM UPON AGENCY'S DEFAULT

If at any time, the Agency fails to perform and such failure is likely to cause injury to any person or damage to the project, the Employer may, but shall have no obligation to, perform any such obligation of the agency. The cost to the Employer of affecting such performance would be deducted from the payment due to the Agency.

No extra payment shall be made for operation and maintenance services during the maintenance period and shall be deemed to be included in the quoted contract price.

7.0 ACCEPTANCE TESTS ON COMPLETION OF MAINTENANCE PERIOD

Upon completion of prescribed maintenance period, the acceptance tests shall be carried out before the project is taken over by the Employer. These acceptance tests shall be identical to the tests conducted during commissioning of the project.

The Contractor shall also make available the proof that maintenance of total system was carried out during operation & maintenance period in accordance with the maintenance schedule & O&M manual.

8.0 FORCE MAJEURE

"Force Majeure" means an event beyond the control of the Employer and the Agency, which makes it impossible or illegal for a party to perform, including but not limited to:

i) Act of God
ii) War, hostilities (whether war be declared or not), invasion, act of foreign enemies, mobilisation, requisition, or embargo;
iii) Rebellion, revolution, insurrection, or military or usurped power, or civil war
iv) Contamination by radioactivity from any nuclear fuel or from any nuclear waste from the combustion of nuclear fuel, radioactive toxic explosive, or other hazardous properties of any explosive nuclear assembly or nuclear component of such assembly
v) Riots, commotion or disorder, unless solely restricted to employees of the Agency or of his Sub-agencies.

If either party is prevented from or delayed in performing any of his obligations under the Contract by any circumstances of Force Majeure, then he shall notify the other party thereof within seven days, and specify how these circumstances are detrimental in the performance of the Contract.

If the performance of the operation is substantially disrupted for a continuous period of three months by virtue of any event of Force Majeure, then either party may by written notice to the other terminate the Contract. The provisions of Clause 3 shall apply to such termination as for indemnification.

The Employer will indemnify the Agency against all additional costs incurred as a result of the performance of the operation during circumstances of Force Majeure, as well as for the consequences of the termination resulting there from.

9.0 ASSIGNMENT

The Agency will not be entitled to sub-contract any part of his obligation to any third party under any circumstances.

10.0 LIABILITY

The Agency will not under any circumstances be liable for costs or loss of profit that the Employer may incur as a result of the unavailability of the plant on account of force majeure.

11.0 INSURANCE

The Agency shall, without limiting his or the Employer's obligations and responsibilities insure:

a. The works, together with materials and Plant for incorporation therein, to the full replacement cost (term "cost" in this context shall include profit).
b. The Agency's Equipment and other things brought onto the site by the Agency, for a sum sufficient to provide for their replacement at the site.

The insurance detailed above shall be in the joint names of the Agency and the Employer at the Agency's cost and shall cover the Employer and the Agency against all loss or damage

from whatsoever cause arising, other than as provided in Clause of Risks & Obligations, from the start of the operation and maintenance until the date of completion of operation and maintenance in respect of the Facility or any Section or part thereof as the case may be.

Any amounts not insured or not recovered from the insurers shall be borne by the Agency in accordance with their responsibilities.

The Agency shall, except if and so far as the Contract provides otherwise, indemnify the Employer against all losses and claims in respect of:

a. Death of or injury to any person, or,
b. Loss of or damage to any property (other than the works),

Which may arise out of in consequent of the Operation and Maintenance of the Facility and the remedying of any defects therein, and against all claims proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto, subject to the exceptions defined in Sub-Clause Risks and Obligation of the Employer.

The "exceptions" referred to in Sub-Clause 1.2 is:

a. The permanent use or occupation of land by the works, or any part thereof.
b. The right of the Employer to execute the Works, or any part thereof, on, over, under, in or through any land,

12.0 MAINTENANCE

The Agency shall be responsible for maintenance of each components of UGPL network along with related civil structures, off takes structures, turn out structures, valves etc. within the limits of his scope of work, under this Contract.

13.0 PERFORMANCE STANDARDS

The Agency will operate and maintain in a state of continuous operational readiness all UGPL irrigation systems to meet the flow requirements. It shall remain the Agency's responsibility to ensure that UGPL systems are at all times able to operate to the maximum capacity.

14.0 CONSUMABLES AND UTILITY SERVICES - SPARE PARTS –STORES

14.1 Consumables and Utility Services

Unless stipulated otherwise elsewhere in the document, for the duration of the O&M period, the Agency will be responsible for the supply and control of all spare parts and consumable materials necessary for the continuous operation of the works.

14.2 Spare Parts and Stores

The agency is to furnish the list of spare parts for use during O&M period of the system along with the bid. The list shall be approved by the Engineer-in-Charge before commencement of O & M period and this shall be binding on both the parties.

The store's inventory, the issuing and recording of spare parts will be the responsibility of the Agency and shall be verified by the Engineer-in-Charge quarterly.

The Agency is also responsible for providing spare parts and material required for the operation and maintenance during the operation period, and shall bear the cost for the same, including the cost of storing and safeguarding.

The Agency will make all necessary arrangements to ensure the continuous supply of spare parts and material for the works and the rate of supply of these materials shall be in such quantities and amounts as would ensure uninterrupted operation.

Any spare parts used during the O&M period shall be replaced by purchasing new spare parts and total set of spare parts shall be handed over to the Engineer-in-Charge after completion of 5 years maintenance period / extended O & M period if any.

14.3 Miscellaneous Equipment

14.3.1 Workshop Equipment

All the necessary and required workshop equipment for the proposed project shall be supplied by the Agency under this Contract. Bidder shall give a comprehensive list of the same.

15.0 INSPECTION

15.1 General Provisions

The Employer shall check the operation of the plant or designate an organization of his choice to carry out inspections regularly. The Employer or the organization appointed by him shall check that the Agency is performing the tasks for which he is responsible with due diligence. The Agency shall at his cost provide all the assistance to the Employer requires to complete these inspections.

15.2 Measurement and Analysis

The Employer has the right to perform any analysis or inspection he deems necessary. Before any inspection, the Employer shall give a prior written notice of three days to the Agency and shall cover the costs of such action.

15.3 Documents to be provided by the Agency

15.3.1 Operation Log Book

The Agency shall keep a permanent record of water supplied in the command area on daily basis. This log book shall be kept at the site and shall be presented on request to representatives or agents approved by the Employer.

On a daily basis, the following information shall be recorded in the log book:

a. Reading from the different meters, indicators and recorders (including but not limited to consumption of energy, volume of water conveyed, operating times of the different items of equipment),

b. Computer documents and tapes produced by monitoring and surveillance equipment which shall be attached to the log book,

c. Report of visits by persons other than those of the Employer and the Contractor to the Facility.

The Contractor shall also indicate any significant modifications to the set-up characteristics of the installation, shut-downs, anomalies or incidents that have occurred with respect to operation.

15.3.2 **Monthly Report**

The monthly report shall include but not be limited to :

i. Volume of water conveyed, scheme wise.
ii. All the problem areas in the facility,
iii. The status and progress of the training programs,
iv. Electricity consumed scheme wise.

15.3.3 **Annual Report of Operation**

The Contractor shall provide the Employer by March 31 of the current year (n) with an annual report for the preceding year (n-1). This report shall include:

a. All technical statistics related to plant operation as supplied by the operation;
b. A statement of works carried out during the preceding year n-1 in

15.3.4 FINANCIAL PROVISIONS

15.4 Method of Payment

The rate quoted by the bidder for O&M shall be derived by Engineer-in-Charge in upward incremental order @10% from 1st year to 5th year at the time of agreement.

O & M cost includes cost towards normal O & M of all UGPL Projects and PIM activities. 20% of the total O & M cost shall be considered as cost of PIM. The Employer will pay the Contractor for the O&M Price on a monthly basis subjected to his delivering the stipulated water quantity to the stipulated CCA and also completion of all PIM activities during O & M period. **The payment for operation and maintenance shall be based on the year wise Breakup of the O&M cost derived by the Engineer-in-Charge in Appendix F-4(a) and F-4(b) at the time of agreement**. Payment for the last quarter towards cost of O & M and all PIM activities for that corresponding year shall be made subject to satisfactory completion of associated WUA particulars at the end of last Quarter.

Invoicing

The Contractor shall prepare and submit to the Employer an invoice at the end of every month of O & M with all documents supporting its calculations for the preceding month. The invoice shall be submitted between 1st& 5th day of the month.

The Employer shall have seven (7) calendar days from receipt of such invoice to notify in writing to the Contractor its acceptance thereof or the grounds for disputing such invoice. The Employer shall pay to the Contractor all accepted amounts.

LIQUIDATED DAMAGES FOR SUPPLY OF WATER TO MEET THE REQUIREMENT:

15.5 The agency shall ensure water supply to the command area as per crop water requirement of approved CCA of the system during O&M period. For the regular supply during the O&M period, the agency shall get the demand requirement from the Engineer-in-Charge and run the system accordingly as per the varying demand during the O&M period. Liquidated damages at the rate of 1.0 percent per day of the scheme wise O&M cost shall be levied on the agency for non supply of water as per requirement of the approved CCA due to the system deficiency and or management deficiency till the supply is restored.

15.6 In case the water supply is not restored within three days of breakdown of the water supply system, it will be treated as a system and management deficiency for the purpose of imposition of liquidated damages.

16.0 TAXES, LICENSES, PERMITS AND FEES

These shall be as per General Conditions of Contract.

17.0 TERMINATION OR FORE CLOSURE OF CONTRACT

17.1 The department may terminate the contract in event of poor performance of the agency after sufficient notice given and failure of the agency to take corrective measures to improve the O&M condition to desired level by giving 15 days' notice

17.2 The department reserves the right to foreclose the contract before its scheduled period without assigning any reason by giving 30 days' notice. The agency shall have no claim for balance period and shall peacefully handover the project to department as instructed by Engineer-in-Charge.

17.3 Payment will be made after adjustment of any dues or penalty or LIQUIDATED DAMAGES as applicable arising out of the contract.

18.0 TRAINING

This shall be as per General Conditions of Contract.

19.0 O&M MANUAL

This shall be as per General Conditions of Contract.

20.0 HANDING OVER OF SYSTEM:

The system shall be considered as separate entity for the purpose of O&M and handing over to the Engineer-in-Charge after successful completion of O&M. The system shall be handed over to the Engineer-in-Charge on completion of the stipulated O&M period as per conditions of contract.

SECTION VII

TECHNICAL SPECIFICATIONS

EXTENT OF WORK

1.0 GENERAL

THE SPECIFICATIONS CONTAINED UNDER DIFFERENT SECTIONS IN THIS DOCUMENT ARE FOR GENERAL GUIDANCE. IN CASE OF DISAGREEMENT BETWEEN THE SPECIFICATION OF THE DEPARTMENT AND STANDARD PRACTICES BEING FOLLOWED AND / OR SPECIFICATIONS NOT PROVIDED SPECIFICALLY, THEN RELEVANT SPECIFICATIONS UNDER INDIAN STANDARDS & CWC GUIDELINES SHALL PREVAIL.

This Technical Specification relates to the Planning, Design, Construction of distribution system for 467 Ha of CCA including Command Area Development (CAD) of Karadiha and Karanjia Sub-Minor off-taking from R.D. 16045m of Right Main Distributary of Deo Irrigation Project through Underground Pipeline Irrigation system (Gravity flow) in Mayurbhanj District of Odisha on EPC turnkey basis including Operation and Maintenance of complete commissioned project for 05 (five) years."; comprising work of Detailed Planning, Design, Drawing, Estimation, Preparation of ROW/ROU schedules and commissioning of the UGPL irrigation system along with CAD works and Operation & Maintenance of completed commissioned system for five years or five Khariff / five Rabi crop seasons whichever is later.

1.1 Details of works covered in the Scope of Work is as below :

(A) Detailed Engineering of each of the scheme along with Micro Irrigation compatible System conducting Survey, Investigation, Planning and component designs and preparation of estimates.

(B) Civil Works

I. MS/DI/HDPE/GRP/PSC Pipeline for Transmission of Water up to delivery chamber (optional) / Pressure main, Surge Control Devices / Water Hammer Control Devices, other appurtenances,

II. Delivery Chamber (optional) and the Irrigation Distribution Network such that Micro Irrigation System can be adopted through pipes.

(C) O & M Works for 5 years after completion

O&M for 5 yrs is Mandatory for the work construction of distribution networks including CAD works and micro irrigation system after completion.

(D) Miscellaneous Works

ROU (Right of Use)/ROW, Land acquisition processing, forest & environment & other statutory clearances.

1.1.1 Operation & Maintenance Staff For UGPL Irrigation System

The agency shall provide all the necessary operating staff and maintenance personnel to operate and maintain the works for five years Operation and Maintenance contract period under the contract. Agency will train local personnel of Pani Panchayat and engage them in the O&M so that the capacity of beneficiaries is enhanced and they become

capable to effectively manage the system. The agency shall provide a detailed proposed staffing schedule covering all categories of his staff with duties, responsibilities, qualification, experience and their salaries, etc. The staffing schedule shall be prepared on assumption that the system will be operated on a 24 hours per day basis with three equal shifts of 8 hours each for the crop calendar period. The inspection vehicles and staff required for the maintenance and operation of the pipeline shall also be considered for three equal shifts of 8 hours.

1.2 Drawings, Documents, Certificates & Manuals

The envisaged UGPL irrigation System is independent catering to command area of **467** Ha. Hence the Detailed Planning and Design Works can be taken up simultaneously.

Submission and review of Engineering Documents

1.2.1 The agency will submit within 30 days from award of contract, the following designs and drawings for review and approval of the Engineer-in-Charge generally in the sequence given below:

(a) General layout plan of the entire UGPL irrigation System on village maps

(b) General arrangement drawings for all works

(d) Structural design calculations and drawings for all works shall be prepared and signed by his authorised engineer. As far as possible drawings shall be drawn with the appropriate scale, neatly giving all the sections and details necessary for the easy understanding and smooth execution of the work.

1.2.2 After review by the department/consultant of the department, Engineer-in-Charge will convey comments, within 30 days from receipt of details from agency, which the agency shall incorporate by modifying designs and drawings accordingly.

1.2.3 In no case will design, calculations / drawings will be considered complete or acceptable, if

(a) They are not duly signed by respective Design Engineer(s).

(b) They are not thoroughly checked and duly signed in the appropriate places by the agency.

(c) Design calculations are not accompanied by supporting engineering, drawings or appropriate sketches.

(d) Design calculations are incomplete or not fulfilling the design requirements or are shabbily done or are without adequate reference, or other necessary back-up data.

(e) Any comments previously made are not incorporated on revised drawings /calculations.

1.2.4 Such unaccepted drawings / designs as described above shall be summarily rejected and agency will be informed. Agency shall arrange to resubmit the same duly checked, revised and signed within 15 days. No claim from agency for extension of time or for extra cost on this account will be entertained under any circumstances.

1.2.5 The review of civil design calculations and drawings shall be carried out only in respect of correctness of centre-to-centre distances, elevations, important / typical details, orientation and sizes of important components, general design principles and approach, adherence to requirements of the relevant IS or other statutory codes, compliance with the Technical Specifications, general or specific notes and with the requirements of good engineering practice and whether the details shown on drawings confirm to design calculations. Check for any interference and taking remedial action is the responsibility of the Agency.

1.2.6 No check will be specifically carried out by the Consultant / Engineer-in-Charge to verify arithmetical / numerical accuracy of the calculations, which shall remain entirely the Agency's responsibility, irrespective of any approval that may have been accorded thereto by the Consultant / Engineer-in-Charge.

1.2.7 All values / dimensions / elevations, etc. without supporting back-up data adopted / assumed by the agency in his calculations / drawings shall be taken by the Consultant / Department to be correct unless they are specified.

1.2.8 Approval from Engineer-in-Charge to the Agency's design or drawings shall not relieve the agency of any of his contractual obligations or liabilities under the contract or his responsibilities for correctness of dimensions, materials of construction, weights, quantities, design details, assembly, performance particulars and conformity of the suppliers with the Indian statutory laws as may be applicable, nor does it limit the Engineer-in-Charge's rights under the Contract.

1.2.9 Should it be found at any time after approval has been given by Engineer-in-Charge that any designs, drawings or documents submitted by the agency are not consistent with any design, drawings or documents submitted or approved previously or deviate from any major aspect of the Contract Document, then such alterations or additions as may be deemed necessary by the Engineer-in-Charge shall be made therein by the agency and the works carried out accordingly for which no extra payment shall be made.

1.2.10 No revision shall be made by the agency after design, drawings or documents are "approved" by the Engineer-in-Charge. In case the agency desires to incorporate any minor amendments in the "approved" drawing, he shall resubmit the same for formal approval. Agency shall not make any revision in design / drawings, which is not related to the comments conveyed by Engineer-in-Charge.

1.2.11 The design would have to be got approved from the CCE, ABP, Salapada. All compliances to the technical requirements are to be fulfilled.

1.3 Certificates

1.3.1 EPC agency shall ask manufacturer to submit the Quality Assurance Plan (QAP) for the equipment manufactured by them. The QAP will indicate clearly the tests to be carried out at manufacturer's works which will be as per I.S. Specifications and as specified in technical specifications of the tender documents. The QAP shall be approved by Employer. The Engineer-in-Charge can depute third party inspector /consultant's representative / Client representative to witness the tests as per approval given for Quality Assurance Plan and technical specifications of the equipment given in the tender.

1.3.2 Where certificates are required by the Specification or relevant Reference Standard, the original and one copy of each such certificate shall be provided by the Agency.

1.3.3 Manufacturer's and supplier's test certificates shall be submitted as soon as the tests have been completed and in any case not less than seven calendar days prior to the time that the materials represented by such certificate are needed for incorporation into the Works.

1.3.4 Certificates of test carried out during the construction or on completion of parts of the works shall be submitted within 7 days of the completion of the test.

1.4. Criteria For Design

1.4.1 INTRODUCTION

This section forms the engineering design. The content of these documents is to form the guidelines for engineering design and to provide information about other disciplines concerned.

This is technical specification summarizes the concept and relevant IS codes (Latest Revision) to be followed.

1.4.2 LIST OF DESIGN CODES AND STANDARDS

All designs shall be based on the latest Indian Standard (IS) Specifications or Codes of Practice. In case of any variation or contradiction between the provision of the IS Standards or Code and the specifications given with the submitted tender document, the provision given in the Specification shall be followed.

Some of I.S.Codesare mentioned below. During execution other relevant I.S.Codes shall be followed if necessary.

(i) Reinforcement:

IS 1786 : High strength deformed steel bars

IS 2502 : Bending and fixing of bars for concrete reinforcement

IS 5525 : Recommendation for detailing of reinforcement in concrete works

(ii) Cement and Fine & Coarse Aggregates:

IS-455 Portland slag cement

IS-1489 Part 1 Portland Pozzolana Cement (PPC) fly ash based

IS-1489 Part 2 PPC Calcined clay based

IS-8112 43 grade Ordinary Portland Cement

IS-12330 Sulphate Resisting Portland Cement

IS-12269 53 grade ordinary Portland cement

IS-383 Coarse and Fine aggregate

(iii) Miscellaneous:

IS:1172 Code of basic requirements for water supply, drainage and sanitation

SP:16 Design Aids for reinforced concrete to IS:456

SP:24 Explanatory handbook on Indian Standard Code of Practice for plain and reinforced concrete

SP:34 Handbook of concrete reinforcement & detailing (SCIP)

(iv) Pipe laying

IS-783 Pipe laying

IS-14846 Sluice valve

IS-13095 Butterfly valve

IS-14845 Air valve

IS-8008 Reducer

IS-8360 Tee

1.4.3 Design Aspect

a. Earth Pressure Load
Earth pressure for all underground structures shall be calculated using coefficients of earth pressure at rest or coefficient of active earth pressure (whichever is applicable). In addition to earth pressure a minimum surcharge load of 20 kN/sqm shall also be considered for the design of all underground structures or railway load (in case the railway track is located nearby) whichever is critical. The underground structures shall be subjected to sub surface water pressure. Calculations shall be based on the weight of the soil plus full hydrostatic pressure. The full upward pressure of water below base raft shall be taken over the entire area.

b. Hydrostatic Pressure Load
Ground water level for calculation of load shall be considered as indicted in the geotechnical report or high flood level whichever is maximum / at Finished Ground Level.

c. Impact Factor
Loads for cranes, hoists and elevators shall be taken as per IS: 875(Part 2). The minimum impact factors to be used in design shall be as follows:

d. Crane Loads
   a. For vertical force, an impact factor of 25% of the maximum static loads.

   b. A lateral crane surge of 10% of the weight of the crab plus lifted load applied at the top of crane rail acting on any one crane track rail. For frame analysis, this force shall be applied on one side of the frame at a time in either direction.

   c. A longitudinal surge of 5% of the maximum static wheel loads of the crane applied at the top of the rail.

e. Temperature Load
Expansion and contraction due to changes of temperature of materials of a structure shall be considered and adequate provisions shall be made for the effects produced (as per provision in relevant IS codes). Suitable expansion joints shall be provided in the longitudinal direction wherever necessary. The maximum distance of the expansion joint shall be as per the

provisions of IS: 800 and IS: 456 for steel and concrete structures respectively.

Coefficient of thermal expansion of steel shall be taken as per IS: 800. Coefficient of thermal expansion for concrete shall be taken as per IS: 456.

f. Vibration Loads

Vibration Loads shall mean the vibration forces caused by heavy vibrating equipment or machinery and dynamic forces caused by fluids in the normal operation. Frames, structures and foundations for machinery or equipment causing vibration shall be designed to limit vibrations to an acceptable level. It shall be designed such that whether they are independent or part of the building, it shall not only safely carry the loads for such items but also prevent resonance. Natural frequencies of frames, structures and foundations must differ by more than 20% from that of the machinery under operating conditions. While carrying out dynamic analysis of foundations/structures supporting dynamically loaded equipments, the loads indicated by vendor in his documents shall be used.

g. Soil Bearing Capacity

The agency has to assess soil bearing capacity for all works at his own cost and design the structures on the basis of data received after investigation. The soil investigation report has to be submitted to Department.

1.5 Planning, Design And Drawing

Design purpose: The Culturable Command Area for design purpose will be the area of the village/villages that can be irrigated, worked out from Revenue Record after deducting (i) Un-commandable higher lands, (ii) Pastures, (iii) fallow land iv) Gochar, v) cremation ground vi) roads, vii) devasthanam and (vi) abadi area.

The above definitions are only for guidelines and the Agency is at liberty to use and incorporate latest technology for regulating piped flow for irrigation.

1.5.1 SCOPE OF WORK :

i) Detail survey and Investigation

ii) Fixing ofPermanent/Temporary Bench Marks.

iii) Preparing a General Arrangement Plan for the system with Planning and furnishing most economical and feasible diameter of distributaries, minors & sub-minors etc. up to outlet point, preparing & obtaining approval for the most economical and feasible alignment from the Chief Engineer_____.

A. After getting approval to the alignment from the project authorities, the agency has to fix the chainage pillar at 100m interval along alignment on central line and apex stones at every deviation of alignment duly indicating apex No. and chainage.

B. Temporary Bench Marks with values should be furnished on site. Their location shall however be decided in consultation with the project authorities.

Service Area:

The entire command of the project will be subdivided into service area of 200 ha to 500 ha which will be the basic unit for allocation of water. The service area would be combined to limits of a single village. The agency is required to study Pani Panchayat Act of Odisha and study the local habits and suggest model operational plan to be implemented or to be enforced for safety of project and smooth functioning of the system.

(a) General layout plan of the entire command area on village maps

(b) Structural design calculations and drawings for all units of work shall be prepared and signed by registered structural engineer. As far as possible all structural drawings shall be drawn with the appropriate scale, neatly giving all the sections and details necessary for the easy understanding of structural details and smooth execution of the work.

1.5.2 After review by the department/consultant of the department, Engineer–in-Charge will convey comments, within 30 days from receipt of details from contractor, which the contractor shall incorporate by modifying designs and drawings accordingly.

1.5.3 In no case will design, calculations / drawings be considered complete or acceptable, if

(a) They are not duly signed by respective Architect/ Civil/ Structural Design Engineer(s).

(b) They are not thoroughly checked and duly signed in the appropriate places by contractor and Sub Contractor (if any).

(c) Design calculations are not accompanied by supporting engineering, drawings or appropriate sketches.

(d) Design calculations are incomplete or not fulfilling the design requirements or are shabbily done or are without adequate reference, or other necessary back-up data.

(e) Any comments previously made are not incorporated on revised drawings /calculations.

1.5.4 Such unaccepted drawings / designs as described above shall be summarily rejected and contractor will be informed. Contractor shall arrange to resubmit the same duly checked, revised and signed within

15 days. No claim from contractor for extension of time or for extra cost on this account will be entertained under any circumstances.

1.5.5 The review of civil design calculations and drawings shall be carried out only in respect of correctness of centre-to-centre distances, elevations, important / typical details, orientation and sizes of important members, general design principles and approach, adherence to requirements of the relevant IS or other statutory codes, compliance with the Technical Specifications, general or specific notes and with the requirements of good engineering practice and whether the details shown on drawings conform to design calculations. Check for any interference and taking remedial action is the responsibility of the Contractor.

1.5.6 No check will be specifically carried out by the Engineer–in-Charge to verify arithmetical / numerical accuracy of the calculations, which shall remain entirely the Contractor's responsibility, irrespective of any approval that may have been accorded thereto by the Engineer–in-Charge.

1.5.7 All values / dimensions / elevations, etc. without supporting back-up data adopted / assumed by the contractor in his calculations / drawings shall be taken by the Department to be incorrect unless they are specified.

1.6 Form of Drawings

1.6.1 All drawings submitted for approval shall be ISO standard size sheets, prepared on computer with Auto CAD 2012 & above. Every drawing shall have a title block in the bottom right corner showing:

Drawing Title:

Job:

Client: DEPARTMENT OF WATER RESOURCES, ODISHA, Chief Engineer_____

Consultant:

Contractor:

Drawing Number:

Revision Number:

Date:

1.6.2 Drawings / Documents

Drawings & Documents to be submitted have been outlined in the Technical Bid document .

1.6.3 Programme of Submission

The contractor shall furnish a programme for submitting all designs, drawings, and documents to Engineer-in-Charge within three weeks of award of Contract for pre -construction review. The program shall make reasonable provision for resubmission of unapproved designs, drawings and documents and for the time needed to review and transmit such designs, drawings and documents. No designs, drawings and documents will be accepted for review until the programme for submission has been approved by Engineer–in-Charge**.** The Engineer In-charge will approve / convey his comments on the submitted programme within one week from receipt of programme by him.

1.6.4 The contractor shall provide six copies of all submissions for review / approval. One copy will be returned to the contractor with comments / approval.

1.6.5 The review period of pre-construction documents shall be as per conditions of contract.

1.6.6 After approval, the contractor shall submit to Engineer-in-Charge one tracing, soft copy of design & drawings and minimum six copies of all approved drawings with the date of approval marked. Depending requirement of use in the project the contractor shall provide additional copies as requested.

1.7 Approval of Designs and Drawings

1.7.1 Approval from Engineer–in-Charge to the Contractor's design or drawings shall not relieve the contractor of any of his contractual obligations or liabilities under the Contract or his responsibilities for correctness of dimensions, materials of construction, weights, quantities, design details, performance particulars and conformity of the suppliers with the Indian statutory laws as may be applicable, nor does it limit the Engineer–in-Charge's rights under the Contract.

1.7.2 Should it be found at any time after approval has been given by Engineer–in-Charge that any designs, drawings or documents submitted by the contractor are not consistent with any design, drawings or documents submitted or approved previously or deviate from any major aspect of the Contract Document, then such alternations or additions as may be deemed necessary by the Engineer–in-Charge shall be made therein by the contractor and the works carried out accordingly for which no extra payment shall be made.

1.7.3 No revision shall be made by the contractor after design, drawings or documents are "approved" by the Engineer–in-Charge. In case the contractor desires to incorporate any minor amendments in the

"approved" drawing, he shall resubmit the same for formal approval. Contractor shall not make any revision in design / drawings, which is not related to the comments conveyed by Engineer–in-Charge.

1.7.4 The design would have to be got approved from department & authorized agencies. All compliance of technical requirements is to be fulfilled.

2.0 SURVEY, INVESTIGATION, PLANNING, DESIGN AND DRAWING

2.1 DEFINITIONS:

Definitions of most of the terms used in the Contract document are as follows:-

A. RISING MAIN: Main pipe line taking off from the Main canal for carrying water to the delivery chamber(optional). If delivery chamber is not provided, then the Rising Main should be considered up to the last off taking of Distributary/Minor.
B. PRESSURE MAIN: Equivalent to Rising main taking off from the Main canal for carrying water till the last off taking of Minor.
C. GRAVITY MAIN: Main pipeline or pipelines take off from intake or Delivery chamber(optional) or Ridge of Rising main/Pressure main which follows positive gradient and carries gravity flow for distribution of water. The gravity Main should end at the last off taking of Minor.
D. CONVEYANCE SYSTEM :
    a. Distributaries: All pipelines taking off from Rising main/Pressure mains or delivery chamber(optional) for conveying water to Minor.
    b. Minors and sub-minors: Consisting of minors serving an area of about 200 to 500 Ha off taking from Rising main/Pressure main/distributaries and sub minors off taking from Distributaries /minors.
    c. Field pipeline: Water distribution system beyond minor and sub minor Outlet upto end use i.e. Sub-Chak (1 Ha)
E. Culturable Command Area (CCA)
   <u>For Design purpose</u>:

   The Culturable Command area for design purpose will be the area of the village/villages that can be irrigated, worked out from Revenue Record after deducting (i) Un-commandble higher lands, (ii) Pastures, (iii) fallow land iv) Gochar, v) cremation ground vi) roads, vii) devasthanam and (vi) abadi area.

   <u>Chak</u>:

   It is a sub division of C.C.A. typically about 20 Ha in size. The area can be varying up to 20% as per Chak boundary condition. The outlet point is preferably expected to be on middle area within a chak. Sub-Chak is the sub-division of the Chak about 1 ha in size. The last outlet point should be such that two sub Chaks can be served at one location. The size of the Branch Field pipe and distribution pipe along with field pipe up to 1 Ha

should be sufficient to convey the minimum discharge of 15lps. The Velocity should be within the permissible limit as per guideline and IS as applicable.

F. The above definitions are only for guidelines and the Contractor is at liberty to use and incorporate latest technology for regulating piped flow for irrigation.

3.0 SCOPE OF WORK :

3.1 The scope of work to be carried out for **each system** shall be as under :-

3.1.1 Fixing of Permanent Bench Marks.

3.1.2 Conduct hydrology study (Yield & flood) at the intake location for estimating water availability for khariff crop, scour depth computation, HFL and normal flood levels.

3.1.3 Survey work for block contouring at 30 cm intervals on the revenue village maps, planning, design and estimate having components Rising main/Pressure main, Delivery chamber(optional) associated appurtenant including its distribution net work down to 1 Ha chak. Survey work will be used for preparation of land acquisition cases, Water User's Association formation proposal, operation and maintenance manual.

3.1.4 Preparing a General Arrangement Plan for each system with Planning of Rising main/Pressure main and furnishing most economical and feasible diameter & alignments proposal with alternative survey wherever necessary should be conducted. After getting approval of the alignment from the competent project authorities, contractor has to take up survey & investigation of distributaries, minors & sub-minors etc. up to outlet point, preparing & obtaining approval for the most economical and feasible alignment from the competent project authority and furnish the following details :

3.1.5 Kilometer wise L-section and design statements of Rising main/Pressure mains with apex details, location of CD works, detailed designs of curves, part village map showing the alignment of that KM, cross sections at 150 M. interval on alignment for complete Rising main/Pressure mains on village maps. Distributary /Sub Distributary/Minor alignment map with apex details, kilometer wise L-section, location of control works, detailed designs of curves, cross sections at 90 M. interval on alignment. Complete distributary, minors and sub-minors network on revenue village maps indicating bearing of the centre line of pipe line with reference to boundary stones of survey numbers.

3.1.7 Detailed topographical survey including contour mapping of the command area on revenue village maps with contour at 50 cm interval including details of chak wise and distributary /minor wise irrigable area and planning of complete distribution system with outlet details.

Final location survey including marking of pipe line alignment on revenue village maps with contours at 30 cm intervals, showing of B.M etc.

Preparation of land acquisition cases in required proforma and sketch on revenue village maps as per Odisha Land Acquisition Act.

4. DETAILS TO BE SURVEYED

4.1 The objective of the survey is to provide sufficient detail to enable the design of the whole irrigation distribution net works. The survey shall include, but not be limited to the following:

I. Establishment of a network of triangulated control points incorporating benchmarks or with a separate system of benchmarks. Existing monuments should be used wherever possible and their accuracy confirmed. In addition, where control point or benchmarks are not available, new points are to be established at the head of each Distributary, Minor and Sub-minor. Where the distance between these points exceeds 2.0 Km, intermediate point are to be established.

II. Pucca, kacha and all other motorable roads and accesses including bridges and railways.

III. Principal footpaths and foot bridges.

IV. Location, invert level and principal dimensions of all irrigation off-takes, cross drainage structures, regulators etc. whether temporary or permanent for existing irrigation work within the command area.

V. Location and type of all tube wells and open wells, village hand pumps etc.

VI. Village boundaries (tri-junction marker pillars) where these are located on the ground. Due note of the village name within each boundary shall also be made.

VII. Services and utilities including electricity, water supply, sewerage, cable etc. and their supporting high tension poles or posts:

VIII. Drainage courses including nallas, ditches, check dams or any other structures on drainage courses etc;

IX. Raised field boundaries or any other such points that cannot be used in the Digital Terrain Model for contour generation unless they are at a level that represents the prevailing ground surface.

X. Water bodies including rivers, lakes, tanks and ponds, rock outcrops borrow pits and quarries forestry (protected, reserved, preserved, private or otherwise) other significant ground cover where cultivation cannot take place.

4.2 After getting approval to the alignment from the project authorities, the contractor has to fix the chainage stone at 100m interval along alignment on central line and apex stones at every deviation of alignment duly indicating apex No and chainage. The chainage stones and apex stones shall be of size 20x20x75 cms. Projection of the stone above ground level will be 25cms.

4.3 Permanent Bench marks with values should be furnished on site. The permanent bench mark (PBM) shall have to be established by the contractor along the Rising main/Pressure main, delivery chamber(optional)s, along distributaries & minors in command area in the cluster by double leveling and cross checking. Their location shall however be decided in consultation with the project authorities.

5.0 FURNISHING ALIGNMENT PROPOSAL:

Apart from kilometer wise L-section of Rising main/Pressure main, distributary, minors and sub-minors, contractor has to furnish the detailed network of the distribution system on revenue village maps with contours of 0.30 m. intervals, showing distributaries/ Minors/Lateral outlets and sub blocks with ROR details. A Command Area Information Data Base showing the village map Number with irrigable area, names of beneficiaries etc in each Chak should be furnished.

6.0 DESIGN AND DRAWING OF RISING MAIN/PRESSURE MAIN

(If delivery chamber is not provided, then the Rising Main should be consider upto the last off taking of Minor.) **and related works:** Design of Rising main/Pressure mains, economical diameter and all components should be as per IS, CPHEEO, MOST/ Departmental and other prevalent norms. Contractor has to prepare and get approved Longitudinal Sections, Design Statement of Rising main/Pressure mains and main distributary and minors of entire length of each system which should be furnished duly considering losses including head losses. Cut off statement should be reach-wise and should indicate gross command area and irrigable command of the blocks coming under the reach, designed discharge, discharge required, roughness coefficients with respect to type of pipe selected. Distribution net work should be designed for the reaches shown in the cut off statement and got approved from the competent authority. For design of head work, detailed hydraulic calculations, water thrust etc., should be analysed, suitable water hammer reducing majors and devices to be designed and transition curves and smooth joints should be designed and got approved.

6.1 Preparation of Schedule of quantities: Estimate and Schedule of quantities should be furnished separately for entire project. Item of work should be in accordance with the **specification and r**ates mentioned in the current "Schedule of rates" of the state of Odisha and prevailing market rates for non-scheduled items supported by rate analysis and quotations from manufactures of selected material. The detailed estimates in triplicates sets and also in soft copy which shall include detailed report, estimates and detail survey sheets.The same shall be approved by the Project Authority.

7.0 CONSTRUCTION OF BENCHMARK STRUCTURES AS PER SPECIFICATION :

The contractor will collect the details of Survey of India bench marks in the area. With this as a datum additional net-work of Temporary Bench Marks (TBMs) shall have to be established by the Contractor on an average not more than 1 No/100 ha of C.C.A. by double leveling and cross checking. Their locations shall however be decided in consultation with department. Contractor shall fix temporary bench mark preferably on permanent structures in the command area. Values of such bench marks shall be fixed with reference to the Permanent Bench Mark established by SOI as indicated by the Engineer-in-Charge. The representatives of the Engineer-in-Charge not below the rank of Assistant Engineer shall remain present and check the survey while establishing the temporary bench marks and permanent bench marks.

A proper system shall be evolved for numbering the TBMs as directed by Engineer-in-Charge. A plan to a scale of 1:15000 indicating location and levels of all PBMs established in the command area shall be prepared and submitted to the Department.

7.1 Construction of Permanent Bench Marks (PBMs):

The PBMs shall be constructed at location as may be directed by Engineer-in-Charge. This should be located preferably at one corner of the field or field boundary, Govt./no man's land which will not hamper the agricultural operations or as instructed by the Engineer-in-Charge. A 10 mm dia anchor about 300 mm in length with steel plate 120 x 120 x 6 mm. Shall be embedded in the concrete, and the top of the steel plate shall be 100 mm below the top level of concrete and truly horizontal. The level of PBM shall be established on top of steel plate. Adequate care shall be taken by the Contractor for curing the concrete laid for the PBMs. The PBMs

shall be numbered in oil paint for identification. Where black cotton soil is met with the foundation will have to be taken to extra depth and filled with M-10 c.c. & standard size bench marks shall be constructed over this.

8.0 FIELD TO FIELD SURVEY FOR BLOCK CONTOURING WITH CONTOURS at 30 cm INTERVAL AND PREPARATION OF VILLAGE MAPS SHOWING CONTOURS AND FIELD DETAILS :

For plotting contours at 30cm intervals, ground levels must be taken for each survey number covering all corners and the centre of the fields with spot levels at every 30 m intervals and reading shall be taken up to 5mm accuracy. Additional spot levels shall be taken on roads, nalla, drain, railway etc. The leveling staff should be placed in the field and not on the field bunds as to represent the local topography. The levels must be taken at point in the field shall also be marked on the village sheet. Additional spot levels must be taken at points that appear abnormally higher or lower than the general elevations of the plot so that the ridge and valley lines can be marked and ascertained. For drawing valley lines, the levels of the bottom of the nalla must be taken. All Kachha and Pucca roads, ditches, well, house, railway lines, high tension lines, electric poles, telephone poles, nalla, irrigation pipe lines, and all other prominent features etc. shall be shown on the map. The reduced levels shall be marked on village map at the corners of each field and additional spots as taken. Thereafter contours shall be marked in broken lines and full meter contours shall be marked with continuous full line. Concurrent checking of survey, investigation etc, shall be done by the departmental officer posted at work site. At least ten percent field levels shall be got checked by the Engineer-in-Charge.

The leveling work should commence from the permanent Bench Marks, whose value is known. The BMs shall be constructed as per standard specifications. All the BMs shall be connected by double leveling accurately. Every day's work shall be closed on any one of the bench mark mentioned above and the accuracy of the day's work checked by Engineer's representative present throughout the activity. The contour map is to be prepared in the same scale of village maps and plotted on them.

8.1 Contouring

All relevant topographical survey data shall be incorporated in the Digital Terrain Model (DTM) using GIS applications. The contractor shall take sufficient spot heights to ensure adequate generation of contours at 0.50m interval and as done as per guidelines provided in SOI publication "MAP EDUCATION" 1993 for generation of final product or using appropriate acceptable computer software. Complete mosaic of the whole command area shall also be prepared and supplied in appropriate contour interval.

8.2 Survey Accuracies

a) General

The Contractor will be required to ensure the various minimum levels of accuracy outlined below until such time as he can demonstrate supplemented with codal provisions or in vogue with examples to the satisfaction of Engineer-in-charge in the best interest of the work and these variation of accuracies should be at no additional cost to the Employer.

b) Control Points

In the case of triangulated control points and traverse work, maximum closure accuracies are to be better than 1:25,000 in plan of the distance traversed and 15 mm per kilometer vertically. All angles are to be measured to the nearest 1 second and all distances are to be measured to the nearest millimeter, Co-ordinate pairs for control points are to be reported to the nearest millimeter.

8.3 Co-ordinate System

A local grid system, based on the SOI projection, shall be established for each distribution network such that all co-ordinates within the scheme are positive. This shall be agreed with the Contractor at the start of the Contract and linked to the Survey of India (SOI) grid where suitable coordinated control points are identified and the Contractor advised of the corresponding offsets. Where applicable, suitable azimuth control will be applied and the methodology adopted outlined in the report. The geographic information or geographical information system (GIS) software should be used for preparation all maps, plans and depiction of topography. Modern GIS technologies rely on digital information, for which there are a number of collection methods. The most common method of data creation is digitalization, where a hardcopy map or survey plan is transferred into a digital medium through the use of a CAD program, and geo referencing capabilities.

8.4 Satellite Imagery

Satellite imagery of 0.8 m or higher resolution from NRSA, Hyderabad, covering the complete project area is to be procured as part of the Contract. The imagery shall be cloud free and of the Rabi/Kharif 2010-11 period such that field boundaries are clearly distinguishable. The imagery is to provide a crosscheck of the location of existing major infrastructure and where relevant, field boundaries. The imagery is to be procured in hard copy and in digital format as well. This imagery will become the property of the Employer at the completion of the Works.

8.5 Collection, Storage and Processing of Field Data

All field measurements together with their relevant field codes are to be automatically stored in electronic data-loggers either within the field instrument or attached to field instruments and downloaded from storage remotely or directly to computer for processing. Recording by hand and transcription of field data is not considered appropriate for this project given the time frame available and will not be permitted. GIS application should be used.

Surveying, Planning, Designing and estimation including preparing land plans and schedules for land acquisition and also collecting data of roads and cart tracks in the command area for

8.6 Distribution network

i) Marking alignment on SOI Maps:

Besides marking the Intake works, the alignment of Rising main/Pressure main, (If delivery chamber is not provided, then the Rising Main should be consider upto the last off taking of Minor.)distributaries are to be marked and boundary of block for which the contractor is required to plan, design and estimate distribution network

shall be indicated on The Survey of India Maps to a scale of 1:50000/1:10000 with contours.

a) Rising main/Pressure main, Delivery chamber (optional) & distributaries

Following broad principle shall be followed while fixing the initial alignment

i. On the contour map valley lines and ridge lines should be marked.
ii. The alignment of the Rising main/Pressure main & distributary should be marked so as to command maximum possible area.
iii. The alignment shall be straight as far as feasible. Smooth curves shall be provided where necessary to minimize head loss.
iv. Alignment should be away from village site by about 50 m.
v. Major crossing of railways, roads and drains should preferably be at right angles;
vi. Have minimum number of road or cross drainage works.
vii. Permanent structures such as wells/tube wells, house etc. should as far as feasible be kept away from alignment.
viii. The Delivery chamber (optional) shall be as far as possible in wasteland/Govt. lands.
ix. Delivery chamber (DC) shall be provided on the basis of topography and design philosophy. However DC is not mandatory.
Necessary provisional arrangements shall be made in Distribution network at 20 Ha. Chak towards installation of Secondary filtration unit for future requirement.

b) Culturable Command Area Planning:

After marking the alignment of the Rising main/Pressure main (If delivery chamber is not provided, then the Rising Main should be consider upto the last off taking of Minor.) and distributary As it is a pipe line system CCA will be on both sides of it. Spread of a CCA will be between the pipe line and the drainage line and should, as far as possible, be limited to revenue boundary of a village. In cases where a village is divided by the distributary and if the sub divided areas of village are large enough there will be two CCA and if the areas are small they should be clubbed with adjoining CCA. The byelaws governing the formation of Water Use Association (WUA) shall be kept in mind while delineating CCA.

c) Minors and Sub- Minors:

A minor is a pipeline off-taking from the distributary or Rising main/Pressure main. It serves generally command area of typically about 200-500 ha. In a few cases where distance between Rising main/Pressure main and the command boundary is less, a minor can serve more than one village with the upper limit of command area raised to about 1000 ha. A minor shall off-take from the Rising main/Pressure main or distributary at the highest level in the CCA. All the principles listed for fixing alignment of a distributary shall be followed. If the command area of a village as intercepted by a drain or a railway line or a major

road, it may be necessary to take out a sub minor to serve the command on the other side

All the exercises mentioned at (a) (b) & (c) above shall be carried out jointly by the Department officers or their authorized PM consultants and the contractor.

ii) Reconnaissance survey:

After fixing the alignment of Rising main/Pressure main, distributaries and minors on SOI Sheet the contractor shall carry out reconnaissance survey in field to verify that the ground features as shown on plan tally with actual as existing on site. Any variation as a result of subsequent events such as development of brick kilns, new artificial drains, roads, pipe lines, transmission lines, railway lines, wells, buildings or farm houses etc shall be noted and alternation in the alignment fixed earlier may be done after Engineer-in-charge visiting the site. On the basis of the levels available either from SOI sheet or at corners of fields, if taken, a line diagram shall be prepared to determine exit water head required at chak head, CCA head and the distributary head. During reconnaissance survey special attention shall be given to ascertain that the drainage lines marked on map on the basis of contours do actually exist on site. This can be done by local inquiry and site observations. If any variation is noticed the chak boundaries should be refixed.

8.7 Minor/Sub-Minor pipelines:
A- chak planning:

These shall be generally aligned along field boundaries. After fixing the alignment of sub minor with consideration of formation of WUA, the contractor shall carryout reconnaissance survey in field to verify if the features on the plan tally with actual ground conditions and structures such as tube wells, houses, gharbadi plots etc. are not located along the alignment fixed. The location of the outlet, command area having each point for every field shall also be verified on the field to confirm that the 20 Ha chak outlet with little variation about 10% shall be proposed preferably at the middle point in the Chak. In the same way the last out letting point (at two ha level) should be as far as possible in the middle reach of the common boundary between two sub Chak so that the friction losses in MIS shall be minimum. The Engineer-in-charge shall examine the layout, have discussion with the contractors and if necessary, visit the site jointly and suggest alternatives regarding adjustment of sub-chaks, drainage layout etc.

Chak outlets shall be provided inside the designated CCA. The outlet management system (OMS) including SCADA Central control unit has to be provided in PLC room of pump house.

After observing these formalities layout may be considered as approved by the department and the contractor shall proceed with detailed survey according to the specifications.

8.8 Final layout:

8.8.1 After approval of the preliminary layout as provided under 5.3 above, the contractor shall proceed with the work of field to field surveys for taking longitudinal sections of the alignments, collecting the field data for the approved pattern.

8.8.2 The survey work should commence from an established TBM and end on established8.8.3 TBM only at the end of the day's work. The closing error should not exceed the permissible limit. Levels shall be taken at 30 m interval for all L-Section covering apexes, lowest point of depressions, highest point of ridges and turnout. However, Contractors are responsible to locate all turnouts/outlets at the highest possible locations to serve the maximum possible command. Apex locations shall be fixed by giving location sketches with reference to the survey Nos/Block No. boundaries of fields. Contractor shall demarcate the apexes, tangent points and turnout point locations of the distributaries, minors & sub minors, and demarcate the apices on sub minors and branch sub minors by excavating a pit of size 60 cm x 60 cm x 60 cm which shall be shown to the Department authority at the time of inspection. On approval by department the Contractor shall arrange to construct the reference Pillars of size 15cm x 15cm x 75cm.

The contractor shall submit final layout prepared as stated above to the Engineer-in- Charge for approval. The Engineer-in-charge shall scrutinize the proposal and convey his observations to the contractor within fifteen days. The contractor shall promptly comply with the remarks and/or if necessary discuss the proposal made by him with the Engineer-in-charge and sort out differences. The Engineer-in-charge shall convey the final approval within one month.

8.8.3 checking of works done by contractor :
The department officer posted at works site shall concurrently check the work of transfer of PBM and TBM surveying & leveling by arithmetical checking plotting of survey work on village map checking of contours, pipe line alignment marked on village maps & verifying same actually at site also.

9 DESIGNS AND PREPARATION OF PLANS & ESTIMATES:

After receiving approval to the final layout, the contractor shall proceed with the task of preparing final designs of Rising main/Pressure mains, delivery chamber(optional)s and distribution system, its detailed designs, fixing permanent bench marks along the alignment of intake works, Rising main/Pressure main, delivery chamber(optional)(optional), distributaries and minors and preparation of plans and estimation of the complete system. All system shall be designed using relevant IS codes and prevalent practices. Contractor shall also furnish details of land to be used for Rising main/Pressure main distributaries, minors, sub minors, and drainage lines in prescribed format after marking land width and curves on village plans. Contractor shall construct and establish permanent bench marks at the rate of

no less than one nos. per five KM grid and temporary bench marks on average not more than one no per 100 Ha of CCA along the approved alignment of Rising main/Pressure main, distributaries and minors. EPC contractor shall furnish Bill of Quantities within 30 days of approval of detail drawing and design

PROPOSED DESIGN OF THE SYSTEM

a. Distribution Network: Details of Distribution network for Distributaries & Minors as UGPL in the command of____ Project (From ch____to_____km) is as under

DETAILS OF UGPL IN DISTRIBUTION NETWORK			
SL	**NAME OF**	**OT CHAINGE IN**	**CCA IN HA**
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
	TOTAL		

b. CAD work

CAD works/UGPL Sub-Minors: Area under flow irrigation for CAD works/UGPL Sub Minorsisabout10671.44Ha.

10. DESIGNCRITERIA

The general design criteria for this UGPL Gravity Irrigation Scheme are listed below:

10.1 Culturable Command Area: CCA and GCA of Main, Branch, Distributaries, Minor and sub-minor can remain same as already considered in original planning of open canal. However, if the alignment & command area is revised in UGPL planning, individual CCA of Chak/UGPL Minors can be modified where planning of minor and sub-minor both have to plan as UGPL. CCA Statement shall be prepared as per modified planning of minor and CAD works/sub-minors. Chak wise and Sub Chak wise CCA should also be prepared.

10.2 Duty: In open canal, design Duty considered is_____ha/cumec and design discharge is arrived by adding water losses. The Basic Discharge

coefficient(B.D.C) of the project will be as per actual design discharge (i.e. Discharge as per duty + water losses). Hence B.D.C. is about Cumecs/Ha.

10.3 Capacity factors: Canal capacity is considered as per "Guidelines for planning and designing of canal network system" issued by CDO, in OCTOBER-1994 as under.

Name of channel	Capacity factor
Minor and Sub Minors(upto20cumecs)	1.00
Canalservingupto10,000ha	1.08
Canalservingabove10,000ha	1.05

The design discharge of Distributary, Minor &Sub-Minor is calculated based on command area they serve.

Required discharge=B.D.C. XC.C.A. X Capacity factor

1. CommandareaofMinorshouldbe**from20to30haandsizeofsub-chaksshallbeabout1ha.** In special cases due to topographical features,it may be less than 20 and more than 30ha.Sizeofsub-chakcanalsovary from0.85Ha to1.20 Ha.
2. DesigndischargeforUGPLsystemshallbe,asdesignedinopencanaldistribution system&Capacityfactorasmentionedabove.However,itcanchangeasperagro- climatic zone.
3. **MinimumDesignDischargeshallnotbelessthan15LpsatTurnoutPoint. (i.e.1HaTurnoutPoint)**
4. No telescopic design shall be applied at UGPL Sub-Minor/CAD-Work Level, i.e. if theCCAis25Ha, the whole pipe line shall be designed to carry discharge of25xBDC=___Cumecs up to tail end of sub-minor.
5. Friction loss in HDPE/DI/MS pipes shall be computed with the Hazen William formula or Modified Hazen William formula whichever is applicable as per the Guidelines for Planning and Design of Piped Irrigation Network CWC-2017.
6. To over come against head losses due to bend, Tee, Joint or all other minor losses 20% extra head loss shall be added in Hazen William formula or modified Hazen William's formula.
7. Available head shall be worked out from level difference between off-take point and T.O. point of the pipeline and then calculate minimum diameter of pipe using Hazen William formula or Modified Hazen William formula.
8. TheHydraulicGradientLineatanypointshallbeatleast0.3mabovethetopR. L. of pipe. Residual Head at Turnout shall be kept atleast 20cm above highest ground level of Chak to avoid lift at turn out. If Residual Head at turn out is below 0.20m, a well at that turn out point shall be constructed to facilitate the lifting of water by providing diesel engine water pump set of required capacity.
9. As far as possible Air valve shall be provided on anaverage 250m interval & at those location where possibility of air trapping is higher.
10. MinimumcushionofsoilontopofPipeshallbe1.0m. It may be upto 0.90min special cases.
11. DesignVelocityshallgenerallybeinbetween0.6mto3.00mpersecondinUG

PLnetwork. In special cases, it can be allowed 0.5to0.60m per second.

12. Atleast25cmofcut-off/drivingheadshallbeensuredatofftakeofeachUGPLOff-takingfrom parent open canal.
13. TheUGPLsystemshallbedesignedforHalf-runconditioni.e.**2/3ofFullSupply Depth (FSD)** of parent open canal. This will result in functioning of UGPL network even the open network is carrying the discharge in Half-Run Condition.
14. All possible measures shall be taken to facilitate the flushing of the system by providing appropriate low level outlets i.e. flush valve, Blow off Valves etc.
15. All the structures shall be designed to protect against tempering by the villagers.
16. All the structures shall be designed to protect against the possible entry of flood water and sediments in to the UGPL system in flood zones.
17. In case of Distributaries, Minors including CAD-works/ Sub-Minors are to be designed as UGPL, a controlled structure shall be provided at off take point of UGPLtofacilitatedeliverof designed discharge.
18. In flow condition, Tee Valve/Sluice/Ball valve shall be proposed at turnout structure to irrigate command area as per irrigation management schedule.
19. Allthepipematerialshallbeusedaspertheirrespectivespecificationandlatest codes of practices.
20. 250mm dia C.I. flange shall be provided in Turn out RCC well of sub minor at FSL Level to deliver / lift the discharge of chak.
21. If command of chak is higher than the design FSL, RCC well shall be proposed to lift water locally. The location of RCC well will be in either side of alignment by providing Tee.
22. Generally the minimum inner diameter of well shall be 1.50m incase of sub minor and 3.0m incase of minor and 1.50m at tail end of minor. In case of Distributaries minimum inner diameter of well shall be twice the diameter of off-taking pipe. Each well shall be covered by R.C.C slab at top with manhole opening. Each well shall have0.5msilt pocket in Minor and sub-minor to check silt. It is proposed to adopt rotational supply of water within a chak Hazen-William & Modified Hazen-William friction equation will be used for computing head-loss within the pipe lines with an appropriate roughness coefficient.
23. Concrete pindi shall be constructed for Turn out.

10.4 Micro Irrigation Network: The purpose of this irrigation network for providing pressurized pipe network is to supply or supply of timely and adequate water to each holdings. Govt. of Indian is now giving emphasis on implementation of this system at least 10% of the command through DRIP and Sprinkler system from out to each filed. Water from each out outlet to each filed. Water from out let will delivered to storage sump / pond to regulate the supply of water in the field through DRIP or Sprinkler system, Guideline for planning and designing of pipe network of MOWR, DR & GR, Govt. of India – 2017 and the BIS Code as given below may be followed at the time of designing& planning of this network.

ThevariousBIScodesfor different components ofthe system aretabulatedas under

S.No	Componentdescription	BIScode
1	Polyethylenepipe forirrigation-Lateralswithamendmentsnumber5	IS127886:1989(reaffirmed1998)
2	Emitters	IS13487:1992
3	Emittingpipessystem	IS13488:2008
4	Strainertype filters	IS13488:2008
5	IrrigationequipmentrotatingsprinklerPartII,TestIS12232(Part II)Methodforuniformityofdistribution(1strevision)(amendment 1)(includingraingun)	IS12232(PartII)1995
6	Polyethylenemicrotubes fordripsystem	IS14482:1997
7	FertiliserandchemicalsinjectionsystemPartventureinjector	IS14483(Part1)
8	MicroSprayers	IS14605:1998
9	MediaFilters	IS14606:1998
10	HydroCycloneseparators	IS14743:1999
11	PVCpipesforwatersupply	IS4985–1999
12	IrrigationequipmentsprinklerpipesspecificationsIS14151(Part I)1999PartIPolyethylenepipes	IS14151(PartI)1999
13	Irrigationequipmentsprinklerpipesspecifications PartIIquickcouplesPolyethylenepipes	IS14151(PartII)1999
14	QualityofIrrigationwater	IS11624:1986
15	HDPE Pipes	IS4984:1995
16	Moulded PVC Fittings	IS7834:1987
17	GIand MSFittings	IS1879:1987
18	GMValves	IS778: 1984

S.No	Componentdescription	BIScode
19	CINonReturnValves	IS778: 1984
20	FabricatedPVCFittings	IS10124:1988
21	GIPipes	IS1879:1987
22	SluiceValves	IS780:1984
23	PEFabricatedFittings	IS8360:1977
24	PEMouldedFittings	IS808:2003
25	PVCFootValvesandNRV	IS10805:1986
26	IrrigationequipmentrotatingsprinklerPartI, DesignandOperationalrequirements(1strevision)	IS12232(Part I)1996
27	Design,InstallationandFieldevaluationofMIS	IS10799:1999
28	Preventionandtreatmentofblockagesproblems Indripirrigationsystems	IS14791:2000

11.0 EXCAVATION

11.1 CLEARING THE SITE :

The site ofexcavation shall be cleared of all grass vegetation, fencing, bushes, and trees as directed by the Engineer-in-Charge. The materials, obtained from such clearance shall be the property *of* the Govt. and shall be stacked as directed by the Engineer-in-Charge so as not to cause obstruction to the work.

11.2 LAY OUT:

All materials such as pegs, bamboos and strings and templates for marking out slopes, and tools required for line out shall be provided by the Agency at his own cost. The centre line of excavation shall be clearly marked by pegs or by stones at each chain or change of direction or at shorter intervals on curves, in the beginning. The final line out will be done by fixing reference stone at suitable distances on either side of thecentre line.

Agency shall provide and maintain the quarry roads and temporary roads required for conveying and transport of materials at his cost.

For the points, which are not covered by these specifications, the instructions given by the Engineer-in-Charge shall be final and binding on the Agency.

The material available from all excavation and remaining surplus after use on the work from adjacent work etc. can be used by the Agency free of cost provided

these materials are used solely for the specific agency work and prior approval of the Engineer-in-Charge is taken.

11.3 EXCAVATION

Section shall be excavated as shown on the drawings or as directed by the Engineer - in - Charge.

Suitable arrangements for drainage shall be provided to take surface water clear of excavation during the progress of work.

Excavation may be carried out by manual labour or by excavating machine.

11.4 EXCAVATION IN ROCK:

Excavation in rock shall be mostly controlled blasting so as not to endanger surrounding structures. All sharp points of rock are chipped off. Blasting in a manner, which is likely to produce over breakage, which in the opinion of Engineer-in- Charge is excessive, shall not be permitted. Special care shall be taken to prevent over-breakage or loosening of materials on bottom and side slopes. Excavation in excess of the prescribed section shall not be permitted and no payment will be made beyond scope of agreement.

The material excavated shall be stacked on either side as specified on the drawing or as directed by the Engineer - in - Charge.

The Excavation shall be carried out according to the design with side properly slopped as shown in the drawings and as directed by the Engineer - in - Charge.

The excavation shall actually be carried out in steps. The steps shall have such width and depth that after they are cut, the required final side slopes is attained. Cutting of steps shall be done when altered level is reached and after one monsoon.

11.5 REMOVAL OF LOOSE ROCK ETC:

Before any work of excavation is taken up all loose rock, semi-detached rock in /or close to the areas to be excavated, that is liable to fall or otherwise endanger the workmen on the project shall be stopped. The methods employed shall be such as will not shatter or render unstable and therefore unsafe any rock that was originally sound or safe. Any material not requiring removal as contemplated herein, but which may later become loosened or unstable shall be promptly and satisfactorily removed. The cost of such clearing shall be deemed to have been included in the unit rates accepted under the different items under excavation.

11.6 MAINTENANCE OF SLOPES IN EXCAVATION:

Any shoring and strutting required during excavation and afterwards shall be deemed to be covered by the rates quoted for the items. No extra payment will be made for this purpose.

11.7 SLIPS:

Slips shall be avoided, but if any slips occur on account of any reason, the excavation shall be promptly restored to stability. No extra claims shall be entertained for such slips.

The Agency shall have to make good the work immediately at his cost.

11.8 USE OF EXCAVATED STUFF:

Excavation shall be done systematically. Only those excavated stuff, which will be permitted for use, shall be used.

11.9 DEPOSITION OF EXCAVATED STUFF CLEAR OFF TRAFFIC LINES ETC.

Disposal of all material from excavation shall be as per approved disposal plan of instructions of Engineer - in - Charge, regarding the location and deposition of the stock piles, spoil banks of embankment. Before any excavation is started the deposition of spoil shall be carefully planned so as not to obstruct normal traffic and traffic lines required for the construction materials, and shall be dumped sufficiently clear off the edges of the excavation so as not to endanger stability of the slopes of the excavation and also to permit ample space for lorry paths, installation and lifting of dumping devices, stacking construction materials etc.

11.10 SORTING AND STACKING OF MATERIALS:

Excavated materials shall be sorted out and stacked as under.

a) Soft Strata: All the excavated materials from the soft strata shall be sorted on. The material not useful shall be deposited as directed by the Engineer - in – Charge. Materials useful shall be, sorted out and neatly stacked. Every stockpile of the material shall be of regular size and not less than 5 m. in height.
b) Hard Strata : Rubble and boulders from hard strata shall be stacked in separate area as directed by the Engineer - in - Charge. Stockpiles shall be of regular shapes, allowing for easy measurement No stockpiles shall measure more than 200 Sq.m. In plan, less than 60m in length and more than 1.5 m. in height, unless specifically permitted by the Engineer - in - Charge in writing.

11.11 SURPLUS MATERIALS:

The excavated materials, if not required shall be stacked in spoil banks with neatly made stable slopes at top and a suitable berm being left between the toe of bank, and edge of excavation, as directed.

11.12 STACKING IN STOCK AND WASTE PILES:

After sorting is done, useful materials of various types shall be stacked in stockpiles and rest may be disposed off as directed by the Engineer - in - Charge.

The excavated material shall be stacked within the area approved by the Engineer - in - Charge. If the excavated material is deposited in unauthorized land, such work will not be measured for payment unless suitable action as may be directed by the Engineer - in - Charge. In additional to non - payment of such work suitable amounts as directed by the Engineer - in - Charge will be recovered from the Agency as directed towards any extra cost which may have to bear on account of the Agency's un-authorized action.

11.13 USE OF EXCAVATED MATERIALS

All the materials available from excavation will be the property of Govt. and shall be deposited as directed by the Engineer - in - Charge. The Material of approved quality may be used by the Agency in the item of work included in Schedule of requirement of the tender or on ancillary for preparatory work free of charge. Prior approvalof the Engineer - in - Charge for such free use shall however be taken.

11.14 SILTING DUE TO FLOODS, EMPLOYER NOT RESPONSIBLE:

If excavated pits get silted due to intervening floods, slips or any other cause, till completion of the work, the Agency shall excavate and restore the pits and section to the required shape and dimensions without any extra cost.

11.15 BOX EXCAVATION:

Initially box excavation shall be carried out up to top of hard strata. There after stable slopes may be cut in soft strata as stated hereafter

On sinking hard rock in foundation trench the surface of this rock shall exposed on all area ofthe trench and it shall be brought to the notice of Engineer- in - Charge by the agency. The Engineer - In - Charge or his authorized representative shall take levels of the top of hard stratum along predetermined section in the presence of Agency or continued up to foundation level to be fixed by the Engineer - in - Charge.

11.16 EXCAVATION IN WET CONDITION AND DEWATERING:

Unless otherwise specified no distinction will be made as to whether the material being excavated is dry, moist or in wet condition

12.0 BLASTING:

12.1 OBSERVING RULES REGARDING BLASTING:

In conducting blasting operations proper precautions shall be taken for the protection of life and property, work etc. All relevant laws and procedures relating to the design and location of magazine, transport and handling of explosives and other measures for the prevention of accident shall be strictly observed. Warning signs shall be prominently displayed on the magazines for each blast. Specifications for blasting given under the separate section shall be carefully and rigidly observed.

12.2 STORING OF EXPLOSIVES:

Explosives shall be stored in a safe place at sufficient distances from the work and under the special care of watchman so that in case of accidents no damage occurs to the other part of work. Explosives, detonators and fuses shall be each separately stored. No Objection Certificate from District Magistrate or inspector of Explosives shallbe obtained as required by the Agency.

12.3 RESTRICTIONS ON BLASTING:

a) Blasting which may disturb or endanger the stability safety or the quality of the foundation will not be permitted.

b) Blasting within 30 meter of masonry work in progress of a permanent structure shall not be permitted.

c) Blasting operation shall be monitored so as not have peak practical velocity near important structures to exceed 10 ppv.

d) Progressive blasting shall be limited to two third of the total remaining depth of excavation.

d) No large scale blasting operation shall be restored to when the foundation excavation reaches the last half meter. Only small charges preferably black powder may be allowed so as not to shatter the foundation

e) Rules of blasting are as appended.

12.4 EXCAVATION IN HARD STRATA WITH CHISELLING AND / OR CONTROLLED BLASTING:

EXCAVATION IN HARD STRATA:

Where the excavation in hard strata is involved, since usual blasting operations are likely to damage the adjoining houses, transmission lines or hinder the traffic on important roads. The excavation for a good length is required to be done under controlled blasting conditions and / or chiseling. The item will include excavation in hard strata to correct sections as shown in the drawings with chiseling and / or controlled blasting and depositing the excavated stuff as and where directed.

The holes for blasting shall be drilled for a depth of only 40 cm thus increasing the number of holes and correspondingly decreasing the charge required for each holes.

The holes as far as possible shall be slant. All the holes after charging will be covered by grill of steel rods which shall be suitably loaded by gunny bags filled with sand or moorum. The steel grill shall be so lowered over the holes that it does not to cause any damage to the fuse wire or charges and care shall be taken to see that the fuse wires remain free. The loading shall be sufficient to prevent the overthrow of rock after blasting In addition to the above loading; the steel grill shall be securely anchored to the adjoining rock by chains. The steel grill shall extend at least 3 meters beyond the area to be blasted.

Chiseling manually or excavation by pneumatic rock breakers shall be restored to as directed by Engineer -in - charge where blasting cannot be permitted.

Any alternate technique approved by the Engineer- in - charge may be used, but approval to execute the work by the above mentioned method or alternate technique would not relieve the Agency of the responsibility of damage to the power line and properties.

13.0 DEWATERING

13.1 SCOPE:

The item shall include all dewatering during construction work of under ground pipe line, intake structures, Flush structure, Turnouts etc. and diversion work required in a manner hereinafter specified.

13.2 GENERAL:

The area of work shall be kept dry by resorting to pumping or in combination with manual labourfo r bailing cut water with buckets, etc., or any other satisfactory method to be adopted shall be entirely left to the choice of the agency provided dewatering i s carried out satisfactorily and the scheduled programme is adhered to. The agency shall plan, construct and maintain satisfactorily, safe and full proof arrangement for dewatering to ensure safe condition excavation and laying works. The agency shall have responsibility for the adequacy of dewatering arrangement and for the quality and safety of the work, for all of which the agency shall be solely responsible.

13.3 PUMPING:

Adequate pumping arrangement shall be made for dewatering and keeping the same dry while laying pipes or concreting is in progress. Pumps of required capacity and required number and stage shall be provided to ensure the above. Pumping shall be done in such a way as not to cause damage to the work or property blow subsidence etc.

The agency shall make his own arrangement for necessary labour, materials pumps, engines, well points and other suitable machinery and devices required for successful execution of item of dewatering.

13.4 AGENCY RESPONSIBLE FOR DIVERSION ETC:

The Agency shall plan, construct and maintain satisfactorily necessary diversion channels and other temporary diversion and protective works and furnish, install, maintain and operate all necessary pumping and for dewatering the various parts of the works and maintaining the work site as free from water as directed by the Engineer-in-Charge.

13.5 DESILTING:

It channel excavation is filled due to accumulation of surface flow during the progress of the work or during rainy season or due to any other cause, all pumping required for dewatering the pits and removing silt shall be done without extra cost.

13.6 REPAIRS AND REMOVAL OF DIVERSION CHANNEL, BUNDS ETC.:

After having served their purpose the temporary bunds shall be removed to the extent by the agency at his cost as directed by the Engineer from time to time.

13.7 DISPOSAL OF WATER:

The water from the excavated area shall be disposed off in the manner detailed below or in any other manner as per the direction of Engineer-in-Charge.

In undeveloped areas such as countryside where sewerage system has not been introduced the water may be led to the nearest natural drain or pond through properly laid and dug channels or through pipes.

Disposal of water shall in no case cause inconvenience or nuisance to the in habitants of the area or cause damage to property and structure nearby.

Government regulations shall be complied with the rights or private land owners shall be respected regarding disposal of water.

Agency shall be responsible for all the incidental like obtaining permission of local bodies and persons concerned to lead the water to the open channels, making use of lands and properties owned by private persons or public bodies etc. and for the damage caused in the operation of this item.

14.0 CONCRETING

14.1 SCOPE OF WORK:

The work covered by this item shall consist of Cement Concrete for required structures in UGPL System.

i) Furnishing all materials, equipment and labour for the manufacture, transport, placing and curing of concrete and performing all the functions necessary and ancillary thereto including the concrete to the required shape as per drawing.

ii) No extra payment will be made for the installation of this embedded metal work or for delays or for interruptions arising there from.

iii) Providing and removal of all form work comprising furnishing all materials, equipment and labour for the manufacture, transport, erection, keeping in place with necessary fixtures and supports oiling etc. complete.

iv) Necessary sampling and tests for material and concrete,

v) Compensation for injury to persons and damages to work or property.

THE FOLLOWING SPECIFICATION WILL APPLY IN GENERAL OF

ALL TYPES OF CONCRETE WORKS INCLUDING R. C. C. WORK.

14.2 CEMENT

Cement shall be obtained by the Agency and confirm to the Bureau of Indian Standard for Portland pozzolan confirming I.S./8112 of 1989. The cement shall be procured- in standard bags as received from the manufactures and is to conform to the specifications.

14.3 SAND

The sand shall consist of hard, dense, durable, uncoated siliceous gritty materials obtained from rock fragments. It shall be free from injurious amount of dust, clay lumps soft and flaky particles, shale, alkali, organic matter, mica and other deleterious substance. The texture should necessarily be course, matching grading specifications. The maximum percentage of deleterious, substance in the sand delivered for use in concrete or mortar shall not exceed the following values. The material should be as per relevant I.S.Code.

Approval of quality of material by the Quality control Organisation of the DOWR is binding on the agency.

14.4 COARSE AGGREAGATE.

Coarse aggregate for concrete shall consist of hard dense, durable uncoated crushed rock and shall be free from injurious amount of soft, feeble thin elongated or laminated pieces alkali, organic matter or other deleterious substances. Flaky and weathered stones shall not be used.

The broken stone shall be free from dust and dirt and shall be washed if necessary to ensure that all faces or the stones are perfectly clean. The material should be as per relevant I.S.Code.

Approval of quality of material by the Quality control Organisation of the DOWR is binding on the agency.

14.5 GRADING :

The approximate range in grading of coarse aggregate shall be as under, coarse aggregate shall be of such size as shall be retained on a mesh 5 mm.Sq.

Maximum size of aggregate	Normal range mm	Percentage of coarse aggregate (mm)				
		40 to 80	20 to 40	5 to 20	10 to 20	5 to 10
20 mm	10 to 20	--	--	100	50 to 67	33 to 45
40 mm	20 to 40	--	40 to 50	50 to 60	28 to 40	18 to 30
80 mm	40 to 80	20 to 366	16 to 36	35 to 44	10 to 30	13 to 29

The grading between the limits specified above shall be such as shall produce a dense concrete of the specified Proportions and consistency that will work readily into position without segregation and without the use of excessive water content.

The use of gravel fraction left behind sieving river sand for winning fine aggregates shall be permitted in the bending of coarse aggregate if asked for after suitable experiments and without rate variations.

14.6 SIZE :

The maximum size of coarse aggregate for a particular grade or concrete shall be as large as possible but normally not greater than 1/4th of minimum thickness of the concrete member provided that in the case of R.C.C. this size present no difficulty to surround the reinforcement thoroughly and fill up the corners of the form work fully and is less than the minimum cover by 6 mm.

Generally a maximum size of 20 mm should be found satisfactory for reinforced concrete work.

The grading between the maximum size and minimum size of 5 mm shall be such as to produce a dense concrete of 'the specified proportion and consistency that will work readily into position without segregation and without the use of excessive water content.

The Agency shall at all times maintain a minimum storage of all grades of the aggregate for the day’s requirements at work site .

14.6 WATER:

Water used in concrete shall be clean and free from objectionable quantities of silt organic matter, alkali, salt and other impurities which are likely to be injurious. The turbidity of water forming shall not be more, than 200 parts per million and shall preferably be lower.

14.7 GRADING AND RELATIVE PROPORTION :

Grading of the aggregates (fine and coarse) brought on the site shall be done by the agency and shall be got approved from the Engineer-in-charge. The grading of sand and coarse aggregate is liable to be modified beyond the limit specified above to suit local condition in order to obtain required strength and workability.

14.8 MIX VARIATION:

Cement variation in the concrete mix is not liable for compensation

14.9 DESIGN MIX:

The ratio of the Volumes of the fine and coarse aggregate may be varied within limit of 1:1.5 to 1:2.5 as directed by the Engineer-in-charge to suit the maximum size of coarse aggregate the grading, density, workability and strength without extra cost.

The quantity of water shall be just sufficient, but not more than sufficient to produce a dense concrete of required workability for its purpose. An accurate control shall be kept on the quantity of mixing water. An allowance shall be made for surface moisture present in the aggregate when computing water content as indicated in IS.456 - 2000.

Exact proportions in which the materials are to be used for different part of the work shall be determined by carrying out mix design to obtain the specified strength of the concrete. The design of mix shall be submitted by the agency and got approved from Deptt. Quality Control Laboratory at least one month before commencement of the work. The design may be changed at any given time at the discretion of the Engineer-in-charge during progress of the work. The samples of aggregates and cement and the resulting concrete as well as the concrete mix design shall be tested as per relevant I.S. code method. The tests shall be made by the agency at frequent intervals as decided by the Engineer-in-charge, so as to secure the required workability, density, impermeability, strength & economy.

14.10 TESTS FOR CEMENT CONCRETE.

A) STIPULATED CRUSHING STRENGTH : Concrete should confirm to

Nominal mix	Equivalent ISS mixes	Preliminary lab test at 28 days N/mm^2)	Stipulated crushing strength in works tests	
			At 7 days (N/mm^2)	At 28 days (N/mm^2)
1:1:2	M-25	32	17	25
1:1:5:3	M-20	26	13.5	20
1:2:4	M-15	20	10	15

1:3:6	M-10	13.5	7.5	10
1:4:8	M-7.5	10	5	7.5

B) STANDARD OF ACCEPTANCE:

Not a single sample of work test cubes shall have at the age of 28 days, a crushing strength less than the stipulated crushing strength of concrete. The Engineer-in-charge may at his discretion occasionally accept the crushing strength of a sample, which is less than the stipulated strength but which is equal to or more than 85 % of the stipulated, strength. Each sample of work test cubes shall assume to represent 30 M3 concrete and amount of corresponding quantity of concrete showing crushing strength less than stipulated strength shall be recovered as under.

Crushing strength.	Amount to be recovered (Recovery rate)
1) Equal to or more than 95 %	Nil.
2) Equal to or more than 90 % but less than 95 %	5 % of rate of Concrete in current Schedule of rate.
3) Equal to or more than 85 % but less than 90 %	10 % of rate of Concrete in current Schedule of rate .

The recovery rate shall be approved by the Chief Engineer.

If the crushing strength falls below 85 % of the stipulated crushing strength then the quantity of concrete represented by these samples shall be removed and redone by the agency at his cost. Unit for acceptance or these tests will be one working season.

C) SLUMP TESTS.

In order to test the consistency of the mixed concrete, slump test shall have to be made by the Agency when and where required by the Engineer in charge, as per Indian Standard Specification. The allowable slump shall be decided by the Engineer-in-charge, depending upon the location of the concrete.

In the case of reinforced concrete work, the workability shall be such as the concrete will surround and properly grip all the reinforcement. Water cement ratio will be such as will give concrete just sufficiently wet to be placed and compacted without difficulty.

Concrete shall have a consistency such that it will be workable in the required position and in the case of R.C C. flow around reinforcing steel also.

For vibrated concrete slump shall range between 2.5 cm. to 5 cm. The slump shall be the less permitted by workability. The slump shall be determined as detailed

in Appendix 'G' of IS.456-2000 and maintained throughout the concreting operation.

D) FORMS

Form to confine the concrete and shape as required shall be used wherever necessary. The form shall have sufficient strength and rigidity to hold concrete and to withstand the pressure of ramming and vibration without excessive deflection from the prescribed lines the more so when the concrete is in vibration. The Agency shall have to get the design and drawing of the centering approved from the Engineer-in-charge before erection. Form work shall be of Steel shuttering.

14.11 DESIGN

The detailed designs of the formwork shall be prepared by the Agency and got approved by the Engineer-in-charge well in time. Such an approval however, will not relieve the Agency of his responsibility for the adequacy and strength of the formwork.

15. PIPELINE WORKS

TYPE OF PIPES TO BE PROVIDED FOR DIFFERENT COMPONENTS OF THE SYSTEM.

Sl. No.	Components of the System	Type of pipes to be provided
1	**Intake pipes**	RCC NP4 Hume pipes
2	**Rising Main/Pressure Main** a. Diameter up to 1000 mm. b. Diameter more than 1000mm)	 a. Ductile Iron Pipe as per detailed specification. b. M.S pipe as per detailed specification.
3	**Distribution / CAD network** a. Below 300mm dia. b. 300mm to 800mm dia.	 a. HDPE pipe as per detailed specification. b. D.I pipe as per detailed specification.

	c. Above 800mm to 1000mm dia d. More than 1000mm	c. GRP/PSC/DI pipe as per detailed specification. d. MS pipe as per detailed specification.

A. R.C.C Hume Pipes

1.0 **GENERAL**

R.C.C Hume Pipes of non pressure type NP_4 shall be used as water conductors from intake to the sump well of Pump Houses.

1.1 **SCOPE** Scope of the work includes procurement of NP_4R.C.C Hume pipes of adequate size from reputed manufacturers having accreditation from B.I.S transportation from factory to the site, unloading &laying of the pipes on the prepared bed fixing in position & filling up the trenches as per specification

2.0 **SPECIFICATION**

Schedule – 3: Reinforced Concrete, Medium duty, Non-pressure Pipes, Class: NP3, with ends of the pipes suitable for flush joints conforming to IS: 458/2003 (Fourth Revision) with up-to-date amendment.

Nominal Diameter of Pipes in mm.

80, 100, 150, 200, 225, 250, 300, 350, 400, 450, 450, 500, 600, 700, 800, 900, 1000, 1100, 1200, 1400, 1600 , 1800 & Maximum up to 3000.

2.1. Dimensions, Design & Strength requirements of Reinforced Concrete Pipes of Class NP4 shall be as per the Table 3 of IS: 458/2003 (Fourth Revision) with up-to-date amendment.

3.0 **INSPECTION & TESTING**:

As per prevailing practice, the following Review of Reports shall be carried out.

Review of Reports:

The following Reports shall be submitted to the Inspecting Officer at the time of Inspection for review:

During manufacturing, Compressive Strength Tests shall be conducted by the manufacturers on 150 mm Concrete Cubes in accordance with the relevant requirements of IS: 456/2000 with up-to-date amendment and IS: 516/1959 (Reaffirmed 1999) with up-to-date amendment, as stipulated in clause 5.5.3 of IS: 458/2003 (Fourth Revision) with up-to-date amendment. The manufacturer shall submit the results of Compressive Strength Tests of Concrete Cubes made from the Concrete used for the pipes. Alternatively, if the manufacturers do not have the facilities for Compressive Strength Test on Concrete Cubes, they shall

get the Test done at CSIDC laboratory at least once in a month and submit the report to the Inspecting Officer for review.

1. Manufacturer shall submit his own Certificate for materials of construction used in the pipes.

2. Manufacturer shall submit Test Certificate for the Steel used for Reinforcement.

3. Manufacture's Test Report of Rubber Rings shall be submitted for review (in case of Pipes with Socket & Spigot ends).

4. Manufacture's having E.P.M rate contracts shall have to provide the certification from E.P.M authorities.

4.0 TESTS:

All required tests shall be conducted as per procedure & methods according to IS: 458-2003 & IS: 784-1978.

As per prevailing practice, the following Tests/Checking shall be carried out.

1. Visual examination,

2. Permeability Test and

3. Three Edge Bearing Test to produce 0.25 mm crack.

4. Any other Tests that are mentioned in IS: 458/2003 (Fourth Revision) with up-to-date amendment shall be carried out if desired by the Consignee.

NOTE:

1. The tolerances on Pipes shall be as per clause 8.2 & tolerances on Collar shall be as per Table No. 21 of IS: 458/2003 (Fourth Revision) with up-to-date amendment.

2. Workmanship & Finish of the Pipes & Collars shall be as per Clause 9 of IS: 458/2003 (Fourth Revision) with up-to-date amendment.

3. The length in which the pipes are to be supplied shall be as per the mutual agreement between the purchaser and the supplier. However, the recommended length above 300 mm Nominal Diameter is 2.5 meters.

4. Curing of the pipes shall be done as per the Clause 7.4 of IS: 458/2003 (Fourth Revision) with up-to-date amendment.

5. Rubber Ring chords used in the Pipe joints shall conform Type 2 of IS: 5382/1985 with up-to-date amendment.

6. The following information shall be clearly marked on the each Finished Pipe.

   a. Size of Pipe,

   b. Class of Pipe, and

   c. Name of manufacture.

7. The supplier shall guarantee the Pipes and Collars for a period of 12 months from the date of receipt of the materials by the consignee.

5.0 Transportation:-

Pipes shall be transported form factory to work site mostly by trucks or trailers. Loading & unloading must be done by mobile cranes or Hydra Cranes & lowered carefully to the bed of carrier trucks with such cushioning material sand or pebbles or Murom as available. The sides of the pipes shall be prevented from rolling & dashing with each other during transportation by suitable wooden wedges fixed securely to the bed of transport vehicle. Similarly while unloading from vehicles at work site due care shall be taken to lower the Pipes to a level surface slowly so as to avoid any jerk or impact. Protection against rolling & dashing against other pipes or hard materials like rock out crops etc., by sand bags of adequate numbers on both sides.

6.0 Laying of pipes in position, filling of trenches.

Laying of pipes will be done inside trenches excavated for the pipes by moveable cranes (Hydra Cranes). Tackles for lifting should be carefully placed so that the pipes are lifted in a horizontal manner & don't tilt or slip during shifting & lowering. Pipes are to be placed on the prepared & compacted bed as for as in a straight line & completely horizontal bedding slowly without any jerk or impact. After lowering a few pipes end to end, they should be carefully aligned and the end faces brought closer so as to form a flush joint. After due checking of levels & the alignment by competent authority, filling up of the sides of the trench should start with selected excavated materials, layer by layer & manually compacted till desired top level is reached.

7.0 Provision for manholes

Suitable manholes for cleaning shall be provided 50m apart.

P.S- Contractors may also adopt other systems like RCC barrels of suitable size for the conductor system of raw water to pump houses. Specification of RCC provided in section-III will be followed.

B. M.S PIPE LINE

1.0 DETAILED TECHNICAL SPECIFICATIONS OF M.S. PIPELINE

1.1. APPLICABLE CODES & SPÉCIFICATIONS (M.S. PIPES)

The following specifications, standards and codes are made a part of the specification. All standards, tentative specifications, specifications, codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions.

In case of discrepancy between this specification and those referred to herein, this specification shall govern.

1.	IS : 2062	Steel for general structural purposes.
2.	IS : 814	Covered Electrodes for manual Metal Arc Welding of carbon and C-Mn steel.
3.	BS EN 499	Welding Consumables covered Electrodes for Manual Metal Arc Welding of Non Alloy and Fine Grain Steel. Classification
4.	AWS : A-5.1	Specification for Mild Steel Covered Arc Welding Electrodes.
5.	IS : 3613	Acceptance Tests for Wire Flux combinations for Submerged – Arc Welding.
6.	AWS : A-5.17	Specification for Bare Mild Steel Electrodes and Fluxes for Submerged Arc Welding.
7.	IS : 1377 -	Technical Supply Conditions for Threaded Fasteners
8.	IS : 1367	Technical Supply Conditions for Threaded Fasteners (Parts 1 to 3).
9.	IS : 2074	Ready Mixed Paint, Red Oxide Zinc Chrome and Priming.
10.	IS : 102	Ready Mixed Paint, Brushing, Red Lead, non setting Priming.
11.	IS : 816	Code of practice for use of Metal Arc Welding for General Construction in mild steel.
12.	IS : 4353	Submerged Arc Welding of Mild Steel & Low Alloy Steels – Recommendations.

13.	IS : 817	Code of practice for Training and Testing of Metal Arc Welders.
14.	IS : 1182	Recommended practice for Radiographic examination of Fusion -Welded Butt Joints in steel plants
15.	IS : 2595	Code of Practice for Radiographic Testing.
16.	IS : 3658	Code of Practice for Liquid Penetrant Flaw Detection
17.	IS : 5334	Code of practice for Magnetic Particle Flaw Detection of welds.
18.	ASTM E 94	Guide for Radiographic Testing
19.	ASTM E 709	Guide for Magnetic Particle Examination.
20.	ASTM E 165	Test Method for Liquid Penetrant Examination.
21.	IS : 3600	Methods of Testing Fusion Welded Joints and weld metal in Steel (Parts 1 to 9)
22.	IS : 4853	Recommended Practice for Radiographic Inspection of Fusion Welded Butt Joints in Steel Pipes.
23.	IS : 3589	Seamless or Electrically welded steel pipes for Water Gas And Sewage (168.3 to 2540 Outside Diameter)
24.	IS : 6631	Steel pipes for Hydraulic Purposes
25.	IS : 7343	Code of practice for ultrasonic Testing of Ferrous Welded Pipes And Tubular Products
26.	IS : 2598	Safety Code for Industrial Radiographic Practice
27.	IS : 5822	Code of Practice for Laying of Electrically Welded steel pipes For water supply
28.	IS : 1608	Mechanical testing of Metals.
29.	IS : 9595	Metal Arc welding of Carbon and Carbon-Manganese Steels.

30.	IS : 2825	Code of unfired Pressure Vessels
31.	IS : 5504	Code for Spiral Arc Welded pipes
32.	I.S. 10748	Requirement of weldable hot rolled carbon steel strip incoils.

1.2. MATERIALS

1.2.1 Steel Plates / H. R. Coil

The steel used for pipes, fittings, specials and stiffeners shall be of mild steel conforming to IS: 2062, grade B Fe 410 or H. R. coil confirming to IS: 10748 grade III or equivalent ISO. The dimension of HR coils shall conform IS: 2062.The quality of steel, chemical composition and tensile strength of the steel plates shall be as specified in IS: 3589 for steel of grade Fe 410. Positive tolerance as per IS: 3589 shall be allowed for plate thickness, but no negative tolerance shall be allowed.

Steel plates should confirm to IS: 1730, Dimensions for Steel Plates, Sheets, Strips and Flats for General Engineer-in-Charge Purpose. The test certificate for the plates shall be issued by Plate Manufacturer.

1.3. Minimum thickness of the MS pipe line:

The thickness of the plate for the manufacturing of the MS rising main shall be governed by the economic sizing of the pipes analysed in line with the guidelines of CPHEEO manual and BIS Standards. However less than 8 mm thickness of pipe shall not be acceptable.

1.4. Welding Consumables

Welding consumables Such as electrodes, filler rods and wires shall conform to IS: 814, IS: 3613, IS: 6419 and IS: 7280.

1.5. Standard Length of pipes

The MS pipes shall be manufactured in lengths of 10 to 13m with beveled ends. Length of each pipe shall be measured at diametrically opposite four places and average of the four measured lengths shall be considered for measurements of pipe length.

1.6. Welding process

The pipes shall be manufactured by shop welding from steel plates only by qualified welders, butt welded either spirally or longitudinally by automatic submerged arc welding process using at least two runs, one of which shall be on the inner side of the pipes. Welding shall be so done that there will be through fusion and complete penetration and shall be free from cracks, oxides, and slag inclusion and gas pockets. Longitudinally welded pipes shall have circumferential weld at not less than 1.5 m centre to centre. Longitudinal weld shall be staggered.

Minimum distance between spiral welds should be 1.5 m. The contractor shall certify that the welding of pipes has been done by qualified welders and welding operators.

1.7. Deviation in Length

Finished pipe length shall not deviate from straightness by more than 0.2 percent of the total length.

1.8. Straightness of Pipes

Finished pipes shall not deviate from straightness by more than 0.2% of the total length checking for straightness shall be carried out using as taut string or wire from end to end along the side of the pipe to measure, the greatest deviation. Pipe ends shall be at right angle to the axis within 1^{o}.

1.9. Radiographic / Ultrasonic test

Three percent of all seams of pipes, welded in the fabrication shop, shall be radio graphed at the end of pipe (as per IS: 4853) to render visible inspection of any internal defects such as blow holes, slag, inclusion of cracks. If any defects are detected, the metal at the location shall be gouged out and re-welded. In addition to the radiography of the joints, 100 percent testing by ultrasonic equipment (as per IS: 4260) shall also be done for welding tests. Any defects found out shall be rectified free of cost. Welds found deficient in quality shall be removed by gouging or melting and remade as per specifications. Chipping or cutting the weld shall not extend to the base metal. Gouging of defective welds should be done carefully by experienced welders so that no damage to the original plate base metal occurs.

1.10. Hydraulic Test at Works

Each pipe shall be hydraulically tested at manufacturer's works before applying any coating / lining.

1.11. Allowable tolerance

- Allowable tolerance for outside diameter shall be ± 0.75% of the specified diameter.
- Allowable tolerance for ovality shall not be more than 1% of the specified diameter.
- Negative tolerance for plate thickness shall not be allowed.

1.12. Sampling and testing

Sampling and conformity criteria for various tests shall be as given in IS: 4711. The test samples shall be cut from pipes in the final condition of supply. Tests for tensile strength, percentage elongation, guided bend test, shall be carried out and the test values shall be in conformity with those specified in IS: 4711.

1.13. Destructive Test

The destructive test of pipe joints on the field shall be carried out as per IS 3600. It will be one for every rising main and for every two km of manufactured length.

1.14. Third party inspection

The pipes ready in the manufacturer's work yard shall be inspected and tested before dispatch, by the employer and or inspecting agency appointed by the employer. All the tests including hydraulic test shall be carried out on specified number of samples from each lot as specified in IS: 4711, in presence of the inspecting agency. The protective coating as per specification shall be applied to the pipes only after the inspecting agency is satisfied regarding the test results, which shall be in conformity with the limits specified in IS: 4711. The contractor shall produce the test certificate issued by the inspecting agency.

1.15. Application of Red oxide

The pipes cleared by the inspecting agency shall be provided with one shop coat of red oxide as per relevant IS, externally, prior to despatch.

2.0 Manufacture, Supply, Laying and Jointing of MS specials

2.1. Fabrication of specials and appurtenances

Specials such as bends, tapers, and tees shall confirm to IS: 7322. Specials shall be fabricated by cutting plates / HR coils of required thickness to the required shape, obtained by developing the form of specials on ground. Abutting profiles shall be obtained using templates, which guide the cutting torches as to obtain a uniform cut. No hand cutting shall be permitted. Specifications for using and testing of the plates, electrodes, welding process, etc shall be the same as for the MS pipes. Plain ends shall have beveled edges. Specials shall be manufactured as per the standard drawings enclosed in the tender documents. Stiffeners shall be provided wherever necessary.

2.2. Requirement

Specials as specified below may be required. Slight variation may be possible as per the site conditions.

- Horizontal and vertical bends
- Air valve tees
- Washout valve tees
- Access manhole tees with blank flange
- Eccentric reducers (tapers)
- Steel strap ring and bearing plates at chairs proposed for the above ground pipeline.
- Stiffener rings for pipes and specials as required and as directed by the Engineer-in-Charge.
- Blank flanges etc.

2.3. Bends, tees and tapers

The testing of these specials is not envisaged at the fabrication stage. These shall be subjected to test when the completed pipeline is tested hydraulically. In view of this, the contractor shall fabricate these specials with due care so that there is no failure of any welded joint during testing of the completed pipeline, which will invite dewatering the main, repairing and retesting.

2.4. Eccentric tapers (Reducers)

The tapers shall be fabricated in one or more pieces as may be necessary according to their lengths and plate sizes available. Stiffener rings shall be provided as necessary and as directed by the Engineer-in-Charge. The tapers shall be eccentric with bottom portion straight and top reducing as shown on drawing.

2.5. Stiffener rings

Stiffener rings shall be provided for the pumping main on each side of air valves, washout valves, on line valves and access manholes to strengthen the pipe at provided openings.

2.6. Bearing plates and steel strap rings

Bearing plates, equal in width of chairs and thickness as shown on approved drawings shall be straps of size and thickness as shown on drawings shall be provided and fixed for pipe anchorage with the chair supports. The straps shall be welded to MS angle on either end and anchored with the chair concrete by providing MS bolt as shown on drawing.

2.7. Gas Cutting For Ms Pipes

Cutting of the pipe for providing tees for air valves, washout valves, preparation of manhole openings, etc becomes necessary. The edges of the specials are required to be cut to match with the pipe edge for proper jointing and welding. Plate cutting operations at such places are performed with the use of gas cutting.

3.0 PROCEDUREFOR RECEIVING STEEL PIPES

3.1. General

To ensure that the work of erecting pipes is not held up at any stage and place, the Contractor shall maintain an adequate stock of standard specials, flange rings, plug plates, manhole covers, etc. and short length of smaller diameter pipelines, etc. at site in his field stores, in consultation with the Engineer. Wherever possible, the Contractor shall arrange one full month's requirement of pipes, specials, etc. stacked along the alignment.

3.2. Stacking of pipes, etc. and Inspection

The Contractor shall keep in each section a responsible representative to take delivery of the pipes, specials and appurtenances, etc. transported from the fabricating stockyard or received from any other work site to the site of laying and to stack along the route on timber skids. Padding shall be provided between coated pipes and timber skids to avoid damage to the coating. Suitable gaps in the pipes stacked shall be left at intervals to permit access from one side to the other. The pipes, specials, appurtenances so received on site shall be jointly inspected and defects recorded, if any, such as protrusions, grooves, dents, notches, damage to the internal coating etc. shall be pointed out

immediately to the Engineer at the site and in the acknowledgement challans. Such defects shall be rectified or repaired to the satisfaction of the Engineer entirely at the Contractor's risk and cost.

3.3. Handling of Pipes, Specials, Appurtenances, etc.

It is essential to avoid damage to the pipes, fittings and specials, etc. or their coatings at all stages during handling. The pipes and specials shall be handled in such a manner as not to distort their circularity or cause any damage to their surface treatment. Pipes shall not be thrown down from the trucks nor shall they be dragged or rolled along hard surfaces. Slings of canvas or equally non-abrasive materials of suitable width of special attachment shaped to fit the pipe ends shall be used to lift and lower coated pipes to prevent damage to the coating. Great care shall be taken in handling the pipe right from the first operation of manufacture until they are laid and jointed. The Contractor will provide temporary props in order to prevent any sagging of the pipes while they are stacked in their yard and while transporting to the site of delivery, i.e. laying. The props shall be retained until the pipes are laid. If at any time these props are found to be dislodged or disturbed, the Contractor shall immediately reinstate them in such a way that the true shape of the pipe shell or specials is maintained to the satisfaction of the Engineer. No defective or damaged pipe or special shall be allowed to be used in the work without rectification to the satisfaction of the Engineer. Any damage to the coating shall be repaired by the Contractor at his own cost to the satisfaction of the Engineer.

3.4. Dents

Whenever any dent, i.e. a significant alteration of the curvature of the pipe shell is noticed, the depth of the dent shall be measured between the lowest point of the dent and the pipe shell curvature line. All dents exceeding 2 percent of the outer diameter of the pipe shall be removed by cutting out a cylindrical portion of the pipe and replacing the same by an undamaged piece of the pipe. The Engineer may permit insert patching if the diameter of the patch is less than 25 percent of the nominal diameter of the pipe. Repairs by hammering with or without heating shall not be permitted. Any damage to the coating shall also be carefully examined and rectified.

3.5. Marking

The component parts of the pipes shall be carefully marked for identification in the field. The marking shall be on the side, which will be the inside of the pipe after bending. The marking operation shall be conducted with full size rulers and templates. Only blunt nose punches should be used. The plates used for fabrication of pipes shall be laid out in such a way that when the shells are completed one set of original

identification markings for the material will be plainly visible. In case these markings are unavoidably cut out, they shall be accurately transferred by the Contractor to a location where these markings will be visible on the completed work. After hydraulic tests on the specials and other items, the number of the shell in the line as it will be erected and the direction of flow shall be stamped in a prominent manner on each piece.

A register shall be maintained in suitable proforma giving the following information for each shell tested:

(a.) Serial No.

(b.) Shell No.

(c.) Date of test

(d.) Thickness and specification of steel

(e.) Weight of shell tested

(f.) Maximum test pressure

(g.) Details of test performance

(h.) Details of radiographic examination of welds

(i.) Name of Engineer's representative witnessing tests

A copy of these details shall be furnished to the owner at free of cost.

4.0 SPECIFICATION FOR LIQUID EPOXY COATING SYSTEMS FOR INTERIORCOATING OF STEEL WATER PIPELINES:

Providing & applying internal lining / painting / coating to MS pipe with solvent free food grade epoxy having dry film thickness of 406 microns including scrapping the surface of the pipe.

4.1 General

Buried steel pipeline shall be coated internally, with a single coat two part solvent free high build liquid epoxy lining as per AWWA C210-07 suitable for potable water application and shall be approved by NSF International Standard NSF/ANSI-61 2004 or by water regulations advisory scheme (WRAS), UK or Central Food Research Institute,

Mysore as per standards BS 6920 UK. Protective lining shall consist of a coating system consisting of 100% solids epoxy comprising of resin & hardener mixed in a proportion as recommended by the manufacturer. The mixed epoxy shall be applied to abrasive blasted steel surface in the coating plant using plural hot airless spray machine with extended boom to apply the lining to a smooth finish without any drip or sag. The epoxy shall also be capable of application by brush at field joint locations and repair of damages to the spray applied epoxy.

The Contractor shall perform all work in accordance with these specifications and the latest pipeline coating practices, and shall complete the work in all respects to the full satisfaction of the Owner / Owner's Representative. The entire coating operation starting from cleaning and surface preparation till coating shall be performed under the supervision of skilled personnel who are well conversant with the work. Pipes which have been cleaned and primed, or cleaned, primed and coated, without having been inspected and approved shall be rejected.

This specification is not intended to be all inclusive and the use of guidelines set forth here does not relieve the Contractor of his responsibility for the quality and performance of the applied coating system, and to supply coating material capable of performing its intended service.

All steel special sections, connections fittings and field joints to be used for underground steel pipeline shall be internally coated with same liquid epoxy.

4.2 Reference Standards

The following standards (latest revision) referenced below are a part of this specification.

In case of conflict between this specification and the referenced standards, this specification shall apply

(a) ANSI/AWWA C210 - Standard for Liquid Epoxy Coating Systems for the Interior & Exterior of Steel Water Pipelines.

(b) NSF/ANSI 61 – Standard for Drinking Water System Components- Health Effects.

(c) ANSI /ASTM D149 - Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.

(d) ANSI/ASTM D3359 - Standard Test Method for Measuring Adhesion by Tape Test.

(e) ANSI/ASTM D3363 - Standard Test Method for Film Hardness by Pencil Test.

(f) ANSI/ASTM D4417 - Standard Test Method for Field Measurement of Surface Profile of Blast Cleaned Steel.

(g) ANSI/ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.

(h) ANSI/ASTM D2240 – Standard Test Method for Rubber Property – Durometer Hardness

(i) ANSI/ASTM D5000 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser

(j) SSPC-PA 2 - Measurement of Dry Paint Thickness with Magnetic Gauges

(k) SSPC-SP l - Solvent Cleaning

(l) SSPC-SP 6/NACE No. 3 - Commercial Blast Cleaning

(m) IS 16676:2017 Specification for solvent less liquid epoxy system for application on the interior and exterior surface of steel water pipeline.

4.3 Internal Lining System

The internal epoxy lining shall consist of chemically cured resin (epoxy) & hardener (curing agent), mixed in the ratio as recommended by the manufacturer and applied to a dry film thickness (DFT) of minimum 406µ.

Table-1 Physical properties of the internal lining shall be as follows.

Property	**Requirement**	**Test Method / Reference**
Long term contact with potable water	No effects for human consumption as certified by NSF International	NSF / ANSI -61

Property	Requirement	Test Method / Reference
Thickness (applied min)	406µ	SSPC-PA 2
Thickness deviation (min)	- 0 / + 200µ	SSPC-PA 2
Dielectric strength (min)	450 V/mil (15 V/µm)	ASTM D149
Hardness Shore D	85 (min)	ASTM D2240
Adhesion to Steel (min)	800 psi	ASTM D4541
Tabor Abrasion	1560 cycles / mil	ASTM D4060
Compressive strength	70 MPa	ASTM C109

4.3.1 Coating Application for bends, joints etc.
General

For internals of bends, short section of pipes, tees, fittings etc., internal epoxy will be manually spray applied either in the coating plant or in the field using suitable two component airless plural spray machine.

Internal field joint coating shall be brush applied.

The internal epoxy lining shall be applied only on blasted steel surface.

4.3.2 Pipe preparation
Metal surface condition

Internal surface of the pipe shall be free from mud, mill scale, mill lacquer, wax, oil, grease, or any other foreign material. Before blast cleaning, surfaces shall be inspected and pre-cleaned according to SSPC-SP 1 to remove oil, grease, and loosely adhering deposits. Visible oil and grease spots shall be removed using a solvent. Only solvents that do not leave a residue shall be used. Preheating to remove oil, grease, and mill scale may be used provided that all pipe is preheated in a uniform manner to avoid distortion.

After drying and removing all loose adhering foreign materials, the pipe surface shall be cleaned by blasting with grit or steel shots to achieve a surface preparation at least equal to that specified in SSPC: SP6/NACE3. The blast anchor pattern or profile depth shall be 2 mil to 3 mils (50 μm to 75 μm) measured in accordance with ASTM D-4417.

For consistent surface finish, a stabilized working mix shall be maintained in abrasive recycling blasting machines by frequent small additions of new grit, shot infrequent large editions shall be avoided. The abrasive working mix, abrasive recycling blasting machines shall be maintained clean of contaminants by continuous effective operation of blasting machine scalping and air-wash separators.

The cleaned interior pipe surface shall be in inspected for adequate surface preparation. Surface imperfections, such as slivers, scabs, burrs, weld spatter, and gouges, shall be removed by hand filing or grinding if necessary to prevent holidays.

Blast-cleaned pipe surfaces shall be protected from conditions of high humidity, rainfall, or surface moisture. No pipe shall be allowed to flash rust before coating. To ensure a dry pipe surface at the time of liquid epoxy application, the minimum steel substrate temperature shall be 10°C and at least 3°C above the dew point.

4.3.3 Application temperature

The temperature of the mixed coating material and of the pipe at the time of application shall be not lower than 10^0C. Preheating of the coating material by using in line heaters to heat the coating material may be used to facilitate the application. Heating shall conform to the recommendations of the epoxy coating manufacturer.

4.3.4 Application of epoxy

The epoxy shall be applied directly to the abrasive roughened steel surface pipe using a hot plural component airless spray equipment, with all necessary ancillary equipment like spraying boom etc, in accordance with the epoxy coating manufacturer's recommendations. Pipe will be rotated at a suitable speed and the boom of the spray machine carrying the spray gun will travel inside the pipe at a pre-determined speed to ensure that thickness of minimum 406 microns is achieved in one single spray application.

4.3.5 Curing

After application of epoxy, curing of the epoxy shall be natural air convection. Typical dry time of the epoxy at ambient temperature of 25-400C shall be between one hour to three hours. Shore D hardness of the epoxy after 10 hours shall be > 65.

Internal coating cutback on either side of the pipe shall be 75 mm +/- 25 mm.

4.3.6 Field Joints

After the main pipes have been welded in the trench, internal epoxy coating shall be applied on the inside of the pipeline at the girth welds using brush application. Internal epoxy for field joint coating shall be supplied by the same manufacturer and shall be NSF approved. The epoxy shall be supplied in small cans of appropriate size required per joint with applicator pad. The internal surface of the field joint shall be inspected and weld spatter or slag shall be removed by grinding.

The internal surface shall then be manually blasted to remove rust / contamination etc. The resin & hardener will be mixed and the coating applied to a minimum thickness of 406µ. The internal field joint coating shall overlap the factory applied main line internal coating by 50mm on either side.

4.4 Material acceptance, inspection and testing

4.4.1 Material acceptance

Proposed internal epoxy lining materials shall be approved by the Owner / Owner's representative. Test certificate from independent third party test laboratory shall be submitted conforming compliance to the physical properties as listed in Table I. No deviation to the physical properties shall be acceptable.

When the material is supplied, acceptance of the material shall be based on submission of certificate of conformance of the internal epoxy to this specification along with manufacturing acceptance test certificates for various lots as per manufacturer's quality assurance and quality control requirements.

4.4.2 Coating application inspection

The entire internal lining operation by the Contractor will be supervised by qualified experts from the manufacturer. The CV of the manufacturer's expert shall be approved by the Owner / Owner's representative. All coating work will be done in the presence of the Owner / Owner's representative.

4.4.3 Thickness

Thickness of the coating system shall be checked in accordance with SSPC-PA 2. Thickness shall be in accordance with the values given in the Table I and shall be checked at a frequency specified by the Owner / Owner's representative.

4.4.4 Pull Off Adhesion

The pull off adhesion of the internal epoxy lining to steel shall be checked in accordance with ASTM D-4541. The average value below the limits stated in the Table I shall constitute a failure of the system to meet the adhesion requirement. The pull off adhesion test shall be conducted at a frequency specified by the Owner / Owner's representative.

4.4.5 Field procedures

At all times during construction of the pipeline, the Contractor shall use caution to prevent damage to the internal lining on the inside of the pipe. No metal tools or heavy objects shall be permitted to unnecessarily contact the finished coating. Workmen shall not be permitted to walk on the internal coating except when necessary. In these cases, they shall wear shoes with rubber or composition soles and heels or other suitable footwear that will not damage the coating. Any damage to the pipe or the protective coating from any cause during the installation of the pipeline shall be repaired.

4.4.6 Coating repair in field

All defects visually or electrically discovered either at the coating plant or in the field shall be repaired by applying the same liquid epoxy coating using brush. The minimum over-lap at the damaged area shall be 100 mm all around. The repaired area shall be tested with a holiday detector as per specifications after the repair is completed. The thickness of the coating at the repair area shall be minimum 406µ.

Epoxy Painting for Internal Surface of Pipes and Specials

The epoxy coating shall be solvent-less, liquid epoxy coating of at least 406 microns thickness, for the interior surface of steel pipe lines & conforming to IS 3589: 2001. Epoxy paint to be used for this work shall be suitable to local environmental conditions / ambient conditions.

4.4.7 General

All steel pipes and fittings outside the pumping station shall be internally lined with a spray applied solvent free epoxy approved for contact with potable water under the United Kingdom Water Regulations Advisory Scheme authorized for use under Regulation 31 (4)(a) of the water supply (Water

Quality) Regulations 2000 for contact with potable water. The applicable specifications for the coating system shall be suitable to potable water at elevated ambient / air temperature tested as per BS – 6920. AWWA C210 is referred standard for coating application as per Sec. 4.4. Surface preparation application condition, post treatment of coated surface to be as per manufacturer's specifications.

Paint – NSF standard 61 – NACE RP – 01 – 75. paint should be suitable for long timestoring or potable water in the pipeline.

4.4.8 Materials & Workmanship

The coating system shall be factory lined and the lining shall be suitable for application in an environment with black bulb temperature up to 85 deg C.

All steel pipes shall be lined at the factory. Pipes welded on site shall be lined on site to the same standards as for pipes.

Pipe ends – coating shall be held back in from the ends of pipe sections to be jointed by field welding.

Detailed proposals of the lining method, materials and apparatus to be used for both factory and site application shall be submitted to and approved by the Engineer before work starts. Storage and application shall be accordance with recommendations of the coating manufacturer, but as a minimum:

a) A visual examination of the surface to be coated shall be carried out and any slivers or similar deposits removed.

b) Prior to blasting all oil and grease shall be removed from the surface to be coated.

c) Preparation of steel surfaces for both factory and site application shall be to a minimum of Sa 2 ½ in accordance with BS 7079/ ISO 8501-1:2007 specifications /or as per client specifications and roughness should 50-75 micron.

d) The surface to be coated shall be dry, clean and free from foreign material and coating shall take place before any surface rusting and at least within 4 hours of blasting.

e) Surface preparation and coating shall not be carried out when the relative humidity exceeds 85% or when the surface to be coated is less than 3 deg C above the dew point.

f) The coating shall have a minimum mean dry film thickness of 406 microns.

g) Coatings shall be used within the pot life specified by the manufacturer.

h) The materials to be used for the work of each batch, test certificate shall be reviewed.

i) Paint shall be applied by brush / air less or conventional spray method.

Pipe linings shall be inspected on site and damaged, defective or otherwise unsatisfactory linings may be condemned. All defective areas shall be made good to the satisfaction of the Engineer.

4.5 Inspection and Testing:

It will be detailed in the contractor's Quality Plan and will be undertaken as minimum to the following:

a) Visual Inspection of blasted profile on every pipe to be coated.

b) Visual inspection of finished coating on every pipe.

c) Measurement of coating thickness at four points on each pipe.

d) The completed pipe shall be subjected to holiday detection tests which shall be carried out to the satisfaction of the Engineer. The applied voltage shall be hose appropriate to the coating under test as recommended by the coating material manufacturer.

e) The adhesion test as per clause no. 5.1.6 of AWWA-C-210.07 shall be carried out on one pipe per lot of every 10 pipes. Two parallel knife cuts about 100 mm long and 20 mm apart shall be made through the coating. If necessary, the test knife may be heated to make the cut. The painted surface between two cuts shall be lifted off the pipe with a stiff blade. If the paint film does not pill-off, more than the width of the cut, the bond shall be deemed to be satisfactory. If the width of the peel exceeds the width of the cut, two additional tests shall be made on the same pipe at two different locations. The painted surface shall be accepted if both the tests are satisfactory. If the results of either of the tests are un-satisfactory, the painting work of pipeline shall be rejected. Adhesion test shall be performed on 1 pipe out of 10 pipes. If the adhesion test fails for one pipe, then this test shall be performed on all the remaining 9 pipes of that particular lot.

f) Prior to acceptance and application of the material, the Epoxy coating material shall be submitted by the contractor & shall be tested in an independent third party / vendor's test laboratory designated by the purchaser, in presence of client / consultant and the results shall be in accordance with the specified standards. The frequency of the test shall be minimum 1 sample in every 10000 liters or per batch of the coating material. Tests like: Specific Gravity, Hardness (shore – D), Adhesion to steel, Tabor abrasion, pull-off adhesion tests, will be carried out.

g) Rejection: If the sample of coating material does not comply with the standard, the coating material represented by such a sample shall be rejected.

h) The pull-off adhesion of the internal epoxy lining to steel shall be checked in accordance with the ASTM D – 4541.

i) All holidays visually or electrically discovered either at the coating plant or in the field shall be repaired by applying the same liquid epoxy coating using the brush. The minimum over-lap at the damaged area shall be 100 mm all around. The repaired area shall be tested with a holiday detector as per specification after the repair is completed. The thickness of the coating at the repair area shall be minimum 406 micron.

4.6 Preservation, Marking and Shipping Preservation

4.6.1 Preservation

The bare ends of each pipe shall be painted outside with a removable varnish as temporary corrosion protection during transportation.

Bevel protectors of a type to be approved by the Engineer shall protect the bare ends of each pipe.

4.6.2 Marking

In addition to the marking required by API 5L, the specification MO1 "Steel Pipes for Main lines and other applicable project specifications, the Pipe Coating Contractor's unique coating number shall be marked to the internal surface or the pipe with synthetic resin paint.

Further marking details like colour coding etc. shall be agreed upon with the Engineer.

The marking shall have at least a distance or 150 mm to the pipe end.

4.6.3 Shipping

Shipping and Loading preparation shall be in accordance with API Specification 5L or otherwise stated in the contract documents.

The pipe coating Contractor shall submit detailed loading, stacking- and shipping procedures for approval by the Engineer.

4.7 Documentation

4.7.1 Pre-Production Documentation

The Pipe Coating Contractor shall submit the following documents to the Engineer for approval prior to commencing production:

a) The manufacturer's trade name and data sheets for all proposed coating materials. This includes cleaning and abrasive blasting consumables.

b) Procedure for identifying or maintaining the identification of each coated item.

c) Handling procedure.

d) Stacking procedure.

e) Materials control and traceability procedure for the batches of coating materials.

f) Materials control and traceability procedure (pipe and coating materials).

g) Procedure for steel surface preparation including materials, cleaning, inspection, verification of cleanliness and surface profile.

h) Coating application procedures.

i) The results of the batch tests for batches to be used for pre-qualification tests.

j) Details of testing methods including instrument types and copies or current calibration certificates.

k) Details of inspection methods for bare and coated pipe.

l) Full test results from the coating Procedure Qualification Test (PQT).

m) Repair procedure and results or tests on demonstration of repairs.

n) Project specific Quality Plan. Work shall not commence until these procedures have been reviewed and approved by the Engineer.

The selection of proposed coating materials shall be subject to Engineer's approval

4.8 Production Records

A daily log containing the following data shall be maintained and be available for inspection by the Engineer during and/or after production. Data shall be recorded against the pipe unique identification number.

a) Bare pipe inspection data

b) Ambient temperature (every 4 hours)

c) Humidity (every 4 hours)

d) Coating progress (no. of items coated. Including item serial numbers)

e) Blast pipe surface amplitude

e) Tests for cleanliness of blast surface

f) Test for cleanliness or blast medium

g) Film thickness measurements

h) Average, maximum and minimum coating thickness during each shift

i) Details of any coating repairs

j) The unique identification number of all items that are stripped for recoating – 'RP'

k) Pipe coating test results

This log shall be available to the Engineer throughout all coating operations.

4.9 Release Documentation

The Pipe Supplier and/or Pipe Coating Contractor shall submit to the Engineer the following documentation in hard copy and softcopy (format to be agreed upon with the Engineer) with each batch of pipes released:

a) Mill certificates for line pipe
b) Unique pipe identification numbers
c) Unique coating identification number (if different)
d) Pipe length
e) Length of the coated portion of each pipe and total coated lengths of all pipes.

f) Reductions in length due to use in tests, damage or repairs, recorded against pipe unique identification number
g) Date or coating
h) Batch numbers of coating materials used
This shall be followed within two weeks by the following:

a) Manufacturer's certificates for each batch of coating materials
b) Certification / calibration certificates for all testing and coating equipment
c) Inspection and test records, results, and other documentation of all materials and coating tests

All reports shall be signed by the Pipe Coating Contractor to signify compliance with the requirements of this specification.

The finished epoxy lining surface shall be able to deliver a guaranteed 'C_r' value of (1) one inmodified Hazen-William's formula for estimating pipe friction loss. The arrangement for 'C_r' value testing is to be arranged by the contractor.

5 700 MICRON POLYURETHANEEXTERNAL COATING

5.1 Scope

Technical specification governs requirements for material, equipment, application, inspection, repair and handling aspects associated with the external coating.

5.2 External coating:

External surface of the pipe and specials to be painted with one coat of two part chemically cured polyurethane primer of min 30 micron dry film thickness followed by one of two coats of two part **solventfree polyurethane** provide a high build coating of dry film thickness of 700 micron including primer coat. Polyurethane coating should have good resistance to ultraviolet degradation along with corrosion resistance. PU coating should provide hard yet flexible, with very low water absorption with outstanding adhesion as well as impact and abrasion resistance.

Solventless PU system is to be used eliminating solvent health hazards.

External coating should be carried out at site by Paint Manufacturer as during transportation coating will get damaged.

5.3 General Requirement:

I) The work shall conform to the following documents / specifications (latest revision or as specified)

a) SSPC SP 10 / NACE 2 / Sa2$^{1}/_{2}$ Near white Blast Cleaning .

b) SSPC PA 2 Measurement of dry film Coating Thickness With magnetic gauges.

c) ASTM D 4541Method for pull off strength using portable Adhesion Tester.

d) NACE RP 0274 – 2004High – Voltage Electrical Inspection of Pipeline Coatings.

e) NACE SP 0188 - 2006Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.

f) NACE RP 0169 – 2002Control of External Corrosion on Underground or Submerged Metallic Piping Systems.

g) AWWAC 210 - 2007 Liquid – Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.

h) IS 3589: 2001 Annexure B Steel Pipes for Water and Sewage Specification.

i) AWWA C222 – 2000Polyurethane Coating for the Interior and Exterior of Steel Water Pipe and Fittings.

j) IS 13213 : 2000Polyurethane Full Gloss Enamel (Two Pack)

k) IS 10221 : 2008Coating and wrapping of undergroundMild steel pipelines

l) BIS DOC : CHD 20 (1938) P Solventless Liquid Epoxy System for interior & exterior of Steel Water Pipeline.

m) IS 16719:2018 Specification for Polyurethane coating for interior and exterior of steel pipe and fittings.

n) The steel surface preparation prior to actual commencement of coating shall conform to SSPC SP 10 / NACE 2 / Sa2$^{1}/_{2}$ (near white metal) with sand blasting.

o) The EPC contactor shall submit a detailed written description in the form of a manual covering coating equipment, procedures, materials inspection test, and repair etc. to the Owner for approval.

p) The contractor shall also provide copies of test reports from NABL approved laboratory (like National Test House, Kolkata) evidencing that materials (paints / primer) shall conform to the technical specification.

q) The contractor shall also provide certificates from coating manufacturer quoting batch numbers, date of manufacture and shelf life etc. The contractor shall provide Manufacturing Quality Plan (MQP) and field Field Quality Plan (FQP) before supply of material and starting of work.

r) The coating shall be applied either by coating / paint manufacturer or by their authorized applicator. If done by applicator, then the same has to be approved by the

PD-cum-CE. The authorized applicator should have been trained by and certified by manufacturer and shall possesses the necessary specialized equipment, trained crew and experience in spraying epoxy coating.

s) Applied coating shall be tested for dry film thickness, holiday (electrical inspection for continuity) and adhesion as per relevant standard such as SSPC PA 2, NACE RP 0274 and ASTM 4541.

t) The material may be heated if necessary and applied by airless spray / plural component spray system with minimum wastage.

5.4 COATING PROCEDURE AND APPLICATION

5.4.1 Surface Preparation:

Pipe shall be blast cleaned by sand. The cleanliness achieved prior to application shall be in accordance with the requirement of SSPC SP 10 / NACE 2 / Sa2$^1/_2$of IS0 8501 (near white metal)

a) The blast pattern or profile depth shall be 40 to 100 micron and shall be measured by dial micrometer.

b) Before sand blasting is started or during blasting or coating, temperature of the pipe surface should be more than 3^0 C above dew point temperature. Blast cleaned surface should be primed within 4 hours and shall be protected from rainfall or surface moisture and shall not be allowed to flash rust. If the rust occurs, the surface again to be prepared by sand blasting or wire brushing.

5.4.2 Application of PU Coating

a) PU Coating shall be applied when the pipe surface temperature at least 30 C above due point temperature (when R.H. is more than 85 %)

b) Material preparation and application shall be done as per manufacturer recommendation and shall be applied by plural component machine.

5.4.3 TEST REQUIREMENTS:

5.4.3.1 Measurement of dry film thickness

Measurement of dry film thickness of coating: coating thickness shall be in the range of ± 20% and as per SSPC PA 2.

(i) Apparatus/ Instrument: The instrument used for dry film thickness may be Type I pull of gauges or Type 2 electronic gauges.

(ii) Procedures

a) No. of measurements. For 100 Square feet (9.29 Square meters) five (5) spots per test area (each spot is 3.8 cm.) in diameter. Three gauge readings per spot (average becomes the spot measurement).

b) If the structure is less than 300 Square feet, each 100 square feet should be measured.

c) If the structure is between 300 and 1000 Sq. ft. select 3 random 100 square feet test areas and measure.

d) For structure exceeding 1000 square feet, select 3 random 100 square feet testing areas for the first 1000 Sq. ft. and select I random 100 Square feet testing area for each additional 1000 Square feet.

e) Coating thickness Tolerance: Individual reading taken to get a representative measurement for the spot are unrestricted (usually low or high readings are discarded). Spot measurements (the average of 3 gauge readings) must be

within 80 % of the minimum thickness and 120 % of the maximum thickness. Area measurement must be within specified range.

5.4.3.2 Electrical Inspection (Holiday) Test:

a) All the coated/ Lined pipes shall be tested with an approved high voltage holiday detector preferably equipped with an audio visual signalling device to indicate any faults, holes, breaks or conductive particles in the protective coating.

b) The applied output voltage of holiday detector shall have a spark discharge of thickness equal to at least twice the thickness of the coating to assure adequate inspection voltage and compensate for any variation in coating thickness. The electrode shall be passed over the coated surface at approximately half the spark discharge distance from the coated surface only one time at the rate of approximately 10 to 20m/min. The edge effect shall be ignored. Excessive voltage shall be avoided as it tends to induce holiday in the coated surface thereby giving erroneous readings.

c) While selecting test voltages, consideration should be given to the tolerance on coating thickness and voltage should be selected on the basis of maximum coating thickness likely to be encountered during testing of a particular pipe.

d) The testing voltage shall be calculated by using following formula (as per NACE 0274:2004)

e) Testing Voltage V=7900_T± 10 percent where T is the average coating thickness in mm.

f) Any audio visual sound or spark leads to indicate pinhole, break or conductive particle.

5.4.3.3 Adhesive Pull off Test:

After holiday the coated surface is subjected to adhesion pull off test as per ASTM D 4541

a) Apparatus/ Instrument: Adhesion tester consists of three basic components: A hand wheel, a black column containing a dragging indicator pin and scale in the middle and a base containing three legs and a pulling “jaw” at the bottom and also dollies.

b) Prepare the test surface: Once test area is selected, test area shall be free of grease, oil, dirt, water. The area should be flat surfaces and large enough to accommodate the specified number of replicate test.

c) Prepare Dolly (Test Pull Stub): The dolly is a round, two sided aluminum fixture. Both sides of the dolly looks same, however, one side sloped on top surface while flat on bottom surface. As the surface of the dolly is polished aluminum, roughen the same using a coarse sand paper.

d) Select an adhesive : Use araldite, a 100 % solid epoxy adhesive. This adhesive requires at least 24 hours at room temperature to cure.

e) Attach the dolly to the surface.

f) Using a wooden stick, apply an even layer of adhesive to the entire contact surface area of the dolly.

g) Carefully remove the excessive adhesive by using a cotton swab. Allow the adhesive to fully cure before performing the adhesion test.

h) Attach the dolly to the coated surface and gently push downward to displace any excessiveadhesive.

i) Push the dolly inward against the surface, then apply tape across the head of the dolly.

j) Determine whether scoring is required.

k) Perform the Adhesion Test.

(a) Attach the adhesion tester to the dolly by rotating the hand wheel counter clockwise to lower the jaw of the device.

(b) Slide the jaw completely under the head of the dolly. Position the three legs of the instruments so that they are sitting flat on the coated surface.

(c) Slide the dragging indicator pin on the black column to zero by pushing it downward.

(d) Firmly hold the base of the instrument in one hand and rotate the hand wheel clock wise to raise the jaw of the device that is attached to the head of the dolly. The dragging indicator pin will move upward on the black column as the force is increased and will hold the reading. Apply the tension using a moderate speed. Continue to increase the tension on the head of the dolly until (a) the minimum PSI/Mpa/Kg.cm2 required by project specification is exceeded and the test is discontinued (b) the maximum PSI/Mpa/Kg/cm2 of adhesion tester has been achieved and dolly is still attached (c) the force applied by the adhesion tester causes the dolly to dislodge.

(e) Read the scale and record the adhesion value.

l) The black column near the middle of the adhesion tester contains two scales and a dragging indicator pin in between. Right scale is PSI and left scale is MPa. The dragging indicator Pin will hold the reading until push back to zero. When achieve the end point of test, read the scale across the bottom of the dragging pin.

5.4.4 Coating Repair

Defecting Coating: Coating shall be repaired in accordance with the following subsections.

Surface Preparation: Accessible areas of pipe requiring coating repairs shall be cleaned to remove debris and damaged coating using surface grinders or other means. The adjacent coating shall be feathered by sanding, grinding or other method. Accumulated debris shall be removed by blowing with contaminant free air or wiping with clean rages.

Areas not accessible for coating repair such as interior surface of small Diameter pipe shall be reprocessed and recoated.

Coating Application: The coating system shall be applied to the prepared areas in accordance with procedure.

Repair Inspection: Repaired portion shall be electrically inspected using a holiday detector.

5.4.5 Welded Field Joints

Preparation : The weld Joints shall be cleaned so as to be free from mud, oil, grease, welding flux, weld spatter and other foreign contaminants. The cleaned metal surfaces of the weld joint shall then be abraded using rotary abrading pads or emery paper. The adjacent liquid Epoxy / PU coating shall be feathered by abrading the coating surface for a distance of 25 mm.

Electrical Inspection: After curing the coating system applied to the welding joints shall be holiday tested. Any holidays is indicated by the detector shall be marked with chak to identify the area of repair

6 LOWERING, LAYING & JOINTING OF PIPE

6.1 General

Unless specified otherwise, the pipeline shall be buried with minimum cover of 1.2 m at top, as shown on drawings. No material shall be erected unless it has been previously passed by the Engineer.

Erection of fabricated shells shall be carried out by the Contractor who shall equip himself, at his cost, with all necessary tools, machinery, labour etc. required for the purpose.

6.2 Welding

Except for routine welding of joints, no other work shall be done in the absence of Contractor's engineer, either during the daytime or at night.

Chipping shall not be kept in arrears for more than 15 joints.

Saddle pieces shall be fixed in position after checking bolts holes, by means of templates. These works shall be done together with the pipe laying work, if pipeline is to be laid above ground in unavoidable circumstances.

6.3 Temperature

The components of the pipeline such as base plates, top plates and pedestals have been so designed that the centers of the plates and pedestals shall coincide at the Mean Temperature (30^{o}).

For this reason, all works such as fixing flanges, base plate etc. in true alignment, and incorrect position and tack welding pipes shall be done at the mean temperature. For ascertaining the temperature, the Contractor shall provide mercury cups and fix them to the pipe shell from outside and shall also provide thermometers of the required type and range. No extra payment shall be made for this.

6.4 Saddle Supports

Unless otherwise specified pipeline shall be underground. However at unavoidable reaches it shall be on R.C.C. saddles spaced at about 7 m centre to centre. The material and construction of R.C.C./Steel structures such as saddles, anchor blocks, crossings etc. associated with the work of pipe line shall conform with the relevant I.S. codes, good engineering practice and as directed by the Engineer. The pipes to be laid on saddle supports shall be erected at mean temperature. Saddle supports shall either be sliding type or fixed type. For both the types of

supports a 10mm thick double plate shall be welded to the part circumference of the pipeline that will make contact with the saddle and another similar plate shall also be embedded in the concrete saddle with necessary arrangement to facilitate welding it to the double plate welded to the pipe, in case of fixed support. In case of sliding support, the pipe shall be allowed to slide freely over the plate embedded in the saddle. Alternatively to achieve fixity, the pipe shall be anchored by providing suitable anchor block. The rate for laying the pipe on saddle support shall include for laying, aligning, tack welding, provision of rigging screws with screw eyes etc., complete.

In addition to above, the pipe shall be held in position on saddles with two numbers 50mm x 8mm thick holding down traps fixed to the saddles with holding down bolts and nuts which shall be paid separately under relevant item of bill of quantities.

6.5 Erection of Shells

The erection shall be true to position, lines and grade as shown in the drawings or as modified by the Engineer. The Contractor shall provide at his cost necessary saddles, pads, spider etc., all necessary instruments and other materials and labour required for proper erection of shells in position and for the Engineer in checking the correctness of the erection.

Alignment of sections at edges to be butt welded shall be such that the maximum offset is not greater than the values given below:

Thickness 't' (mm)	**Offset in Longitudinal joints (mm)**	**Offset in Girth joints (mm)**
Upto 12	0.25 t	0.25 t
12 to 20	3 mm	0.25 t
20 to 40	3 mm	5 mm
40 to 50	3 mm	1/8 t
Over 50	**Lesser of 0.0625 t or 10 mm**	Lesser of 0.125 t or 20 mm

The best of welders as selected from their work in the Contractor's workshop shall be selected for in-situ welding of the shells. The relevant provision under welding such as qualification standard for welding procedures, tests on welder's work and removal of defects etc., shall also apply to in-situ welding.

6.6 General Sequence of Operations

Before commencing the work of pipe laying, the Contractor shall study the L-section of the pipeline for the section concerned. He shall also study the details of laying i.e. underground or aboveground. The underground pipeline shall be laid on sand cushioning/bedding as shown on the drawing. The difference in depth due to uneven excavations shall be made up by sand cushioning.

Pipe laying shall generally start from the fixity points on either side, the expansion joints if required for pipeline aboveground being provided last. Fixing points are at all anchor blocks. Where such blocks are not required for long lengths, fixity shall be achieved by fixing the pipeline to the special type of R.C.C. or steel saddles as directed. The distance between successive fixity points shall not exceed 300 m.

Anchor blocks shall be constructed before commencing the pipe laying work in any section. The construction of the blocks shall be carried out in 3 stages: in the first stage the lower part upto 150 mm below the invert of the pipeline including concrete chairs to support it shall be constructed; in the second stage the pipeline on this part of the block shall be laid; and lastly, the remaining block around and over the pipeline shall beconstructed.

The fixity saddles and ordinary saddles if the pipeline is aboveground shall be cast-at least 3 weeks before the pipeline is laid on them. After all saddles between successive fixity points have been cast, a line plan showing the actual position thereof shall be prepared, after taking levels and measuring distances. In case of any errors in casting the pedestals, corrections shall be applied. The pipe laying work shall then start from the fixity points and shall proceed towards the expansion joints. The method of jointing the pipes and erecting them on previously cast R.C.C. saddles shall be determined by the Contractor depending upon the type of plant equipment and personnel available with them.

The pipe strakes shall be assembled in position on the saddles either by the cranes, portable gantries, shear legs or any other equipment approved by the Engineer. Normally, not more than two pipes shall be aligned, tacked and kept in position on temporary supports. The Contractor shall not proceed with further work, until the circumferential joints of these pipes are fully welded. During assembly, the pipeline shall be supported on wooden sleepers and wedges, with the free end of the pipeline held in position by slings to avoid deflection due to temperature variations during the day. In general, the assembly of pipe strakes and one run of welding shall be done during the day time while full welding including the external gouging and sealing runs shall be done after 5 p.m. or so. The Contractor shall maintain the continuity of the work by adding two more pipes on the second day in a similar manner, after full welding of the previous joints is completed during the night. While this new work is being done, the Contractor shall proceed with the work of providing permanent supports for the pipeline assembled and welded previously.

6.7 Fixing Expansion Joint

The work of laying pipeline in aboveground, laying starts from the fixity points and proceeds towards the expansion joints. It shall be continued until the gap between the pipe ends is less than the lengths of the expansion joint plus pipe strake length. At this stage, the exact gap between the pipe ends shall be measured at mean temperature of that locality. Let it be `X'. Similarly, the exact length of the pipe strake and the expansion joint bought at site shall be measured at the same temperature let these be `Y' and `Z' respectively. Normally, the length of the expansion joint (`Z') is standard.

(a) Case when `Y' plus `Z' is more than `X' or equal to `X' (i.e. fixing of expansion joint without strip)

At mean temperature the exact gap between pipes shall be measured. Free ends of pipes shall be brought in a correct line and level; lateral movement, if any, shall be corrected. Then the gap between the free ends shall be made equal to the exact length of the expansion joint by cutting one of the pipe ends. Choice of the end to be cut must be made from the point of view of bringing the expansion joint to a central position.

The expansion joints are normally supplied without packing. The normal length of the expansion joint shall be reduced by about 100 mm by cutting the inside locks and inserting the inner strake by means of

turnbuckles. At mean temperature this expansion joint shall be inserted inside the gap (care being taken to keep the *Volume* – tapered portion on the down-stream side), and both ends shall be tack welded to the pipe ends, after pulling the expansion joint. (Tacks of these two joints shall be of longer length, approximately 100 mm long).

Welding of these two joints of the expansion joints shall be started only after it is ascertained by taking observations that the expansion joint is functioning properly.

The procedure to be followed for taking observations is given in Clause 8.5 (c).

(b) Case when `Y' plus `Z' is less than `X' (i.e. fixing of expansion joints withstrap)

The expansion joint shall be laid in locked position. Before laying the pipes adjacent to the expansion joint, the exact gap between the pipes shall be calculated by taking measurements of the first pipe (upstream of the expansion joint), and the second pipe (downstream of the expansion joint) at Mean Temperature.

If the gap is less than 100 mm, the second pipe shall be cut to make the desired gap of at least 100 mm. If the gap is more than 200 mm, suitable distance piece of not less than 700 mm shall be inserted after cutting necessary length of the first pipe. The second pipe shall then be laid in position. Then a strap of length equal to three times the gap length shall be welded to the pipe, overlapping the second pipe by the gap length. The other end of the strip shall be kept free.

At mean temperature the other end of the strap shall be tacked to the first pipe, after checking of the line and level. Simultaneously, all the locks of the expansion joint shall be removed and chipped off properly.

Welding of the joints between the strap and the first pipe shall be started only after observations are over and it is ascertained that the expansion joint is functioning properly.

(c) Observations

Before fixing the expansion joint, two mercury cups - one on the left and the other on the right side - shall be fixed on the pipe near the upstream side of the expansion joint.

Immediately after the expansion joint in case (a) above or the strap in case (b) above is tack welded, observations for total expansion or contraction shall be started and continued for 48 hours round the clock. Similarly, the central and end fixity pedestals shall be kept constantly under observation.

The expansion and contraction shall be measured by making a temporary marking on the inner strake (on the upstream side) and measuring the distance between this mark and the edge of the gland of the expansion joint.

The observations shall be recorded in the following proforma;

Reading No.	Time	Shell temp on upstream side	Shell temp on downstream side	Atmospheric temperature	Dist between edge of gland and marking
1	2	3	4	5	6

In case the pipeline is laid in trenches as shown on the drawing, after welding and field testing, the trench shall be filled with selected material upto 300 mm above pipes. This backfill shall be provided in layers not more than 150 mm, with a density more than 95% of the standard proctor density. Samples shall be tested as directed by the Engineer. Remaining depth of trenches shall be filled with ground backfill material.

7 SPECIALS

7.1 General

Specials, such as tees, Y-pieces, bends (single or composite), tapers, etc. shall necessarily be in steel and shall be manufactured as per standards and tested and laid in the same manner as the pipes. Small branches, single piece bends, etc. may be fabricated at site, care being taken to ensure that the fabricated fittings have at least the same strength as the pipeline to which they are to be jointed.

7.2 Bends

(a) Bends shall be fabricated taking into account the vertical and horizontal angles for each case.

(b) The bends shall have welded joints and the upstream and downstream ends of each bend shall have a straight piece of variable lengths as required.

(c) Bends shall be designed with deflection angle of maximum 10 deg. Between segments.

(d) When the point of intersection of a horizontal angle coincides with that of a vertical angle, or when these points can be made to coincide, a single combined or compound bend shall be used, designed to accommodate both the angles. The combined bend should have a pipe angle equal to the developed angle, arrived at from appropriate formula.

(e) All joints in bends shall be thermally stress relieved as specified.

(f) Details of thrust collars anchor bolts, holding down straps, saddle plates should be furnished together with full specifications in Contractor's fabrication drawing.

7.3 Manholes

(a) Manholes of 600 mm diameter shall be provided at locations generally 2.5 km apart, with additional manholes at both the sides of butterfly valves. Manholes in the pipeline shall be placed in suitable position in the top quadrant.

(b) The Contractor shall fabricate different parts of manhole in conformity with relevant IS Specification, well established practices and as directed by the Engineer.

(c) The manhole shall be provided with MS blank flange on top. The required MS nut, bolts & rubber packing shall be fixed of standard quality for fixing of flange.

7.4 Closing or Make up sections

Closing or make up sections shall be furnished at appropriate locations on the line to permit field adjustments in pipeline length to compensate for shrinkage in field welded joints, differences between actual and theoretical lengths and discrepancies in measurements.

7.5 Heads

Test heads may be ellipsoidal, standard dished as per ASME code or hemispherical heads. They shall be welded in the shop and removed after the test. Allowance should be made in the length of the pipe section receiving the test head for the welding and removal of the head and preparation of the plate edges for the final weld after testing.

No separate payment will be made for such test heads.

7.6 Walkways, Stairs, Ladders, Hand Rails etc.

Walkways, stairs, rungs, ladders, hand rails, etc. shall be provided as shown in the drawings and/or as directed by the Engineer. They shall conform to well established design and construction for each accessory concerned.

7.7 Flanges

Flanges shall be provided at the end of pipes or special where, butterfly, air valve, scour valve, sluice valves, blank flanges, tapers, etc. have to be introduced. The flanges received from the manufacturers will have necessary boltholes drilled. The Contractor shall assemble the flanges in the exact position by marginal cutting, if necessary, so as to get the desired position of the valves, etc. either vertical or horizontal and shall then fully weld the flanges from both sides in such a way that no part of the welding protrudes beyond the face of the flanges. In case the welding protrudes beyond the flanges and if the Engineer orders that such protrusions shall be removed, the Contractor shall file or chip them off. If required and when ordered by the Engineer, the Contractor shall provide and weld gusset stiffeners, as directed on site. The drilling pattern shall be matching with the drilling pattern of flanges of valves.

7.8 Blank Flanges

Blank flanges shall be provided at all ends left unattended for the temporary closure of work and also for commissioning a section of the pipeline or for testing the pipeline laid. For temporary closures, non-pressure blank flanges consisting of mild steel plates, tack welded at the pipe ends may be used. For pipes subjected to pressures, the blank flanges or domes suitably designed as per Engineer's requirements shall be provided.

7.9 Stiffener Rings

The Contractor shall provide stiffener rings wherever required by design. The Contractor shall weld the same to the pipes with one circumferential run on each side. All fillet welds shall have a throat thickness of not less than 0.7 times the width of welding.

8 FIELD HYDRAULIC TEST

After each section of the pipeline has been completed, it shall be tested for water tightness before being covered. The contractor shall at his own cost fill up water in pipeline & give necessary hydraulic test section by section & the pipeline shall stand the pressure which shall exceed the working pressure by (a) 50% of the highest pressure in the section (b) 30 M whichever us less without showing any leakage or sweating anywhere in the pipe joints, specials, valves, etc. If any defect is found, the contractor shall make good the same at his own cost.

Any leaking joint shall be made good & above test pressure is to be lowered gradually after satisfactory test is over.

The hydraulic test shall be given again if considered necessary by the Executive Engineer or his representative to show that no further leakages or sweating is there. The contractor shall have to make necessary arrangements for water testing as well as plugging the opened pipe, etc. as directed without claiming any extra cost.

It the contractor does not able to manage section wise hydraulic test, hydraulic test shall be observed as below:

After completion of entire pipeline work and commissioning of pump sets (i.e. the project is ready for commission), the entire pipeline shall be hydro tested.

The contractor shall have to take the permission for drawal of water for field-testing of pipe. The cost of hydraulic testing of the installation by providing necessary testing equipments, creating and maintaining pressure and the necessary bulk heads and their fixtures and their subsequent removal and restoring the installation to working stream shall be included in the rate for laying and testing of the pipe. Water charges and electricity charges for field hydraulic testing shall be borne by the contractor.

The pressure test shall be conducted in dry weather to observe whether any leakage takes place or not. For field hydraulic test water will pass through entire pipe line with a working pressure of maximum working pumps for a period of seven days continuously after attaining the required pressure and water reaches at the outlet of transmission main. A leakage equivalent to 0.267 litre per mm of pipe dia. per kilometre of pipeline per day for testing at working pressure applied is permissible. Any leakage beyond that specified herein above shall be rectified to the satisfaction of the Engineer.

Water shall not spout, ooze or sweat either through joints-welded or bolted or the body of the pipe. If any leakage noticed shall be repaired by the Contractor, which shall include coating and repairing of the damaged portion. Repairs and replacements and further testing including the cost of the plates and other raw materials shall be carried out by the Contractor at his own cost. If any leakages are observed during the defects liability period due to defective workmanship

or material supplied by the Contractor, he shall repair the same to the entire satisfaction of the Employer, at his own cost.

After completion of field hydraulic test as specified above and if no leakage is found in the entire pipeline / joints and all welded portion, then this may be considered as field hydraulic test and after commissioning of the pipeline system, amount retained at the rate of 3% can be released. (Maximum number of working pumps will work continuously to achieve required pressure specified in the tender).

Till the contractor gives satisfactory field hydraulic test & commissioning of the pipeline an amount at the rate of 3% of testing commissioning as per Price Schedule shall be withheld.

9 PROGRESS IN LAYING

The Contractor shall submit along with the tender his detailed bar chart for manufacturing and laying of the pipeline. While preparing his bar chart, the Contractor shall plan his activities such that the laying of pipes shall closely follow the manufacturing schedule and no pipes shall remain stacked in factory or at site for a period more than one month.

It is mandatory that he shall submit an approach note on how he will carry out this Work within the contractual period and on the compatible resources in terms of construction equipment and other facilities that he shall utilize to complete the tendered Work.

9.1 Lowering and Jointing

The pipe shall be lowered into the trenches by removing only one or two struts at a time. It shall be seen that no part of the shoring is disturbed or damaged and, if necessary, additional temporary struts may be fixed during the lowering operations. It shall also be necessary to see that the gunite coating of pipe is not damaged in any way during the lowering and assembling. After the pipe is lowered into the trench, it shall be laid in correct line and level by using the leveling instruments, sight rails, theodolite, etc. Care shall be taken to see that the longitudinal joints of two consecutive pipes at each circumferential joints are staggered by 90°. While assembling the pipes, the ends shall have to be brought close enough to leave a uniform gap not exceeding 4mm. If necessary, a marginal cut may be taken to ensure a close fit of the pipe faces. For this purpose, only experienced cutters who can make uniform and straight cuts, shall be permitted to cut the faces of the pipes. No extra payment shall be made for such marginal cutting. There shall be no lateral displacement between the pipe faces to be joined. If necessary, spiders from inside and tightening rings from outside shall be used to bring the two ends in perfect contact and alignment. It may also be necessary to use jacks for this purpose. In no case shall hammering or longitudinal slitting be permitted. When the pipe is

properly assembled and checked for correct line and level, it shall be firmly supported on wooden beams and wedges and tack welded. Some portion of the trench may be refilled at this stage so as to prevent the pipeline from losing its alignment. The tack welded circumferential joints shall then be welded fully. Only experienced welders, who shall be tested from time to time shall be permitted to carry out the welding work.

On completion of the pipe jointing and external protection, the trench and the welding pits shall be cleaned of guniting rebound. The welding shall be filled and compacted in 150mm layers with the bedding material.

Backfilling shall be carried out as detailed here under.

Providing Steel Props inside the Pipeline (Dia. 1200 mm and above)

It is necessary that the roundness of the pipes is maintained circular. To achieve the same, steel adjustable screw type props of screw or similar approved make consisting of minimum six (three on each side) legs shall be fixed inside the pipe. The deflection of the pipe should be limited to 1% of the average diameter. In no case shall the limit be exceeded, even under the full load, in case of pipes laid underground. The design and drawings of the props that the Contractor intends to use should be got approved by the Engineer before starting the work. While laying the pipes underground, the Contractor shall provide this propping arrangement from inside to maintain circularity. These props shall be fixed vertically and at intervals of not more than 1.8 metres or as directed by the Engineer. In case the Engineer finds it necessary, they will have to be fixed in any position. The props should be kept in position at least for three days after the encasing of the pipe in that section is completed or till refilling is done to the full height of fill over the pipe in case the pipes are not encased. The props shall be removed only after obtaining permission from the Engineer. The height of earth fill over the pipe top shall normally be such as to avoid floatation under submerged conditions and to have a minimum earth cushion of about 1.00 metres over the pipe whichever is greater. It is also necessary that, in case of buried pipe, adequate side supports from the backfilled materials is developed to keep the diametrical deflection within the specified limits.

Backfilling of the excavated trenches, particularly below the pipe and along the sides shall, therefore, have to be done with proper care and compaction as desired. No extra payment will be made for the above work.

9.1.1 Precautions against Floatation

When the pipeline laid underground or above ground in a long narrow cutting gets submerged in water collected in the trench of cutting it is subjected to an uplift pressure due to buoyancy and is likely to float if completely or partly empty. In the design of pipelines, provision is to be made to safeguard against floatation providing sufficient overburden or by providing sufficient dead weight by means of blocks, etc. Factor of safety for calculations for check against floating shall be taken as 1.2.

In the case of works extending over one or more monsoon seasons, however, special care and precautions are necessary during the progress of work on this account. The Contractor shall close down pipe laying operations well in time for the monsoon. The work of providing blocks, refilling the earth to the required level, compacting the same, etc. shall always be done as soon as the pipeline in the cutting has been laid.

The Contractor shall see that the water shall not be allowed to accumulate in open trenches. Where work is in an incomplete stage, precautionary work, such as blank-flanging in the open ends of the pipeline and filling the pipeline with water etc. shall be taken up as directed by the Engineer.

Such works shall be to the Contractor's account and no separate payment shall be made for the same. The Contractor's rate for pipe laying shall be deemed to include such precautionary measures against floatation.

Protection of the pipeline against floatation during the Contract Period shall be the responsibility of the Contractor. Should any section of the pipeline float due to his negligence, etc. the entire cost of laying it again to the correct line and level shall be to his account.

Electric and telephone line, cable and pole if required to be shifted, necessary charges for shifting to be paid to respective authorities shall initially be paid by the contractor to the concern department and the same will be reimbursed by GOVT. to contractor on producing receipt of challan of concern department.

L - section of route is tentative. Contractor has to prepare a fresh Longitudinal Section before starting the work, showing all service lines coming across or parallel.

Alignment of pipeline may required to be changed on same route due to any obstructs or service lines. No extra payment made to contractor.

Manhole chamber and all other structure required to be constructed on road are to be Designed for "AA" class loading and same shall be got approved from Engineer-in-charge.

All necessary actions required for diversion of the traffic on State high way, or any other routes are to arranged by the contractor at his own cost as per the requirement of the traffic rules.

During the execution of work any damage occurred to the private / Govt. property is to be reimbursed by the contractor to the owner.

Asphalt cutting for pipeline excavation included in the scope of work and the debris of asphalt cutting shall have to be carted and dumped at the place shown by the Engineer in charge so that GOVT. can sort it out and reuse the same in other work. The contractor has to bring the road to its original position without any extra cost.

10 ADDITIONAL REQUIREMENT FOR PIPE TO BE LAID BY PUSHING METHOD

For insertion of casing pipe boring shall be carried out by auger type boring device with cutting head to drill a horizontal bore. The hole drilled shall be of suitable size to accommodate casing pipe. The casing pipe shall be inserted along with boring to keep the formation supported to prevent any settlement. The casing pipe shall be installed with even bearing throughout its length. The work will be done under the supervision of canal authority as per restrictions & precautions as may be stipulated by the canal authority.

The casing pipe will be minimum 1.2 m below the canal bed level & 0.9 m below the natural G.L. The length of casing pipe shall be upto the boundary of canal bank. Casing pipe shall be provided with minimum 50 mm dia GI pipe of 2 m height above G.L. with screen at top. Rates are inclusive of bottom & side rollers of suitable size to be provided inside casing pipe at 4 m interval to facilitate insertion of carrier pipe of required dia. The ends of casing pipe shall be suitably sealed.

The casing pipe is to be provided with epoxy treatment as below on outer face of the pipe before lowering.

Zinc Rich Epoxy Primer

Description	**Two pack zinc rich consisting of –**
Base	Fine Zinc Dust Ground in Epoxy Resin Solution, supplied in paste form
Catalyst	Abduct type- the non volatile portion of the material (mixed) should consist of 92 % Zinc Dust & 8-10% Epoxy Resin & curing agent
Shade	Grey
Characteristics	The paint shall provide a complete rust inhibitive barrier coating of high mechanical & abrasion resistance. The film shall be compatible for fusion & spot weld.
Pot-life	4-6 hours
Mixing Ratio	The proportion of mixing of base & hardener should be as specified by the Manufacturer by weight & volume. The mixed primer shall conform to the specifications detailed.
Viscosity of ready mixed paint	15-22 in Fort Cup No. 4 at 30^{o}C
Drying time	i. Dust free – 10-15 minutes ii. Chamber curing – 24-28 hours
Thickness	4 mils (406 microns)

11 BACK FILLING OF TRENCHES

On completion of the pipe laying operations in any section, for a length of about 100m and while further work is still in progress, refilling of trenches shall be started by the Contractor with a view of restricting the length of open trenches. Pipe laying shall closely follow the progress of Trench Excavation and the Contractor shall not permit unreasonably excessive lengths of trench excavation to remain open while awaiting testing of the pipeline If the Engineer considers that the Contractor is not complying with any of the foregoing requirements, he may prohibit further trench excavation until he is satisfied with the progress of laying and testing of pipes and refilling of trenches. If the excavated earth is unsuitable for backfilling.The selected earth is to be brought from outside within 3 km. distance. The selected soil brought from outside shall

only be used for filling trenches form bottom of pipe to 50 cm. on above top of pipe including on both sides of the trench. Only soft earth of good quality free from stones and free from boulders, roots, vegetation etc., shall be utilised after the lumps are broken for refilling in trench. Filling shall be done in layers not exceeding 150mm and compacted to 85 percent of the maximum dry density as per part VII of IS:2720. Care shall be taken during backfilling, not to injure or disturb the pipes, joints or coating. Filling shall be carried out simultaneously on both sides of the pipes so that unequal pressure does not occur. Walking or working on the completed pipeline unless the trench has been filled to height of at least 30 cm over the top of the pipe except as may be necessary for tamping etc., during backfilling work.

The remaining portion of the trench may be filled in with a mixture of hard and soft material free from boulders and clods of earth larger than 150 mm in size if sufficient quantity of good earth and murrum are not available. Filling in shall be done in layers not exceeding 225 mm in thickness accompanied by adequate watering, ramming etc. Water contents of the soil shall be as near the optimum moisture content as possible. The trench shall be refilled so as to build up to the original ground level, keeping due allowance for subsequent settlement likely to take place. No extra payment will be made for material brought from outside.

To prevent buckling of pipe shell diameters 1200 mm and above, pipes shall be strutted from inside while the work of refilling is in progress, for which no separate payment shall be made.

Strutting shall be done by means of strong spiders having at least 6 arms which shall be sufficiently stiff to resist all deformation. Spiders shall be provided at a maximum interval of 4 m.

The Engineer shall, at all times, have powers to decide which portion of the excavated materials shall be for filling and in which portion of the site and in what manner it shall be so used.

If any material remains as surplus it shall be disposed off as directed by the Engineer, which includes loading, unloading, transporting and spreading as directed within a distance of 15 km. If the Contractor fails to remove the earth from site within 7 days after the period specified in a written notice, the Engineer may arrange to carry out such work at the Contractor's risk and cost or may impose such fine for such omission as he may deem fit. Particular care shall be taken to keep the trench dry during the entire refilling operation.

If suitable material for refilling is not available from excavation the Contractor shall bring earth, murrum of approved quality as directed by the Engineer. No extra payment will be made for material brought from outside.

No mechanical plant other than approved compacting equipment shall run over or operate within the trench until backfilling has reached its final level or the approval of the Engineer has been obtained.

Subsidence in filling in : Should any subsidence take place either in the filling of the trenches or near about it during the maintenance period of 12 months from the completion of the Contract Works, the Contractor shall make good the same at his own cost or the Engineer may without notice to the Contractor, make good the same in any way and with any material that he may think proper, at the expense of the Contractor. The Engineer may also, if he anticipates occurrence of any subsidence, employ persons to give him timely notice of the necessity of making good the same, and the expenses on this account shall be charged to the Contractor.

12 SAND BEDDING

The sand bedding of minimum 150 mm thickness & level shall be provided below pipe, prior to laying the pipe in trenches. It shall be compacted with a light hand rammer. Any reduction in thickness due to compaction shall be made up by adding sand during ramming. For the purpose of the bedding under this item only screened fine sand of grain size not larger than 2 mm shall be used. The sand shall be clean, uncoated & free from clay lumps, injurious amounts of dust, soft particles, organic matter, loam or other deleterious substances.

If the sand supplied is unclean, it shall be washed. In no case shall sand containing more than 3.5% by dry volume or 5% by wet volume of clay, loam or silt be accepted. Tests specified for determining silt in sand & organic impurities as described in IS : 383 shall apply. Sieved & washed sand shall be stored on the works in such a manner as to prevent intrusion of any foreign matter, including coarser particles of sand or any clay or metal or chips. Tests as indicated above shall be performed if called for by the Engineer at the expense of the contractor.

During the work of providing sand bedding and laying the pipeline over it, loose material from the sides or edges of the trench shall be prevented from falling inside the trench, by providing shoring and taking other measures

13 PIPELINE MARKERS

13.1 Intent

This specification covers the minimum requirements for supply, fabrication and erection of pipeline markers to be installed at various locations along the pipe route.

Following two (2) types of pipeline markers are proposed for the transmission mains.

(i) Pipeline Warning Signs

(ii) Kilometre Markers

The pipeline markers shall be installed, as far as possible, at locations where no hindrance to the regular use of the land or to the traffic is caused.

13.2 General

13.2.1 DISTANCE INDICATORS AND MARKINGS

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

In case of the pipeline laid above ground details such as chainage, Invert levels of pipe, appurtenance number, pedestal / saddle number, culvert number, anchor / thrust block. number etc., shall be suitably marked either on the pipeline or the supporting structure etc., in distinct colour. The Contractor / Contractor shall include the cost of this in his rates for the other items.

13.2.2 Pipeline Warning Sign

Pipeline warning signs shall be generally installed at the following crossings: Roads (excepting cart roads &kuchha roads), Rivers, Nallahs.

Pipeline warning sign will indicate existence of the buried pipeline at the crossing and display the name address of the client, name of the project and telephone number (for contact in case of emergency).

For the rest of the crossings as mentioned above, the warning signs shall be generally installed at a distance of 50 M on the upstream side only.

The warning sign shall be located 500 mm to the left of the pipe outside diameter, viewing in the direction of flow and shall face the item being crossed (i.e. road, river, rail track etc).

13.2.3 Kilometer Markers

Kilometer markers shall be installed along the pipe route at every one Kilometer interval.

Markers will display the distance (in full kilometer) from the upstream pumping station (in case of rising mains) or upstream reservoir (in case of gravity mains) and name of the client. Kilometer markers shall be located 500 mm to the left of the pipe centreline viewing in the direction of flow.

13.2.4 Scheme of Painting

The underground steel structure except that embedded in concrete shall be painted with coal tar epoxy of minimum 300 micron DFT. For over ground steel structure, one coat of primer & two coats of colour paint shall be applied.

Colour scheme to be adopted for the markers shall be subject to Employer's approval.

Following colour scheme is proposed for reference:

Warning Sign

i. All letters shall be painted black except for the word "Warning" which shall bepainted red. Background colour shall be yellow.
ii. Post shall be painted with 250 mm wide alternate bands of black & white paint.
iii. All above ground steel structure shall be painted yellow.

Kilometer Markers

i. All above points for warning sign shall be equally applicable for Kilometer markers also.
ii. Figures shall be stenciled on both sides of the post.

13.2.5 Language

Pipeline warning sign plates & kilometer markers shall be prepared in regional language in line with guideline for providing information as above & shall be approved by the client.

14 ANCHORING OF PIPELINE

For anchorage, RCC thrust blocks in M-20 shall be provided at each bend, tee, taper, end piece to prevent undue movements of the pipeline under pressure. They shall be constructed as per the as per design approved by Engineer considering the highest operation or testing pressure of the pipes, the safe bearing pressure of the surrounding soil and the friction coefficient of the soil.

15 ENCASING PIPELINE

Encasing of pipeline with M-20 shall be done wherever adequate cover on pipeline is not available as per site condition.

16 ROU / ROW

To lay pipeline as per requirement for which required permissions are to be obtained by the contractor. The standing crop, other damages compensations, etc. are to be borne by the contractor to the farmers. Only statutory charges paid by the contractor will be borne by the department including compensation for ROU in land as per Government rules. Additional expenses over & above are included in scope of the tender.

The contractor will have to submit consent & NOC of each farmer & authority before entering into the land / property / crossing & restoration after completion of work respectively. In any case if any claim or disability during construction and O & M arises due to negligence of the bidder, the same shall be recovered from the contractor.

17 Plain and Reinforced Cement Concrete

17.1 General

Plain concrete is proposed as levelling course below RCC walls of valve chambers and chairs provided for above ground pipeline and reinforced concrete with mix M 20 grade is proposed for MS pipeline thrust blocks, chair / saddle supports, anchor blocks and pipe encasing at road crossings.

Reinforced concrete chambers shall be constructed for air valves, washout valves and on line butterfly valves as per the standard chamber drawings approved. The RCC walls shall have 200 mm thickness and top slab shall have 150 mm thickness. 600 mm x 600 mm size S.F.R.C. cover shall be provided over access opening in the top slab. Puddle flanges, shall be provided in the middle of chamber wall / walls for proper anchorage of the specials to resist the thrust due to water pressure. For detailed specification of concrete refer Section-III Concrete Works.

C. PSC PIPELINE

0.0 SPECIFICATION FOR PRE-STRESSED CONCRETE PIPES (INCLUDING FITTINGS)

0.1 Scope of work

a. **Providing ISI standard pre-stressed concrete pipe of** appropriate class &dia including cost of all material &labour required cost of all taxes, inspection charges, transportation charges, unloading & stacking etc. complete.

b. Lowering, laying & jointing in proper grade alignment pre-stressed cement concrete pipes with rubber ring joint including cost of conveyance to site of work all level involved giving hydraulic testing.

c. Whenever manufacturer is separate & contractor for lowering, laying, jointing & testing in separate the contractor shall enter into an agreement of P.S.C. pipe manufacturer for satisfactory manufacturing, transporting, lowering, laying & jointing & testing of pipes.

0.2 Manufacture of Pipes

a. All pre-stressed pipes and jointing materials shall strictly conform to IS:784 –2001-2nd revision& ammendment-2003, IS: 733, IS:1343 (Latest edition and amendments thereto).

b. Cement used for manufacturing shall conform to IS:12269-1976 (53 grade ordinary Portland cement), IS: 8112 (43 grade ordinary Portland cement), IS:1489-portland pozzolana cement, IS:455-portland slag cement.

c. Aggregates used shall conform to IS:383 -1970.

d. Concrete mix and strength

The mix shall confirm to the required laid down for design mix concrete vide IS:1343 latest edition and quality control shall be exercised in accordance with IS:456-2000. The strength requirement will be as specified at clause 8.1.2 of IS:784 latest revision.

e. Steel to be used

The wires conforming to IS: 1785/Part-l and IS: 1785/Part-ll (1967) shall be used for pre-stressed reinforcement of pipe.

f. Dimension and tolerance of all pipes shall be thoroughly checked for and she adhere to clause 4 and 9 of IS: 784 latest revised editions.

g. The contractor shall design the pipes and suitable to withstand specific hydrostatic test pressure. The pipes shall withstand all the tests stipulated in IS:784 (latest revised). The contractor shall submit the design to Engineer-in-Charge and after approval for the design; he shall start the manufacturing of pipes.

h. Blow out resistance of joint assembly shall be designed for the most unfavourable combinations of joint deflection and tolerance of pipe ends

i. Necessary precautions against chemical attacks and corrosion shall be taken in manufacturing these pipes. Aspect should be studied if treatment is required that will be paid extra.

j. The pipe shall be cured by immersing them in water or by automatic sprinkler system for a period of not less than 7 days as per IS 764-1978 the concrete core and that of the cover shall be done in two separate operations.

k. The pipe manufactured at factory shall be stacked property. The marking on each pipe shall confirm to IS: 784. In addition to this the detail shaft is boldly painted with good quality long lasting oil paint.

i. The Serial Number of pipe (from insideas well as from outside of the pipe both near the socket and spigot ends).

ii. Test pressure in Kg/sq.cm.

l. The programme of inspection and testing shall be fixed by mutual discussions. The pipeswill be tested by the owner or by the third party inspecting agency engaged by the owner.

0.3 Rubber Rings

a. Rubber gasket shall comply with IS 5382-1969. The manufacturer of pipes shall test each gasket by stretching it to 33-1/3 percent in excess of its original length.

b. Every ring shall be visually checked particularly at joint.

c. Gaskets shall be clearly labelled in bundle to Indicate type of joints and its test certificate.

d. The contractor shall procure adequate number of rings required for the work irrespective of number of pipes.

0.4 Carting of Pipes

a. Pipes manufactured at factory to be carried to site of work either directly or stacked suitably excluding cost of taxes nearby the work site

b. All pipes shall be loaded in trucks by mechanical crane and unloaded at site by mechanical crane only. No loading of pipes on type wilt be allowed in any case. Stacking, lowering of pipes by chain pulley block with tripod will be allowed.

c. Extreme care shall be taken while handling the pipes, damage during transit and handling shall be the contractor's account and will not be payable. Damaged pipe shall be rejected outright. The discretion of Executive Engineer in this behalf shall be final and binding on the contractor.

d. Payment of excise entry tax. octroi tax and all other taxes shall be the responsibility of contractor.

0.5 Lowering, Laying, Jointing And Testing of P.S.C.Pipe Line

a. All pipes shall be thoroughly inspected before laying, damaged pipe if any shall not be used and shall be removed from the site immediately.

b. Murum sand bedding shall be done as directed by Engineer- in-Charge. The consolidation of bottom shall be done with ramming

c. Lowering, laying and jointing of pipes, the provision in IS:783 shall be strictly followed. Laying shall not be started till the bedding is approved by Engineer-in-Charge.

d. Pipes shall be lowered in trench very carefully with mechanical appliances such as crane, chain pulley block with tripod arrangements etc. only.

e. The pipes shall be laid true to line and alignment with specified grades.

f. The trench shall be kept free of water tilt the jointing material is properly set

g. Whenever there are chances of rain water entering, into trenches, care shall be taken to prevent pipe line from floating during construction. The contractor shall suggest the position, number and size of concrete blocks in C.C.M-10 to avoid the floating of pipes and seek approval of the Engineer-in-Charge, and shall provide sufficient number of C.C. blocks before onset of monsoon. The contractor should note that even in case after due care, pipes are lifted up or disturbed to uplift, the contractor will

have to rectify the defect, including replacement of pipes wherever required entirely at his own cost.

h. Line should be laid on gradient flatter than 1 in 12 if due to some special reasons it is not possible to do so, then contractor shall point out the same and shall suggest the anchor block as per IS 783-1985. Table 3 and shall contract the same approval of the Engineer-in-Charge.

i. Unless otherwise specifically required the joints of pipes and fittings shall be of semi-flexible spigot and socket type, so manufactured that when fitted with the correct rubber ring the joint shall be self centering and flexible. A rubber rings of adequate strength shall be placed on the spigot which shall be forced into socket of the pipe previously laid This shall compress the rubber ring as it rolls into the annular space forced between spigot at socket and forms a flexible and water tight joint. Jointing includes jointing pre-stressed concrete pipes to pipes and P.S.C. pipes to M.S. specials. Before jointing it should be checked that joint and ring are smooth and clean. The ring should be well stretched and tension is uniform along entire circumstances. Ring should give positive seal under all circumstances of tolerance in dimensions. After Jointing is completed, it should bee checked that rubber ring is properly placed in position etc. For this purpose feeder gauge (simple metal strips of 15 mm width and 0.5 mm thickness) may be used and record of checking of joint should be kept. If ring is not in proper position then pipe must be pulled out.

j. The contractor should note that the laying work shall be taken up only after adequate number of M.S. bends and other specials are fabricated and brought at site and no gap left by contractor for want of providing M.S. machine ends barrel pipes etc. will not be paid by the Board to the contractor and such length of M.S. gaps works will be paid at rate of P.S.C. pipe of relevant class of pipes in which position the gap.

0.6 Hydraulic Testing

After laying the pipe line shall be tested for the 1.5 times of working pressure of that location in the respective sections or as per design criteria which is minimum. The line shall be filled completely with water and kept for a week. The pressure shall then be increased gradually to full test pressure required in that section; this pressure shall be maintained at least for 24 hours.

Hydraulic test pressure test at site should be as per Para 5.4.3.2 of Govt. of India. Manual on W.S.&T and Para 15.5 of IS: 783-1985 and site test pressure will be as mentioned in the design criteria. If the sectional length of pipe line fails in this hydraulic testing, contractor has to locate the leakage and to remove them and reset that sectional length. No section will be acceptable unless it is water tight.

0.7 Providing And Caulking Tarred Yarn in Annular Space of The Joint

After right joint is done and pipe line is tested the annular space in between spigot and socket shall be Ailed with spun yarn dipped in bitumen or any suitable means and shall be property caulked No extra payment for this shall be made and cost shall deemed to be included in the rate quoted in Schedule 'B' for providing and laying of P.S.C. pipes.

P.S- Specifications as laid down in IS: 784-2001 2nd revision and subsequent amendments shall be explicitly followed in all aspects of provision of P.S concrete pipes.

D. HDPE PIPELINE

1.0 Supply, laying and jointing of High Density Polyethylene (HDPE) Pipes & Fittings.

1.1 Scope

This specification covers the requirements for successfully designing, manufacturing, supplying, laying, jointing and testing at works and site of High Density Polyethylene Pipes used for water supply. Use of HDPE Pipes shall be Pressure Class of minimum PN 6 or above. The minimum outer dia for network up to 20 Ha chak shall be DN 200. The minimum outer dia of the pipe beyond 20 Ha chak shall not be less than DN 75.

1.2 Applicable Codes

The manufacturing, testing, supplying, laying, jointing and testing at work sites of HDPE pipes shall comply with all currently applicable statutes, regulations, standards and Codes. In particular, the following standards, unless otherwise specified herein, shall be referred. In all cases the latest revision of the Codes shall be referred to. **If requirements of this specifications conflict with the requirements of the standards/codes, standards / codes shall govern.**

Others Codes not specifically mentioned here but pertaining to the use of HDPE pipes form part of these Specifications.

1.3 Designation

Pipes shall be designated as per IS 4984, according to the grade of material, followed by pressure rating and nominal diameter, for example, PE 100 PN 10 DN 200 indicates a pipe pertaining to material grade 100 having a pressure rating 1.0 MPa and outside nominal diameter 200 mm.

1.4 Colour

The colour of the pipe shall be black.

1.5 Materials

The material used for the manufacturer of pipes should not constitute toxicity hazard, should not support microbial growth, should not give rise to unpleasant taste or odour, cloudiness or discoloration of water. Pipe manufacturers shall obtain a certificate to this effect from the manufacturers of raw material by any internationally reputed organization as per the satisfaction of the Engineer-in-Charge in charge.

CODE	TITLE / SPECIFICATIONS
IS 4984	High Density Polyethylene Pipes for Water Supply
IS 2530	Methods of test for polyethylene moulding materials and polyethylene compounds GRP Pipes, Joints and Fittings for use for Potable Water Supply
IS 5382	Rubber sealing rings for gas mains, water mains and sewers
IS 4905	Methods for random sampling
IS 7328	High density polyethylene materials for moulding and extrusion
IS 7634	Laying & Jointing of Polyethylene (PE) Pipes
IS 9845	Method of analysis for the determination of specific and/or overall migration of constituents of plastics material and articles intended to come into contact with foodstuffs
IS 10141	Positive list of constituents of polyethylene in contact with food stuffs, Pharmaceuticals and drinking water.
IS 10146	Polyethylene for its safe use in contact with foodstuff, Pharmaceuticals and drinking water.

1.6 Raw Material

a) Raw material used to manufacture the HDPE pipes shall be 100% virgin PE 100, compounded or Natural black PE resin confirming to IS: 4984, IS: 7328 and ISO: 4427. For this a certification has to be given by the resin manufacturer as per clause 3.2.3 of IS: 4984. The resin proposed to be used for manufacturing of the pipes should also comply with the following norms as per ISO 9080

b) The resin should have been certified by an independent laboratory of international repute for having passed 10,000 hour long term hydrostatic strength (LTHS) test extrapolated to 50 years to show that the resin has a minimum MRS of over 10MPa. Internal certificate of any resin manufacturer will not be acceptable.

c) Certificate for having passed the Rapid crack propagation test - S4 as per ISO 13477 or FSRCP as per ISO 13478 preferably

certified by a Reputed International laboratory. High density Polyethylene (HDPE) used for the manufacture of pipes shall conform to designation PEEAA-45-T-003 of IS 7328. HDPE conforming to designation PEEAA-45-T-012 of IS 7328 may also be used with the exception that melt flow rate (MFR) shall not exceed 1.10 g/10 min. In addition the material shall also conform to clause 5.6.2 of IS 7328.

d) The specified base density shall be between 940 kg/ m^3 and 958 kg/ m^3 (both inclusive) when determined at 27°C according to procedure prescribed in IS 7328 The value of the density shall also not differ from the nominal value by more than 3 kg/ m^3 as per 5.2.1.1 of IS 7328. The MFR of the material shall be between 0.20 and 1.10 (both inclusive) when tested at 190°C with nominal load of 5 kgf as determined by method prescribed in IS 2530. The MFR of the material shall also be within ± 20 percent of the value declared by the manufacturer.

e) The resin shall be compounded with carbon black. The carbon black content in the material shall be within 2.5 ±0.5% and the dispersion of carbon black shall be satisfactory when tested as per IS 2530.

1.7 Anti-oxidant

The percentage of anti-oxidant used shall not be more than 0.3 percent by mass of

finished resin. The anti-oxidant used shall be physiologically harm less and shall be selected from the list given in IS 10141

1.8 Reworked Material

No addition of Reworked/ Recycled Material from the manufacturer's own rework material resulting from the manufacture of pipes is permissible and the vendor is required to use only 100% virgin resin compound.

1.9 Maximum Quality of Pipe

The outside diameter of pipes, tolerance on the same and Quality of pipe shall be as given in table 2 of IS 4984. Quality shall be measured as the difference between maximum outside diameter and minimum outside diameter measured at the same cross section of the pipe, at 300 mm away from the cut end. For pipes to be coiled the Quality shall be measured prior to coiling. For coiled pipes, however, re-rounding of pipes shall be carried out prior to the measurement of Quality.

1.10 Detectability

HDPE Pipes should be detectable when buried underground, by providing a copper wire of 1.20mm +/- 0.2 mm Ø, co extruded or firmly secured by self adhesive tapes along the entire length of the pipes duly ISI marked or any other equivalent method enabling measurement/detectability from the top of ground including supply of 3 sets of such instrument.

Copper wire shall have PE (Polyethylene) insulation, if laid separately and secured by self adhesive tapes on the Pipe. The insulation shall be

free from voids and shall be strong enough to withstand mechanical and thermal stress of underground buried conditions. The thickness of the PE insulation shall not be less than 1.25 mm or more, if specified in the relevant BIS standards.

Manufacturer of PE insulated copper wire shall perform Type, routine and acceptance tests strictly as per applicable BIS standard specifications. The Contractor will get copies of such tests certificates, approved from the Engineer-in-Charge, before dispatch.

The Engineer-in-charge reserves the right to witness all tests and the Contractor shall provide all facilities, to the Engineer-in-Charge in this regard and shall inform sufficiently in advance to enable the Engineer-in-Charge to depute his representative to witness the same HDPE pipes should preferably to with co-extruded copper wire.

1.11 Length of Straight Pipe

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

1.12 Coiling

The pipes supplied in coils shall be coiled on drums of minimum diameter of 25 times the nominal diameter of the pipe ensuring that kinking of pipe is prevented. Pipe beyond 110mm dia shall be supplied in straight length not less than 6m.

1.13 Workmanship / Appearance

Pipes shall be free from all defect including indentations, delaminating, bubbles, pinholes, cracks, pits, blisters, foreign inclusions that due to their nature degree or extent detrimentally affect the strength and serviceability of the pipe. The pipe shall be as uniform as commercially practicable in colour opacity, density and other physical properties as per relevant IS Code or equivalent International Code. The inside surface of each pipe shall be free of scouring, cavities, bulges, dents, ridges and other defects that result in a variation of inside diameter from that obtained on adjacent unaffected portions of the surface. The pipe ends shall be cut clearly and square to the axis of the pipe. IS 4984 :1995 will be followed for visual appearance.

1.14 Handling, Transportation Storage and Lowering of pipes

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

The following procedures should be followed so as to eliminate potential damage to pipes and fittings and to maintain maximum safety during unloading, lifting and lowering.

- Pipes must not be stored or transported where they are exposed to heat sources likely to exceed 60^{o}C.
- Pipes shall be stored such that they are not in contact with direct sunlight, lubricating or hydraulic oils, petrol, solvents and other aggressive materials.
- Scores or scratches to a depth of greater than 10% or more of wall thickness are not permissible; any pipes having such defects should be strictly rejected.
- PE pipes should not be subjected to rough handling during loading and unloading operations. Rollers shall be used to move, drag the pipes across any surface.
- Only polyester webbing slings should be used to lift heavy PE (>315mm) pipes by crane. Under no circumstances, chains, wire ropes and hooks be used on PE pipes.
- Pipes shall not be dropped to avoid impact or bump. If any time during handling or during installation, any damage, such as gouge, crack or fracture occurs, the pipe shall be repaired if so permitted by the competent authority before installation.
- During coiling care should be taken to maintain the coil diameter at or above the specified minimum to prevent kinks. Coiling shall be done when the pipe attains the ambient temperature from the extruder. In uncoiling or recoiling care should be taken that sharp objects do not scour the pipe.
- When releasing coils, it must be remembered that the coil is under tension and must be released in a controlled manner. The end of the coil should be retained at all times, then the straps released steadily, one at a time. If the coil has bands at different layers of the coil, then they should be released sequentially starting from the outer layers. The amount of the energy locked up in the coil will depend on the size of the pipe, the SDR of the pipe, and the size of the coil.
- Straight lengths should be stored on horizontal racks giving continuous support to prevent the pipe taking on a permanent set.
- Bare coils shall be wrapped with hessian cloth for long distance (> 300Kms) transportation. The truck used for transportation of the PE pipes shall be exclusively used of PE pipes only with no other material loaded – especially no metallic, glass and wooden items. The truck shall not have sharp edges that can damage the Pipe.
- Pipes manufactured at factory are to be carried to the site of work directly or stacked suitably and neatly along the alignment/road side/elsewhere near by the work site or as directed by the Engineer-in-Charge.
- Damages during transit, handling, storage will be to the Contractor's account and replacement for such pipes has to be made by the Contractor without any extra cost as directed by the Engineer-in-Charge.

1.15 Lowering, Laying of Pipes

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

- As the HDPE pipe is flexible and hence smaller deflection can be avoided by bending the pipe while laying. The cold bending should be such that the minimum radius of curvature shouldnot be less than 25 time the outer dia of pipe. Cold bending shall be allow at apex having deflection angle up to 10 Degree.
- For apex having deflection angle more than 10 Degree the pre fabricatedbends or bend at site by hot bending shall be allow subject to requirement of Anchore Block.
- While installing the pipes in trenches, the bed of the trench should be level and free from sharp edged stones. In most cases, the bedding is not required, as long as the sharp and protruding stones are removed, by sieving the dug earth, before using the same a backfill material. While laying in rocky areas suitable bed of sand or gravel should be provided. The fill to about 10 to 15 cm above the pipe should be fine sand or screened excavated material. Where hard rock is met with, bed concrete M15, 15 cm or 20cm thick sand bed as approved by the Engineer-in-Charge may be provided.
- As PE pipes are flexible, long lengths of fusion-jointed pipes having joints made above ground can be rolled or snaked into narrow trenches. Such trenches can be excavated by narrow buckets.
- During the pipe laying of continuous fusion jointed systems, due care and allowance should be made for the movements likely to occur due to the thermal expansion/contraction of the material. This effect is most pronounced at end connections to fixed positions (such as valves etc) and at branch connections. Care should be taken in fixing by finishing the connections at a time the length of the pipe is minimal (lower temperature times of the day.)
- For summer time installations with two fixed connection points, a slightly longer length of PE pipe may be required to compensate for contraction of the pipe in the cooler trench bottom.
- The final tie-in connections should be deferred until the thermal stability of the pipeline is achieved.
- The flexibility of polyethylene pipes allows the pipe to be cold bend. The fusion jointed PE pipe is also flexible as the plain Pipe. Thus the total system enables directional changes within the trench without recourse to the provision of special bends or anchor blocks. However, the pipe should not be cold bend to a radius less than 25 times the OD of the pipe.
- The Installation of flanged fittings such as connections to sluice/air/gate valves and hydrant tees etc., requires the use of stub ends (collars/flange adaptors complete with backing rings and gaskets. Care should be taken when tightening these flanges to provide even and balance torque.
- Provision should be made at all heavy fittings installation points for supports (such as anchoring of the flange in the soil) for the flange joint to avoid the transfer of valve wheel turning torque on to the PE flange joint.
- PE pipe is lighter than water. Hence care should be taken for normal installations where there could be a possibility of

flooding of the trench thus the trench shall be kept free of water till the jointing has been properly done

- When flooded, some soils may lose cohesiveness, which may allow the PE pipe to float out of the ground. Several design checks are necessary to see if groundwater flotation may be a concern. Obviously, if the pipeline typically runs full or nearly full of liquid, or if groundwater is always below the pipe, flotation may not be a significant concern.
- However, weights by way of concrete blocks (anchors) are to be provided so that the PE pipe does not float when suddenly the trench is flooded and the soil surrounding the pipe is washed away. Thus site conditions study is necessary to ensure the avoidance of flotation.
- Pipe embedment backfill shall be stone-free excavated material placed and compacted to the 95% maximum dry density.
- When pipe crosses the road, suitable protective measures shall be taken. For unsurfaced road crossing, the pipe shall be encashed by M20 CC and for carpet road the pipe crossing shall be with casing pipe of NP4 having sufficient larger dia.
- While crosses the drain minimum soil cover of 1 to 1.5 mt as per drain capacity shall be provided. The pipe shall be encased by M20 CC. with necessary protection of rubble pitching or launching type protective measures.

1.16 Jointing of Pipes

The pipe shall have Electro-fusion jointing system that shall provide for fluid tightness for the intended service conditions.

1.17 Bedding, Backfilling and Compaction

1.17.1 Bedding

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

The minimum cover over buried pipe should be 1 m.

1.17.2 Back Filling

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

Most coarse grained soil are acceptable. This may comprise of gravel or sand. However if the excavated earth is unsuitable for backfilling, the selected earth is to be brought from outside approved borrow areaforbackfillingas per IS Code.

It is very important that the pipe zone backfill material does not wash away or migrate in to the native soil. Like wise, potential

migration of the native soil in to the pipe zone backfill must also be prevented.

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

1.17.3 Compaction

Vibratory methods should be used for compaction. Compaction within distances of 15 cm to 45 cm from the pipe should be usually done with hand tempers. The backfill material should be compacted not less than 95% of maximum dry density.

1.18 Thrust Block

RCC thrust block should be suitably designed & provided at bends and at places of reduction in cross section to take care of thrust. The eligibility for requirement of the Thrust Block has to be ascertained prior to laying.

1.19 Fittings & Specials

All HDPE fittings/ specials shall be of minimum PN 6 or above Pressure class, fabricated in accordance with IS: 8360 (Part I& III). PE Injection moulded fittings shall be as per IS: 8008 (Part I to IX). All fittings/specials shall be fabricated or moulded at factory only. No fabrication or moulding will be allowed at site, unless specifically permitted by the Engineer-in-Charge. Fittings will be welded on to the pipes or other fittings by use of Electro- fusion process. Recommended makes for PE / PP fittings / specials are Georg- Fischer, Glynwed, Astore, Magnum and GPS.

1.20 Bends

HDPE bends shall be plain square ended conforming to IS: 8360 Part I & III Specifications. Bends shall be moulded. Combine bends for Horizontal deflection and Vertical deflection shall be avoided.

1.21 Tees

HDPE Tees shall be plain square ended conforming to IS: 8360 Part I & II Specifications. Tees may be equal tees or reduced take off tees. Tees shall be moulded.

1.22 Reducers

HDPE Reducers shall be plain square ended conforming to IS: 8008 Part I & VII Specifications. Reducer must be moulded.

1.23 Flanged HDPE Pipe Ends

HDPE Stub ends shall be square ended conforming to IS: 8008 Part I & VI Specifications. Stub ends will be welded on the pipe. Flange will be of slip on flange type as described below.

1.24 Slip-On Flanges

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

1.25 Welding Procedure

Jointing between HDPE pipes and specials shall be done as per the latest IS: 7634 part II. Method of jointing between the pipes to pipes and pipes to specials shall be with Electro-fusion welding using automatic or semi automatic, hydraulically operated, superior quality Electro-fusion machines which will ensure good quality fusion welding of HDPE pipes.

1.26 Site Fabrication of PE Fittings

Two or more PE specials coming at one place (like PE Tee, Reducer, Flanged end etc.,) shall be jointed at contractor's workshop and transported to the site of works for final installation with proposed PE pipelines. In no case, jointing of three or more welds in one place, at site will be allowed.

1.27 Training

The Contractor shall provide on-site training on PE pipe laying, jointing, testing and maintenance etc., to the personnel authorized by EMPLOYER.

1.28 Manuals

Technical Manual on PE pipes including precautions to be taken during operation of the pipeline.

1.29 Flanges

All flanges employed in the project must be compatible whatever material used.

1.30 Marking

All pipes shall be marked at maximum interval of 1 m.

The marking shall indicate at least the following information.

1) Manufacturer's name & / or trade mark.

2) The dimensions (nominal outside diameter X nominal wall thickness)

3) The outside diameter tolerance (A or B)

4) The designation of pipes material (PE 100, PE 80 etc)

5) The nominal pressure (PN)

6) The production period (date or code)

7) The BIS standard number and ISI logo.

8) The word "Water" shall also be included.

Apart from online marking on pipes, pipe shall have screen printing on both end of pipes conforming to IS:4984-2016.

1.31 Packing & Transport

The pipes should be preferably transported by road from the factory and stored as per the manufacturer specifications to protect damage.

1.32 Summary of quality Tests :

1. Quality Mark: Pipe: IS 4984

2. Material: As per IS 4984. However only virgin resin is allowed, reworked material is not allowed.

3. Grade of Material: PE 100 as per IS 4984 (Certificate from raw material manufacturer is required).

4. Pressure Rating: PN-6.

5. Colour: as per IS 4984

6. Dimensions of Pipe:

   Diameter: The nominal diameter (outside)

   Wall thickness: As per IS 4984.

   Length:

   i. For diameter 90 mm and 110 mm : 100 meter

   ii. For diameter more than 110 mm : minimum 6 meter. (Tolerance as per IS 4984)

7. Visual Appearance: as per IS 4984.

8. Test and sampling: as per IS 4984.

9. Special Test : Notch hydraulic Test for the HDPE pipe made from PE- 100 grade raw material as per ASTM 1474 OR ISO 13479 at manufacturers laboratory or independent laboratory and should pass the Hydraulic test as per IS:4984:1995 for a minimum 165 Hours. The test reports shall not be more than three months old.

Pipe shall convey water under variable temperature conditions ranging from 4 degree centigrade to 45 degree centigrade.

10. Jointing of pipes (pipe end): More than 110 mm diameter: Electro-fusion (Heat Fusion Process)

11. Quality Assurance:

Quality Assurance Plan shall be got approved from the employer before production start.

Note: All remaining parameters / specifications are as per respective IS.

2.0 Field Hydraulic testing of the pipelines

2.1 Sectional tests

After laying and jointing the pipeline shall be tested for tightness of barrels and joints, and stability of thrust blocks in sections approved by the Engineer-in-Charge in Charge. The length of the sections depends on the topographical conditions. Preferably the pipeline stretches to be tested shall be between two chambers (air valve, scour valve, bifurcation, other chamber) The length of the test section shall be from 1 Km to 2 Km and as directed by the Engineer-In-Charge.. The hydraulic testing shall have to be commenced immediately after laying and jointing of 1 km reach is completed.The design test pressure shall be as per IS.

The water required for testing shall be arranged by the contractor himself. The Contractor shall fill the pipe and compensate the leakage during testing. The Contractor shall provide and maintain all requisite facilities, instruments, etc. for the field testing of the pipelines. The testing of the pipelines generally consists in three phases:

preparation, pre-test/saturation and test, immediately following the pre-test.

Generally, the following steps are required which shall be monitored and recorded in a test protocol.

- Complete setting of the thrust blocks.
- partial backfilling and compaction to hold the pipes in position while leaving the joints exposed for leakage control
- opening of all intermediate valves (if any)
- fixing the end pieces for tests and after temporarily anchoring them against the soil (not against the preceding pipe stretch)

- at the lower end with a precision pressure gauge and the connection to the reciprocating pump for establishing the test pressure
- at the higher end with a valve for air outlet
- If the pressure gauge cannot be installed at the lowest point of the pipeline, an allowance in the test pressure to be read at the position of the gauge has to be made accordingly
- Slowly filling the pipe from the lowest point(s).
- the water for this purpose shall be reasonably clear and free of solids and suspended matter
- Complete removal of air through air valves along the line.
- Closing all air valves and scour valves.
- Slowly raising the pressure to the test pressure while inspecting the thrust blocks and the temporary anchoring.
- Keeping the pipeline under pressure for the duration of the pre-test / saturation of the lining by adding make-up water to maintain the pressure at the desired test level. Make up water to be arranged by Contractor himself at his own cost.
- Start the test by maintaining the test pressure at the desired level by adding more makeup water; record the water added carefully and the pressure in intervals of 15 minutes at the beginning and 30 minutes at the end of the test period.

The pipeline stretch will pass the test if the water added during the test period is not exceeding the admissible limits. No section of the pipe work shall be accepted by the Engineer-in-Charge in Charge until all requirements of the test have been obtained.

2.2 Hydraulic test for MS pipes and PSC pipes

2.2.1 Field test pressure

The sections of MS/PSC Raw Water Pumping main shall be tested for the pressures as worked out in detailed designed.

2.2.2 Test requirement

The quantity of water added in order to re-establish the test pressure should not exceed 0.1 litre per mm of pipe diameter per km of pipeline per day for each 30 m head of pressure applied.

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 calculated as above.

2.2.3 Failure to pass the test

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.

2.2.4 Back filling

Water used for testing should not be carelessly disposed off on land which would ultimately find its way to trenches.

On completion of a satisfactory test any temporary anchor blocks shall be broken out and stop ends removed. Backfilling of the pipeline shall be completed.

2.2.5 Flushing and disinfecting of pipelines

After testing and commissioning the contractor shall flush the pipes with a velocity not less than 1 m/s or as approved by the Engineer-in-Charge in Charge. Disinfection of drinking water pipelines should be done by Contractor.

3.0 Technical Qualifications for procurement of pipes during construction :

3.1 Pipe manufacturer : Successful bidders shall source all types of pipes and specials from reputed manufacturers. If the bidder is also manufacturing pipes, should produce documentary evidence of such production Certification of Indian Standards. Manufacturer must not have been debarred/black listed by any Government Department of India.

3.1.1 M.S.Pipe :

The Pipe manufacturer should have an annual installed production capacity of minimum 15,000 MT.

The Pipe manufacturer should have manufactured and supplied at least 200 Km. M.S. Pipe of minimum 500 mm or above dia. including at least 30 Km. M.S. Pipe of minimum 1000 mm or above dia., during past 5 years.

3.1.2 P.S.C. Pipe :

The production capacity of P.S.C pipe of diameter 800 mm to 1200mm shall be minimum 50 Km per year.The manufacturer should have also successfully supplied the above pipes for a length of 50 Km during last year.

The manufacturer should hold valid IS license under IS: 12709 consecutively for last three years to manufacture ISI marked pipes.

3.1.3 H.D.P.E. Pipe :

The Pipe manufacturer should have an annual installed production capacity of minimum 10,000 MT.

The manufacturer should hold valid IS license under IS: 4984 consecutively for last three years to manufacture ISI marked pipes.

3.1.4 D.I Pipes

The Successful Bidder shall source all Ductile Iron pipes and fittings from manufacturers having experience of supplying for at least five years and whose Ductile Iron pipes and fittings are in satisfactory performance for at least three years in Indian projects.

The D.I Pipe manufacturer should have an annual installed production capacity of minimum 15,000 MT.

The manufacturer should hold valid IS license.

E. DUCTILE IRON(DI) PIPELINE

1. GENERAL

This specification covers the specific requirement of design, material, manufacture / fabrication, constructional features, inspection & testing, transportation, handling, laying and site testing of **Ductile Iron (DI) Pipes, Joints, fittings and specials.**

1.1 CODE AND STANDARDS

The material, design, manufacture, dimensions, tolerances, mechanical properties, internal cement mortar lining, external zinc coating along with bituminous finished layer, inspection and testing of DI water pipes shall comply with the latest Indian Standard, "IS 8329 (Centrifugally cast (spun) ductile iron pressure pipes for water, gas and sewage – specification)" or equivalent international standard unless otherwise specified elsewhere in this Technical Specification. The various referred National and International codes generally used in the design, manufacture and testing of DI pipes are as mentioned below:

Sl.No.	CodeNo.	Code Title
1.	IS 8329	Centrifugally cast(spun) ductile iron pressure pipes for water, gas and sewage – specification
2.	IS 9523	Ductile iron fittings for pressure pipes for water, gas and sewage – specification
3.	IS 5382	Rubber sealing rings for gas mains, water mains and sewers

Sl.No.	CodeNo.	Code Title
4.	IS 638	Specification for Sheet Rubber Jointing and Rubber Insertion Jointing
5.	IS 12288	Code of practice for use and laying of Ductile Iron pipes
6.	IS 11606	Methods for sampling of Cast Iron pipes and fittings
7.	IS 455	Portland slag cement
8.	IS 12330	Sulphate resisting Portland cement
9.	IS 6452	Specification for high alumina cement for structural use
10.	IS 6909	Specification for super - sulphated cement
11.	IS 8112	43 grade ordinary Portland cement
12.	IS 1387	General requirements for supply of metallurgical materials
13.	IS 1500	Methods for Brinell hardness test for metallic materials
14.	IS 1608	Mechanical testing of metals - tensile testing
15.	ISO 2531	Ductile iron pipes, fittings, accessories and their joints for water applications
16.	ISO 4179	Ductile iron pipes and fittings for pressure and non pressure Pipelines -- Cement mortar lining
17.	ISO 4633	Rubber seals -- Joint rings for water supply, drainage and sewerage pipelines - Specification for materials
18.	ISO 8179	Ductile iron pipes -- External zinc based coating -- Part 1: Metallic zinc with finishing layer
19.	ISO 8179	Ductile iron pipes -- External zinc coating -- Part 2: Zinc rich paint with finishing layer
20.	ISO 8180	Ductile iron pipelines - - Polyethylene sleeving for site application
21.	ISO 10802	Ductile iron pipelines - - Hydrostatic testing after installation

Sl.No.	CodeNo.	Code Title
22.	ISO 10803	Design method for ductile iron pipes
23.	ISO 16132	Ductile iron pipes and fittings - - Seal coats for cement mortar linings
24.	AWWA M 41	Ductile - Iron pipe and fittings (guideline code for design, manufacturing, testing, jointing, laying &installation etc.)
25.	BSEN 545	Ductile iron pipes, fittings, accessories and their joints for water pipelines - Requirements and test methods

1.2 DUCTILE IRON (DI) PRESSURE PIPES FOR RISING MAINS & DISTRIBUTARY MAINS

1.2.1 Design Requirements

Classification

The class of DI pipes to be provided shall be as specified in the data sheet attached with this sub section. The external diameter and wall thickness of socket and spigot pipes for the specified Class shall be as per IS 8329 or equivalent international standard.

Pressure class and thickness class of pipe flanges shall be as specified in the data sheet attached with this sub section and shall conform to the requirements of IS 8329 or equivalent international standard.

Length

Socket and Spigot pipes shall be supplied in standard working lengths of 5.5m or 6m and flanged pipes in lengths of 4m / 5m / 5.5m as per requirements.

Tolerances

Tolerances on External diameter, ovality, thickness and length of pipes etc. shall conform to the provisions of IS: 8329 or equivalent international standard.

Material Requirements

The metal used for manufacturing the pipes shall be of good quality, commensurate with the mechanical requirements laid down in IS 8329 or equivalent international standard.

Manufacturing Requirements

Pipes supplied shall be centrifugally cast (spun) Ductile Iron pipes conforming to IS 8329 or equivalent international standard. The pipes shall be stripped with all precautions to avoid warping or shrinkage defects, detrimental to their good quality. The pipes shall be sound and free from surface or other defects.

External layer

The DI pipes supplied shall be provided with external protection of metallic zinc coating with finishing layer of bituminous paint as per IS 8329 or equivalent international standard.

Internal lining

The pipes shall be provided with suitable cement mortar internal lining as per IS 8329 or equivalent international standard.

Joints

Push on flexible joints shall be provided for pipe to pipe connection as per IS 8329 or equivalent. Wherever, flange joints are required e.g. at terminal points, valves, over ground and underground pipe connection etc., Welded on flanges shall be used.

Rubber gaskets

Rubber gasket used with push on flexible joints shall conform to the requirements of IS: 5382 or equivalent. Rubber gaskets for use with flanged joints shall conform to IS 638 or approved equivalent.

1.2.2. DI FITTINGS & SPECIALS

1.2.2.1 General

DI Fittings should preferably be manufactured by the manufacturer of the pipes. In case they are not, it will be the responsibility of the manufacturer of the pipes to have them manufactured through a suitable manufacturer under its own supervision and have it tested at his/sub contractor's premises as per the contract. The pipe manufacturer will ensure the compatibility of the pipes and fittings by prescribed type test with its own pipe and the outsourced fittings.

The manufacturing unit should have ISO 9001 certification.

The company should have fully equipped laboratory with in-house microscope to check nodularity and to check chemical composition along with tensile, hardness & elongation by universal testing machine. The laboratory of the manufacturer should be accredited by NABL.

Since the socket design is not given in the standard the min. socket thickness of fittings at any point must not be lesser than minimum body thickness given in the standard.

1.2.2.2 Design Requirements

Classification

The class of DI fittings to be provided shall be as specified in the data sheet attached with this sub section. The external diameter and wall thickness of fittings for Push on joints for the specified Class shall be as per IS 9523 or equivalent.

The Pressure class of flanged fittings shall be as specified in the data sheet attached with this sub section and shall conform to the requirements of IS 9523 or equivalent.

Permissible deviations on length of fittings

The permissible deviations on the length of fittings shall be as per IS: 9523 or equivalent.

Tolerances

Tolerances on external diameter, Raised face height, thickness and Flange drilling of fittings etc. shall conform to the provisions of IS: 9523 or to the provisions of international equivalent standard to which they are supplied.

b) Material Requirements

The metal used for manufacturing the fittings shall conform to the appropriate grade as specified in IS 1865, in commensurate with the requirements of IS 9523 or equivalent.

c) Manufacturing Requirements

The fittings shall be stripped with all precautions to avoid warping or shrinkage defects, detrimental to their good quality. The fittings shall be sound and free from surface or other defects.

d) Linings and Coatings for Ductile Iron Fittings

The DI Fittings are to be lined with Cement Mortar Linings with a sand cement mixture and the lining thickness should be as per Table 33 (Annex B) of IS 9523. The Coatings to DI fittings shall be similar in line with the provisions of DI pipes. All fittings must be painted with Zinc rich paint as per Annexure A of IS 9523. Bitumen being used for External coating should be approved By WRAS or similar approval authority. However, in soil conditions where soil resistivity is less than 1000 ohm-cm with or without water table, fusion bonded epoxy lined and coated DI fittings to be used in place of other type of lined and coated fittings.

e) Fittings with Flexible Push-on joint

Flexible joints shall be of spigot and socket "push-on" type suitable for angular deflection in any direction and capable of axial movement to compensate for thermal expansion or contraction and ground movement.

f) Fittings with Flanged joint

Fittings with Flanged joints will be with raised face and they shall be supplied complete with approved gaskets, hot dipped galvanized or cadmium plated bolts, nuts.

g) Fittings with Mechanical joint

Where Fittings with mechanical type joints are specified, proposed and approved they shall be supplied complete with approved gaskets, glands, hot dipped galvanized or cadmium plated bolts, nuts and all other necessary accessories.

h) Fittings with Restrained Joints

DI fittings with restrained joints shall be utilized in underground application where pipelines have to cross roads through existing ducts or in areas with restricted accessibility where the use

of concrete anchor blocks is prohibited, or as directed by the Engineer-in-Charge. The CONTRACTOR shall submit with his bid with full details of the type of restrained joint he proposes to use.

Whenever in the course of work the CONTRACTOR intends to utilize restrained joints he shall obtain prior approval from the Engineer-in-Charge.

Calculation of the number of pipe lengths with restrained joints required on both sides of the fitting shall follow the manufacturer's recommendation and shall be subject to the Engineer-in-Charge approval.

Restrained joints shall be designed in accordance with ISO 10804-1. The permissible angular deflection will be as declared by the manufacturer. The performance **Type test** of this Joint in line with ISO 10804-1/EN545 has to be established by the manufacturer by getting it witnessed by a NABCB (National Accreditation Board for Certification Bodies) or IAF (International Accreditation Forum) or EA (European Cooperation for Accreditation) accredited institution / certification agency.

Rubber ring for joints shall be of a type that will not deteriorate when stored under manufacturer's guidelines or during operation**.** The rubber gasket shall be of EPDM elastomer in accordance with IS:5382 suitable for water supply.

i) Joints between pipe and fittings

Push on flexible joints shall be provided for pipe to fitting connection as per IS 9523 or equivalent. Flange joints, wherever required, shall conform to the requirements of IS 9523 or equivalent.

j) Rubber gaskets

RubbergasketusedshallconformtoIS:5382:1985o ramended upto date. Other requirements of gaskets are as perclause-7ofIS 9523:2000. Rubber Gaskets to be ISI marked EPDM quality.

1.2.3. TYPE TESTS

The contractor / manufacturer shall carry out the type tests as listed in this specification on the pipes to be supplied under this contract. The bidder shall indicate the charges for each of these type tests separately. The type tests charges shall be borne by the EPC contractor for the test(s) actually conducted successfully under this contract and upon certification by the Employer.

The type tests shall be carried out in presence of the Employer's representative, for which minimum 15 days notice shall be given by the contractor. The contractor shall obtain the Employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set–up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.

In case the contractor / manufacturer has already conducted such specified type test(s), he may submit the type test reports to the Employer during detailed engineering for consideration of waiver of conductance of such type test(s) or otherwise as deemed fit by Employer. Such test(s) should have been either conducted at an independent laboratory or duly approved by accredited third party agency. The Employer reserves the right to waive conducting of any or all the specified type test(s) under this contract.

The type test shall be performed whenever a significant change is made in the design, material or process of manufacture or a new size or size range of the product is being supplied by the manufacturer.

The following **type tests** shall be carried out:

Joint Leak Tightness Test

a) Tests for joints (push on flexible joints) shall be conducted as per the guidelines of ISO 2531 to establish adequate joint performance with respect to internal pressure, external pressure and vacuum pressure under both normal alignment of joints and deflected alignment of joints as dictated in ISO 2531.

b) Tests for Leak tightness and mechanical resistance of **flanged joints** shall be conducted as per ISO 2531.

Cement Lining Smoothness Type Test

The contractor / manufacturer should have carried out Cement Lining Smoothness test to establish C value (Hazen & William's constant) of the offered DI pipe as 140. Necessary certificate for the same shall be furnished to the employer

In case the contractor / manufacturer has not carried out the test, the same shall be carried out by the contractor / manufacturer within the scope of this contract.

Ring bend test

Ring bend test for 3% deflection with respect to external diameter of DI pipe offered shall be conducted by contractor / manufacturer to prove that internal cement mortar lining does not come off the substrate surface of Ductile Iron on random basis for each manufacturing lot.

If the contractor / manufacturer of pipes do not have the facility for this type test at his own works, the same can be arranged by him to conduct and demonstrate the test.

1.3 TRANSPORTATION AND DELIVERY OF PIPES

Bidder shall have to submit a write up for safe handling and stacking of pipes during transportation and at site. It shall conform to the requirements stated in IS: 12288 or equivalent.

All pipes fabricated in the factory and temporarily stacked in the Contractor's yard or factory shall be transported to site after shop testing & cleaning them internally. The loading in the factory shall be carried out by means of either a crane, gantry or with shear legs, so as not to cause any damage to the finished material. Similarly, while unloading and stacking, great care shall be taken to ensure that the material or lining inside is not damaged or dented.

The material being delivered at site shall be jointly inspected by the Employer and the Contractor. Defective or damaged pipe shall be rejected by Employer or in case of minor damage, the Employer may allow repair of the pipe by the Contractor to the satisfaction of the Employer as per guideline of IS 8329.

Props of proven designs shall be fixed to the pipes during transit to avoid undue sagging and consequent distortion. After the pipes are

carefully stacked, props may be removed and re used for subsequent operations.

In case of transport by ship, packing shall be sea worthy so as to ensure safe delivery till site.

All the Dl fittings shall be properly packed with jute cloth. Rubber rings shall be packed in polyethylene bags. Rubber rings in PE bags and nuts, bolts etc. shall be supplied in separate jute bags.

At site, pipes shall be stacked in such a way that suitable gaps shall be left in the pipes at intervals to permit access from one side to the other.

1.4 MARKING

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

a) The Manufacturer's name or trademark on each pipe

b) The nominal diameter of pipes and batch number.

c) Class of Pipes and fittings

d) A white ring line showing length of insertion at spigot end

e)Standard ISI certification mark for the pipes conforming to IS or international standard mark to which they are supplied.

f) The last two digits of the year of manufacture

g) Any important information that the manufacturer deems fit to be inscribed on pipe.

1.5 LAYING AND JOINTING OF DI PIPES

Laying, erection and jointing of DI pipelines at field / site shall be under the direct supervision of Manufacturer (Supplier) from whom pipe is sourced / procured.

Laying Underground

Pipes shall be lowered into the trench with tackle suitable for the weight of pipes. For smaller sizes, up to 250 mm nominal bore, the pipe may be lowered by the use of ropes but for heavier pipes suitable mechanical equipment shall be used.

All construction debris shall be cleared from the inside of the pipe either before or just after a joint is made. All persons shall vacate any section of trench into which the pipe is being lowered.

The assembly for the pipes shall be made as recommended by the pipe manufacturer and using the suitable tools.

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

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

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

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

Special provisions in trench shall be made for accommodating socket (Bell) of each pipe, as applicable so that barrel is uniformly rested on even trench bed surface, which is well compacted as recommended in codes / standards.

At the end of each working day and whenever work is interrupted for any period of time, the free ends of laid pipes shall be protected against the entry of dirt, water or other foreign matter by means of approved plugs or end caps.

Laying above ground

The following is applicable only when no additional bending moments except that those due to self weight of pipe and its content are present. If any additional moments are present, piping contractor has to suitably support the pipe in consultation with manufacturer and Employer.

Socket and spigot pipes

Socket (Bell) and spigot pipes shall be provided with one support (usually pedestal or steel pipe support) per pipe. The supports shall be positioned behind the socket of each pipe.

Pipes shall be fixed to the supports with mild steel straps so that axial movement due to expansion and contraction resulting from temperature fluctuations is taken up at individual joints in the pipeline. Joints shall be assembled with the spigot end withdrawn 5 to 10 mm from the bottom of the socket to accommodate thermal movements.

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

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

Flanged pipes

The maximum unsupported span for flanged pipes shall not be more than 8 m. The supports shall be located at the centre of every second pipe.

The maximum unsupported span at water course shall also be not more than 8 m. The relative position of pipe joints and pipe supports shall be as per IS 12288 or equivalent.

The supports of all flanged pipe work spans shall be stable and unyielding due to movements in the pipeline.

The straps shall prevent any lateral movement or lifting of the pipelines but not restrict expansions and contractions caused by temperature fluctuations.

Cutting of pipes

The cutting of pipe, if required, for inserting valves, fittings etc. shall be done in a neat and workman like manner without damage to the pipe or lining so as to leave a smooth end at right angles to the axis of the pipe. Cutting of pipes shall be reduced to a minimum required.

Cutting has to be made with suitable tools as per IS 12288 or equivalent and according to the recommendations of the manufacturer. The spigot end has to be chamfered again at the same angle as the original chamfered end. If there is no mark for the insertion depth on the spigot ends of the (cut) pipe it shall be marked again according to the instructions of the manufacturer.

Pipeline anchorage

Pipeline shall be securely anchored at dead ends, tees, bends, tapers and valves to resist thrust arising from internal pressure. Suitable thrust blocks made of concrete shall be designed and cast- in-situ.

All specials like bends, tees etc. and appurtenances like valves etc. shall be laid in synchronization with the pipes. The Contractor has to ensure that the specials and accessories are available at site ready to be installed together with the pipes.

1.6 EXTERNAL PROTECTION

The details of soil resistivity data shall be verified by the Contractor.

The contractor shall carry out soil resistivity survey along the ROW of the pipeline using Wenner's 4 pin method in the presence of Employer's representatives.

On completion of all field work, a report incorporating resistivity (on semilog graph sheets) data shall be prepared by the contractor and submitted to the Employer.

In case of highly corrosive soil (soil resistivity less than 1000 ohm cm), polyethylene sleeving shall be provided for encasement of the pipes, fittings and joints against corrosion. This encasement shall be so designed to prevent the contact of pipe, fittings and joints with the surrounding backfill and bedding material. It shall conform to the requirements of IS 8329 & IS 12288 or equivalent international standards.

1.7 HYDRAULIC TESTING OF PIPELINES

After laying and jointing, the pipeline shall be tested for soundness and leak tightness of pipes, fittings and joints, and soundness of any construction work. The pipeline may be tested in sections.

Water and other facilities as required for such hydro testing shall be arranged by the Contractor. Each section shall be properly sealed off with special stop ends secured by adequate temporary anchors. The thrust on the stop ends shall be calculated and the anchors designed to resist it. All permanent anchors shall be in position and, if of concrete, shall have developed adequate strength before testing begins.

Hydraulic Testing of Sections

The section under test shall be filled with water, taking care that all the air is displaced either through vents at the high points or by using a pig or a sphere.

After filling, the pipeline shall be adequately pressurized for a period of time to achieve stable conditions.

The pipeline is then pressurized up to the full test pressure as stipulated in the data sheet attached with this sub section and the section under test completely shall be closed off. The test pressure shall be maintained for a period of not less than 10 minutes to reveal any defects in the pipes, joints or anchorages. The test pressure shall be measured such as to ensure that the required test pressure is not exceeded at any point in the entire pipeline.

If the test is not satisfactory, the fault shall be found and rectified. Methods employed for finding faults shall be as per IS 12288.

Hydraulic Testing of Complete Pipeline

After all the sections have been joined together on completion of section testing, a test on the complete pipeline shall be carried out. This test shall be carried out at a pressure as specified in the data sheet attached with this subsection. During the test, the pressure at any point in the pipeline shall not exceed the pressure as specified in the data sheet attached with this subsection.

1.8 QA REQUIREMENTS FOR DI PIPES, FITTINGS AND SPECIALS

Following tests / inspections to be carried out on the finished pipes, Joints, Gaskets, DI Fittings & specials as per relevant IS/ISO standard:

1. Pipes produced are subject to following checks;

    a. Visual Inspection for workmanship, marking, visual defect etc.

    b. Mechanical Properties as per relevant governing Standard

    c. Dimension

    - Inside Diameter
    - Outside Diameter
    - Wall Thickness
    - Ovality of Pipes
    - Length of Pipes
    - Straightness

    d. Hydrostatic Leak Tightness to be carried out as per relevant standard.

e. Zn coating & Bituminous painting on external layer DI pipes shall be carried out as per relevant standard / Technical Specifications.

f. Identification – Manufacturer Logo, Nominal Diameter, Class, length indication for cutting of pipe at site, ISI certification mark, pipe no.

2. Internal lining of suitable cement mortar shall be done as per relevant standard / Technical Specifications.

3. Rubber gaskets shall confirm to the requirement of relevant standard / Technical Specifications.

4. Joints for pipe, DI Fittings & specials shall be as per relevant standard / Technical Specifications.

5. Type Tests: Please refer relevant sections of engineering portion of technical Specification.

DATA SHEET FOR DI PIPES, FITTINGS & SPECIALS

Sl. No.	Description	Units	Parameters
1.	Pipe Material		Ductile Iron (DI) pipe internally cement mortar lined and externally coated with metallic zinc & finishing layer of bituminous paint
2.	Applicable standards		IS / ISO / AWWA / BS as listed in technical specification
3.	Hazen & William's constant		140
4.	Pipe Class		K7/K9 based on approved design as per IS 8329 or equivalent
5.	Pipe Joint type		Push on flexible joints as per IS 8329

Sl. No.	Description	Units	Parameters
6.	Pipe Joint type at valves, pumps and other piping		Flange Joints as per IS8329 & IS 9523
7.	Welded on Flange (as applicable) Pressure Class		PN 16
8.	DI fittings class		K12 as per IS 8329 or equivalent
9.	DI fittings flange (as applicable) class		PN 16 / as per approved design
10.	Restrain mechanism atbends, specials etc.		Thrust Blocks
11.	Other Requirements		As per technical specification

F GLASSFIBER REINFORCED PLASTICS(GRP) PIPELINE

1.0. GENERAL

This specification covers the specific requirement of design, material, manufacture fabrication, constructional features, inspection & testing; transportation, handling, lowering, laying, jointing, hydro testing and annual maintenance contract of Glass Fibre Reinforced Plastics (GRP) Pipes, Joints, fittings and specials.GRP pipes from mobile plants will not be allowed.

GRP pipes will not be used in the following applications:-

In rocky stretches,

In stretches where the highest water table is above the crown level of the pipe,

Where there is a chance of future excavation by other service providers within 2 m radial distance of pipeline.

2.0. CODE AND STANDARDS

The design, manufacture, inspection and testing of GRP water pipes shall comply with the latest Indian Standard, IS: 14402 (GRP Pipes, Joints and Fittings for use for sewerage, Industrial waste and water (other than potable) or ASTM 3517 (Standard Specification for Fiber glass (Glass Fiber Reinforced Thermosetting Resin) Pressure Pipe in the case of pressure pipes) or AWWA C 950 (Standard for fiber glass pressure pipe) & AWWA M 45 (Fiber glass Pipe design) unless otherwise specified elsewhere in this Technical Specification.

The various codes used in the design, manufacture and testing of GRP pipes are as follows:

Sl. No.	**Code No.**	**Code Title**
1.	IS 14402	GRP Pipes, Joints and Fittings for use for sewerage, Industrial waste and water (other than potable) - specification
2.	IS 12709	GRP Pipes, Joints and Fittings for use for potable water supply - specification
3.	IS 5382	Specification for Rubber sealing rings for gas mains, water mains and sewers
4.	IS 13916	Installation of GRP Piping system - code of practice
5.	IS 6746	Unsaturated polyester resin systems - specification
6.	IS 11273	Woven roving fabrics of E glass fibre
7.	IS 11320	GLASS FIBREROVINGS FOR THE REINFORCEMENT OF POLYESTER AND OF EPOXIDE RESIN SYSTEMS
8.	IS 11551	Glass fibre chopped strand mat for the reinforcement of epoxy, phenolic and polyester resin systems
9.	IS 1367 (Part 1to 20)	Technical supply conditions for threaded steel fasteners
10.	AWWA C950	Standard for fiber glass pressure pipe
11.	AWWA M 45	Fiber glass Pipe design

Sl. No.	Code No.	Code Title
12.	ASTM C 33	Standard specification for Concrete aggregates
13.	ASTM D 638	Standard Test Method for Tensile Properties of Plastics
14.	ASTM D 695	Standard test method for compressive properties of rigid plastics
15.	ASTM D 1599	Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings
16.	ASTM D 2105	Standard Test Method for Longitudinal Tensile Properties of Fiber glass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Tube
17.	ASTM D 2290	Standard Test Method for Apparent Hoop Tensile Strength of Plastic or Reinforced Plastic Pipe by Split Disk Method
18.	ASTM D 2412	Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
19.	ASTM D 2563	Standard practice clarifying visual defects in glass reinforced plastic laminated parts
20.	ASTM D 2583	Standard Test Method for Indentation Hardness of Rigid Plastics by means of a BarcolImpressor
21.	ASTM D 2992	Standard practice for obtaining hydrostatic or pressure design basis for Fiber glass Pipe and Fittings
22.	ASTM D 2996	Standard specification for Filament-Wound Fiber glass(Glass-Fiber-Reinforced-Thermosetting-Resin) Pipe
23.	ASTM D 3262	Standard Specification for Fiberglass (Glass-Fiber Reinforced Thermosetting Resin) Sewer Pipe, in the case of gravity sewer pipes.

Sl. No.	Code No.	Code Title
24.	ASTM D 3517	Standard Specification for Fiber glass (Glass Fiber Reinforced Thermosetting Resin) Pressure Pipe
25.	ASTM D 3567	Standard practicefor determining dimensions of Fiberglass (Glass Fiber Reinforced Thermosetting Resin) Pipe and Fittings
26.	ASTM D 3681	Standard Test Method for Chemical Resistance of Fiber glass (Glass-Fiber-Reinforced Thermosetting - Resin) Pipe in a Deflected Condition
27.	ASTM D 3754	Standard Specification for Fiber glass (Glass Fiber Reinforced Thermosetting Resin) Sewer and Industrial Pressure Pipe.
28.	ASTM D 3839	Standard guide for underground installation of Fiber glass Pipes.
29.	ASTM D 4161	Standard Specification for Fiber glass (Glass Fiber Reinforced Thermosetting Resin) Pipe Joints Using Flexible Elastomeric Seals
30.	ASTM D 5365	Standard Test Method for Long-Term Ring-Bending Strain of Fiber glass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe
31.	ASTM D 5421	Standard specification for contact molded "Fibre glass "flanges.
32.	ASTM F 477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
33.	BS 5480	British Standard Specification for Glass reinforced

Sl. No.	Code No.	Code Title
		plastics (GRP) pipes, joints and fittings for use for water supply or sewerage
34.	ISO 1172	Textile-glass-reinforced plastics – Prepregs, mouldingcompounds and laminates -- Determination of the textile-glass and mineral-filler content – Calcination methods

3. DESIGN REQUIREMENTS

3.1. Normal Diameter

The nominal diameter of the pipe shall be as specified in the data sheet. The inside diameters and tolerances on diameters for the specified nominal diameter shall conform to the requirements stated in IS: 14402 / AWWA C 950 / ASTM D3517.

3.2. Length

Pipes shall be supplied in nominal lengths of 6m/9m/12m as per requirements. The tolerances on nominal lengths shall be as per relevant IS / AWWA / ASTM standards to which they are supplied.

3.3. Wall Thickness

The average Wall thickness of the pipe shall not be less than the minimum wall thickness published in latest manufacturer's catalogue. However, minimum wall thickness in these published wall thicknesses of manufacturer shall conform to the tolerance limit as given in relevant IS / AWWA / ASTM standards to which GRP pipes are supplied.

Contractor shall submit design calculations as per AWWA M 45 & AWWA C 950 to establish the adequacy of pipe size, pressure class and stiffness class selected for the GRP pipes.

3.4. Pressure Class

GRP pipes shall have the pressure class as per the data sheet attached at the end of this subsection.

3.5. Stiffness Class

The pipe shall be stiff enough to meet the design requirement with particular regard to installation method, burial depths, deflection limits, buckling and vacuum requirements.

GRP pipes shall have the stiffness class as per the data sheet attached at the end of this subsection.

3.6. Hoop and Longitudinal tensile strength

GRP pipe system shall meet the minimum hoop tensile strength and minimum longitudinal tensile strength requirements specified in IS 14402 / AWWA C 950 /ASTM D3517 for the pressure class specified in the data sheet attached at the end of this subsection.

4. MATERIAL REQUIREMENTS

4.1. Resin: A thermosetting polyester resin (isopthalic resin) to be used and quality parameters shall be as per relevant IS / AWWA / ASTM standards.

4.2. Glass Fiber Reinforcement: Glass fiber reinforcement shall be of commercial grade 'E' type and shall conform to IS 11273, 1S11320 or 1S11551 as appropriate or relevant ASTM standards.

4.3. Other Materials

Other materials used in the manufacturing of pipe like aggregates, fillers and additives shall be in accordance with the relevant IS I AWWA I ASTM standards.

5. MANUFACTURING REQUIREMENTS

The pipe shall be manufactured through Filament winding process (Continuous Filament Winding process using advancing mandrel method or Helical Filament Winding process) by winding continuous glass fibre filaments saturated with liquid resin or pre impregnated with partially cured resin (subsequent heating may be required to polymerize the resin system) onto the outside of a mandrel in a predetermined pattern under controlled tension as described in ASTM D 2996 to result in a corrosion resistant, composite structure to meet the operating conditions.

5.1. Wall composition

Structure of pipe shall have chemical resistant liner, reinforced structural layer and outer surface layer.

GRP Pipes (as required) shall have to be provided with UV stabilizers and flame retardants in the resin coat of outer surface layer.

5.2. JOINTS

The pipeline shall have a jointing system that shall provide for fluid tightness for the intended service condition.

All GRP pipes and fittings shall be joined with unrestrained sleeve couplings (Double REKA joint) or un-restrained double O' ring bell-

Spigot joints. Thrust blocks are to be provided at each bends irrespective of buried as well as over ground GRP piping. For over ground piping, anchors are to be provided at reducers, branch offs, Tee-offs, expanders and terminal points of other suppliers apart from at points in straight run separated by an interval of 90 meters approx as per AWWA- M45 (for pipes up to 400mm dia.) and as per system requirements for large sizes.

5.2.1. Flanged Joint

Flanged joints shall be used for connecting GRP pipes with valves, pumps and other material piping etc. Flanged joints shall be used with EPDM gasket and hot dip galvanized bolts. The flanged joint is made from the same material as the pipe.

5.2.2. Rubber gaskets

Rubber gasket used with push-on flexible joints shall conform to the requirements of IS: 5382 I ASTM F 477.

Rubber gaskets for use with flanged joints shall conform to IS 5382 or equivalent.

6. TECHNICAL REQUIREMENTS

6.0. GRP FITTINGS & SPECIALS

6.1 General

All GRP fittings, such as bend / elbows, ends, tees, flanges and reducers etc. shall be equal to or superior in performance to pipe of the same classifications and shall be smoothly finished internally.

Generally, all GRP fittings are to be manufactured in factory. Dimensions of the fittings shall be as per relevant standards and drawings shall be submitted to Employer for approval.

Only in exceptional circumstances, specific required fittings may be permitted(Employer's approval) to be fabricated / laminated at site under the supervision of manufacturer of pipes. However, such site fabricated / lapped fitting / branch off shall be hydro tested at pressure no less than 1.5 times the pressure class along-with the pipes.

6.2. Fittings made from straight pipe

Fittings shall be fabricated from complete pipes or portions of straight pipe complying with IS 14402 / ASTM standards as applicable for the pipe classifications. The fitting shall comply

with the declared design requirement and be suitably mitred. The mitreshall be over wrapped externally and internally with liner, woven roving and/or chopped strand mat to ensure the longitudinal and circumferential tensile strength isat least equal by design to that of the pipe with which the fittings is to be used. All fittings shall have sufficient end length of pipe to accommodate over wrapped length of fitting and pipe.

6.3. Fittings made by Moulding

Moulded GRP fittings shall be made by hand lay-up, contact moulding, hot or cold press moulding or tape winding with internal liner.

7. TYPE TESTS

7.1 The contractor shall carry out the type tests as listed in this specification on the pipes to be supplied under this contract. The bidder shall indicate the charges for each of these type tests separately.The same shall be considered for the evaluation of the bids. The type tests charges shall be paid only for the test(s) actually conducted successfully under this contract and upon certification by the Employer.

7.2 The type tests shall be carried out in presence of the Employer's representative, for which minimum 15 days notice shall be given by the contractor. The contractor shall obtain the Employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set-up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.

7.3 The Long term type tests stipulated in Cl.8.05.00 below should have been conducted by the manufacturer or its technology provider on the pipes similar to those proposed to be supplied under this contract, at an independent laboratory or duly approved by accredited third party agency. Bidder shall submit these type test reports to the Employer along with the bid. The manufacturer shall however carry out the short term reconfirmation/ requalification tests as stipulated in Cl.8.05.00 below.

Further, the Employer reserves the right to waive conducting of any or all type tests(short term/ reconfirmation tests) under this contract. In case such type tests are waived for any reason whatsoever, the type test charges shall not be payable to the contractor.

7.4 Not Used.

7.5 The following type tests shall be carried out:

a) Long term hydrostatic strength I Long term hydrostatic pressure Manufacturer or its technology provider should have already carried out the full type testing as described in method A of IS 12709! Procedure-B of ASTM 2992, duly approved by accredited third party agency.

Further, the manufacturer shall carry out the requalification test as described in method B of IS 12709/ reconfirmation test of ASTM 2992 on the same pressure class& stiffness class as specified for the pipes under this package.

b) Chemical resistance of pipe in a deflected condition

Manufacturer or its technology provider should have already carried out the full type testing as described in method A of IS 14402 I Procedure-A or Procedure-B of ASTM3681, duly approved by accredited third party agency.

Further, the manufacturer shall carry out the requalification test as described in method B of IS 14402 I reconfirmation test of ASTM 3681 on the same pressure class & stiffness class as specified for the pipes under this package.

c) Joint testing

All joints shall meet the laboratory performance requirements of section 7 of ASTMD4161. It shall be conducted on joint prototypes of elastomeric gasket sealed couplings in accordance with section 7 of ASTM D4161 on the pipes supplied under this package.

d) Long term Stiffness - Material creep

Manufacturer or his technology provider should have already carried out the full type testing following the guidelines of ISO 10468 and analyzed according to ISO 10928,method B.

Further, the manufacturer shall carry out the reconfirmation test for 1000hrs on the same pressure class & stiffness class as specified for the pipes under this package. The test procedure for this reconfirmation test shall remain same as the Long term Stiffness test stipulated above. The acceptance criteria for this test shall be as given in Clause 11 of ASTM D 5365 or as per alternative method proposed by manufacturer subject to Employer's approval.

e) Long term Ring bending strain test

Manufacturer or his technology provider should have already carried out the full type testing using guidelines of ASTM D5365.

Further, the manufacturer shall carry out the short term reconfirmation test in accordance with ASTM D5365 on the same pressure class & stiffness class as specified for the pipes under this package.

8. MARKING

The marking on pipe shall include the following:

a) Standard mark for the pipes conforming to IS I AWWA I ASTM standards to which they are supplied.
b) The manufacturers name or trademark
c) The nominal pipe diameter
d) Class of pipe (Pressure & Stiffness)
e) Batch no. or date of manufacture
f) Colour bands for over ground piping

9. TRANSPORTATION AND DELIVERY OF PIPES

9.1 GRP pipe shall be handled, stored and transported in strict accordance to the Manufacturer's instructions. Bidder shall have to submit a write up for safe handling and stacking of pipes during transportation and at site.

9.2 All pipes fabricated in the factory and temporarily stacked in the Contractors yard or factory shall be transported to site after shop testing & cleaning them internally. The loading in the factory shall be carried out by means of either a crane, gantry or with shear legs, so as not to cause any damage to the finished material. Similarly, while unloading and stacking, great care shall be taken to ensure that the material is not damaged or dented.

9.3 The material being delivered at site shall be jointly inspected by the Employer and the Contractor. Defective or damaged pipe shall be rejected by Employer or in case of minor damage, the Employer may allow repair of the pipe by the Contractor to the satisfaction of the Employer.

9.4 Props of proven designs shall be fixed to the pipes during transit to avoid undue sagging and consequent distortion. After the pipes are carefully stacked, props maybe removed and re-used for subsequent operations.

In case of transport by ship, packing shall be sea worthy so as to ensure safe delivery till site.

9.5 At site, pipes shall be stacked in such a way that suitable gaps shall be left in the pipes at intervals to permit access from one side to the other.

10. LOWERING, LAYING, JOINTING AND HYDRO TESTING (LLJT) OF GRP PIPES

10.1 Lowering, laying, jointing and hydro testing of pipe shall take place in the supervision of pipe manufacturer. Lowering and Laying shall take place only after the trench and the surface supporting the pipes have been prepared according to the sub-section IIIB - 01 (specification for Civil works of GRP pipes / DI pipes.

10.2 Before placing a pipe in the trench, it is necessary to clean any remains of earth, sand or mud from the inside of the socket and from the opposite end bearing the rubber ring gasket/packing. When cleaning has taken place, run a hand around inside the socket to ensure that there are no residues of hardened resin which can be removed readily with a chisel. It is also necessary to check that the groove has an even depth and has not been damaged.

10.3 For a coupling type of joint, two rubber ring gaskets shall be first fixed into the groove inside the coupling and then the coupling is fixed at the coupling area of the pipe.

10.3.1 Pipes shall be lowered in the trench with appropriate mechanical means like chain pulley block, excavators etc.

10.3.2 Place the pipe in the trench, taking care to dig a small hollow at each end so that the groove and the socket are well separated from the sand gravels in the bottom of the trench.

10.3.3 Anchor the first pipe section laid according to the method described and leave its ends free along a space enough for insertion of the next section and for checking.

Place the next pipe section in the trench and leave enough space for the operator to be free to move and to work between the two pipe sections so as to carry out the cleaning and checking operations.

10.3.4 Clean the coupling area of the joint once more with a cloth and also clean the flared portion of the lead-in using suitable lubricant.

10.3.5 Clean the groove again, take the rubber ring gasket and lubricate it by running it between the hands and checking at the same time, it being in good condition. It shall be ensured that every portion of the ring or inside of the socket must not lacks lubricant as it will impair good insertion of the pipe.

10.4 For socket and spigot type of joint, pass the rubber ring under the pipe until it settles into the groove, then pull it forcibly upwards and follow the ring with the hands so that three quarters of it is positioned in the groove, then lift the ring above the upper generating line of the pipe forcibly and then release it so that it falls into the groove thus being freed of ant twists.

10.4.1 Run the hands around the pipe to check that the whole of the packing is in its seating and, in the case of large diameter pipes, smear lubricant again above the inserted rubber ring gasket/packing.

10.4.2 Align and bring together the two pipe sections until rubber ring touches the flared portion of the lead-in.

When this has taken place, examine the position of the ring and above all, ensure that there are no sand or other foreign bodies present.

10.4.3 Fit the socket onto the spigot very slowly, dwelling halfway along the coupling area, and check the position of the packing visually.

10.4.4 Proceed with the joint until the socket is halted by the abutment ledge. The next pipe section shall not be fitted until the previous pipe section has been anchored with an overlay of sand.

10.4.5 Check the rubber ring gasket/packing after the joint has been coupled. This check must always be carried out and is performed with a blade of steel or of another metal having a thickness of 0.4/0.5 mm, a width of 15 mm and any length greater than 200mm, the blade being inserted into the annular space between the socket and spigot.

This check shall be conducted along the entire circumference where the packing is compressed so as to ensure that the rubber ring has a homogeneous depth and is therefore correctly positioned in its seating. If the ring is found to be seated differently at one point than other points or if there is any doubt, disconnect the joint, check the rubber ring and replace it if shows any permanent signs of faulty seating, check once more the coupling area of the joint, the flared lead-in of the socket and the groove on the spigot. When re-inserting the pipe section, take extra care to align the pipes perfectly. When uncoupling pipe sections, never use chains or steel cables in direct contact with the pipes.

Check once again the position of the ring with the blade

10.5 Checking the installed pipe - Initial diametrical deflection shall not exceed 3% of diameter. Bulges, flat areas, or other abrupt changes of pipe wall curvature are not permitted. Deflection checks shall be done when the first installed pipes have been backfilled to grade and continued periodically throughout the entire project. Layingshall not get too far ahead before verifying the installation quality.

Pipes over 3% deflection shall be replaced completely. No attempt to jack or wedge the installed over deflected pipe into a round condition shall be made to avoid damage the pipe.

10.5.1 Correcting over deflected pipe - Pipes installed with initial diametrical deflections exceeding the approved values shall be corrected to ensure the long term performance of the pipe. Damaged pipe shall be repaired or replaced as directed by the employer. Re compact/ backfill to grade and check the pipe deflections to verify they have not exceeded the values to the satisfaction of Employer.

10.6 Misalignment of the joint - When for reasons of the lay-out of the line the joint has to be misaligned (but such misalignment must remain within the limits provided by the supplier of the pipes),such misalignment at the predetermined angle should be applied only after having inserted the pipe and the joint is thoroughly checked for its water tightness.

10.7 Thrust Block - RCC thrust block shall be provided at bends and at places of reduction in cross section to take care of thrust.

10.8 GRP pipes shall cross minor road / nallah through Hume pipes when buried GRP pipes are crossing roads &nallahs. Sand bags shall be put around GRP pipes within Hume pipe. For railway crossing and / or high way crossings of underground GRP pipes, culverts or MS encased pipe with pushing technology shall be adopted.

10.9 Site lapping of last joint during erection shall be done at a de-humidified condition by skilled worker to ensure correct curing.

11. Field Hydrostatic Tests

The pipeline shall be hydro tested in stretches of suitable length at 1.5 times the pressure class. Water and other facilities as required for such hydro testing shall be arranged by the Contractor.

Finally entire system shall be hydro tested at 1.5 times the pressure class of the pipe/fittings when erection is complete and pump charging has been done. The detailed Filed Hydrostatic Testing Procedure based on International standard shall be submitted to Employer for Approval.

12. ANNUAL MAINTENANCE CONTRACT (AMC) TERMS & CONDITIONS

The Contractor tie-up with the GRP pipe manufacturer, to provide Annual Maintenance Contract (AMC) for 2 years after completion of the warranty period. The following services shall be included under AMC:

a) Round the clock monitoring of GRP pipe installation for any leakage / rupture /damage of the pipeline.

b) Arranging all material (temporary & permanent), manpower (including skilled &unskilled labour), machineries, testing equipment, fixtures, maintenance tools &tackles consumables etc. for repair, maintenance, re-erection/ re-commissioning of any or whole portion of GRP piping system.

c) Repairing the damaged pipes / joints, replacing the damaged part of piping/joints including fittings with new pipes / fittings, wherever necessary, making good damaged or excavated bed & trench of GRP pipe and restoring the trench bed to the original specified bed conditions.

d) Recharging, testing and re-commissioning the entire GRP pipe installation to the satisfaction of the Employer within 24 hours of the reporting of leakage / rupture /damage of the pipeline.

DATA SHEET FOR GRP PIPES, FITTINGS AND SPECIALS

Sl. No.	Description	Units	Parameters
1.	Pipe Material		Glass fibre Reinforced Plastic Pipe
2.	Applicable standards		IS / ASTM / AWWA as listed in technical specification
3.	Design Flow	m3/hr	
4.	Working pressure	mWC	115 (approx.)
5.	Vacuum pressure	Kg/cm2	-0.8
6.	Maximum service	^{o}C	36

	temperature		
7.	Hazen William's constant		150
8.	Pipe Nominal diameter	NB	1100-3000
9.	Pipe Length		Refer Sub-Section-IA; Scope of Supply & Services
10.	Pressure Class		PN15
11.	Stiffness Class		C
12.	Stiffness Value	KPa	248 (minimum) at 5% deflection
13.	Glass fiber reinforcement class		E
14.	Pipeline Joint type		unrestrained sleeve couplings (Double REKA joint) or un-restrained double O' ring bell-Spigot joints
15.	Pipe Joint type at valves, pumps and other piping		Flange Joints

13.APPURTENANCES AND MISCELLANEOUS ITEMS

13..1 Sluice Valves

13.1.1General

The sluice valves shall confirm to IS: 14846. Double flanged short body, Gland less (stem sealing rings) type Sluice valves with appropriate pressure rating. The material to be supplied under this sub-section shall include, but not be limited to, the following: All necessary fittings including bolts, nuts, gaskets, backing rings, counter flanges, jointing material, strainers etc. shall be supplied as required. All the Gland less (stem sealing rings) sluice valve shall be provided with ball thrust bearing and spur gear arrangement or Ductile Iron Double Flanged Resilient Seated Non rising stem type Gate Valve confirming to EN 558-1, DIN 3352 F4/BS 5163 can also be considered.

13.1.2Scope

The Gland less (stem sealing rings) sluice valves shall be with non-rising stem type. The valves will be used for water supply on line installations in upright positions, with double flange, and cap or hand wheel for manual operation. The valves shall be suitable for continuous use at their PN rating within the temperature range of -10" C to 65" C.

13.1.3 Nominal pressure and dimensions

The working pressure on the valves shall be appropriate to the working conditions and approved by the Employer. The flanges and their dimensions of drilling shall be in accordance with IS: 1538 (part-1 to XXII). 35.1.4 Material

51. No.	**Component**	**Material**	**Ref. to IS**	**Grade *I* Designation**
1	Body, bonnet, dome, stool cover, wedge, stuffing box, gland, thrust plate, hand wheel and cap.	S. G. iron	1865	Gr.400/15
2	Stem	Stainless steel	6603	12C,13 04C, 18Ni 10 04C,17Ni 12 MO 2
3	Wedge nut	Leaded tin bronze	318	LTB-2
4	Body seat ring, wedge facing ring and bushes	bronze	318	LTB -2

5	Bolt	Carbon steel	1363(Part 1)	Class 4.6
6	Nut	Carbon steel	1363 (Part 3)	Class 4
7	Gasket	EPDM Rubber	11855	-
8	Gland packing	Stem Sealing Ring	5414	nil
9	Gear	Spheroidal graphite iron	1865	G,500/7
10	Gear housing	S.G. iron	1865	Gr.400/15
11	Pinion and pinion shaft	Wrought carbon steel	1570 (Part 3)	C5SMn7S

The makes given are acceptable makes however the material for different component parts of sluice valve shall conform to the requirements given below:

13.1.5 Marking, Testing and Inspection

The standard marking and packing of the valves shall be done as per Clause 11and 13of IS: 14846. The direction of rotation for OPEN, CLOSE position shall be marked on the hand wheel and on the bonnet of the valve. Hydraulic testing of each sluice valve shall be done for close end test in accordance with IS: 14846 Annex B, to the test pressure and test duration as specified in table 5 and 6 of the IS.

All the valves shall be inspected for flaw detection test in accordance with IS: 14846, clause 10.2. The design, construction material, manufacture, inspection, performance and testing shall comply with all applicable Indian Standards and Codes. Nothing in the specification will be construed to relieve the supplier of this responsibility.

13.1.6 Manufacturer's Test certificate

The manufacture shall provide a test certificate confirming that all the valves have been tested in accordance with IS: 14846 and stating the pressures and medium used in the test.

13.1.7 Third party inspection

The inspection and testing of the sample valves from a lot will be carried out by the employer and or inspecting agency appointed by the employer, in the manufacture's workshop, before application of any paint. All the tests as required as per the IS: 14846 shall be carried out on samples from each lot (Number of samples from a lot shall be as per the relevant IS for sampling and testing), in presence of the inspecting agency. The valves shall be dispatched only after issue of the test certificate by the inspecting agency for satisfactory performance of the tested valves. The inspection charges for such tests shall be first paid by the contractor to the

inspecting agency, which shall be reimbursed on production of the documentary evidence for the payment made.

13.1.8 Acceptable makes for the valves

Acceptable makes for the sluice valves shall be as per the approved vendor list. All the valves shall have the same make. Contractor should not place order with any other manufacturer for the above said item till has been approved in writing by employer for the makes listed above.

13.1.9 Installation

The installation of the sluice valves shall be done at the locations shown on L-sections of the pumping main as washout valves and isolating valves for air valves. The job covers supply of the valves at work site with cost of all the required material and all types of taxes and duties, cost of packing, loading, transportation, unloading, stacking and installation at the specified location with cost of all jointing materials such as nuts and bolts, EPDM rubber gaskets etc. The job also covers field hydraulic testing of the valves after installation for the specified test pressure for the respective pipeline section.

13.1.10 Gate Valves

Electrically operated, Double flanged, Outside screw rising spindle for Real-time operation and control shall be installed at the inlet points of all the Minor and sub-minors off taking from rising main/ducts/ BR's.

13.2 BUTIERFLY VALVES

13.2.1 GENERAL

The Butterfly valves shall confirm to IS: 13095. Double flanged short body butterfly valves of required nominal diameter and pressure rating shall be supplied. The material to be used shall include, but not be limited to, that as shown in the table given below. All necessary fittings including bolts, nuts, gaskets, jointing material etc. shall be supplied as required. Butterfly valves of Concentric Design and Vulcanized type generally as per EN

593, BS 5155, API 609 can be also considered .

13.2.2 SCOPE

The butterfly valves shall be with disc and shaft and shall be designed to withstand the maximum pressure differential across the valve in either direction of flow. The valves shall have no visible leakage past the disc in closed position under test conditions. The shaft may be of one piece design or in two pieces separately attached to the disc. The valves will be used for water supply on line installations in upright positions with actuation. The valves shall be suitable for continuous use at their pressure rating within the temperature range of -10°Cto 65°C.

13.2.3 NOMINAL PRESSURE AND DIMENSIONS

The working pressure on the valves shall be appropriate to the working conditions and approved by the Employer. The flanges and their dimensions of drilling shall be in accordance with IS: 1538 (part-1 to XXII).

13.2.4 MATERIAL

The makes given are acceptable makes however the material for different component parts of butterfly valves shall conform to the requirements given below:

SI.No.	Component	Material	Ref. to IS	Grade
1	Body	Spheroidal graphite Iron *I* Ductile Iron	1865	Gr. 400/15
2	Disc	Spheroidal graphite Iron *I* Ductile Iron	1865	Gr. 400/15
3	Shaft	Stainless steel	6603	-
4	Seating ring *I* Seal retaining ring	Integral Nicol Crominium Welding /Stainless Steel	6603	-
5	Seat	EPDM Rubber	-	-
6	Shaft bearing seals	Bronze *I* brass bearing with '0' rings	-	-
7	Internal fasteners	Stainless steel	Manufacturer' s standard	Suitable for duty
8	External bolting	Carbon steel; tensile strength 390 Mpa	-	-

13.2.5 OPERATION

All valves shall be capable of being operated at a differential pressure across the disc as marked on the valves. Lever, worm gear *I* travelling nut type or any other suitable type of operator can be used.

Manually operated valves shall be closed by turning hand wheel or lever in a clockwise direction when facing the hand wheel or lever. The design of lever when fitted shall be such that the lever may only be assembled to the valve so that it is parallel to the direction of flow when the valve is open.

All gear nut operators shall be provided with suitable stops to prevent movement of the shaft beyond the limit corresponding to the fully closed position of the disc.

All gear *I* nut operators shall be self locking type. All Ieaver operated valves shall be capable of being locked at at-least three intermediate positions. The operating hand wheels shall be marked 'CLOSE' or 'SHUT' to indicate the direction of closure.

The operator shall be provided with arrangement to indicate disc position.

13.2.6 TESTING

All valves shall be hydraulically tested by the manufacturer before dispatch. The pressure shall be applied without any significant hydraulic shock. Testing shall be carried out before application of paint or other similar treatment.

13.2.6.1 Body test

The body ends shall be blanked. The valve disc shall be in slightly open position and the pressure equivalent to 1.5 times the maximum permissible working pressure shall be applied with water. The duration of test shall be 5 minutes for 1600 mm diameter valve.

13.2.6.2 Seattest

Seat test shall be carried in accordance with clause 17.3 of IS: 13095 for 3 minute duration.

13.2.6.3 Disc strength test

The test shall be conducted with the body flanges in horizontal position. The test pressure shall be 1.5 times the maximum permissible pressure. With disc in closed position, hydro test pressure shall be applied to the lower face of the disc for duration as per table 3 of the IS: 13095. There shall be no damage to the valve disc or any part of the valve, or disc shall not be permanently deformed.

13.2.7 MANUFACTURER'S CERTIFICATE

The manufacture shall provide a test certificate confirming that all the valves have been tested in accordance with IS: 13095/Equivalent Standard. The manufacturer shall also provide documentary evidence of having manufactured and supplied BFV of similar design and specifications, working satisfactorily in India, through Performance Certificate.

13.2.8 THIRD PARTY INSPECTION

The inspection and testing of the sample butterfly valves shall be carried out by the employer and or inspecting agency appointed by the employer, in the manufacture's workshop before application of any paint. All the tests as required as per the IS: 13095 shall be conducted in presence of the inspecting agency on the sample valves from the lot (Number of valves to be tested from a lot shall be as per the relevant IS for sampling and testing). The valves shall be dispatched only after issue of the test certificate by the inspecting agency for satisfactory performance of the tested valves. The inspection charges for such tests shall be first paid by the contractor to the inspecting agency, which shall be reimbursed on production of the documentary evidence for the payment made.

13.2.9 MARKING

Marking shall be cast integral on the body or on a plate securely attached to the body. Marking shall be as specified under clause 21 of IS: 13095. The design, construction material, manufacture, inspection, performance and testing shall comply with all applicable Indian Standards and Codes. Nothing in the specification will be construed to relieve the supplier of this responsibility.

13.2.10 ACCEPTABLE MAKES FOR THE VALVES

Acceptable makes for the double flanged butterfly valves shall be as per the approved vendor list. All the valves shall have the same make. Contractor should not placed order with any other manufacturer for the above said item till has been recommended in writing by employer for the makes listed above.

13.2.11 INSTALLATION

The installation of the butterfly valves shall be done at the locations shown on L sections of the pumping main as online valves. The job covers supply of the valves at work site including all type of taxes and duties, cost of packing, loading, transportation, unloading, stacking and installation at the specified location with cost of all jointing materials such as nuts and bolts, EPDM rubber gaskets etc. The job covers field hydraulic testing of the valve after installation for the specified test pressure for the respective pipeline section.

13.2.12 ACTUATORS OPERATED VALVES

- **i** Actuators will be with Limit and Torque switches for either end of travel for control and interlocking purpose .
- **ii** ii) The characteristics of the actuators to be located on the valves are indicated in the actuators specification.
- **iii** Should the actuator be located on the control column, all connecting accessories shall be supplied (extensions, joints, articulations etc.).
- **iv** The valves 350 NB and above shall also be provided with hand wheel drive arrangement suitable for manual operation. Manual operation of valve shall be through worm and gear arrangement having totally enclosed gearing with hand wheel diameter and gear ratio designed to meet the required operating torque. It shall be designed to hold the valve disk in intermediate position between full open and full closed position without creeping or fluttering. Adjustable stops shall be provided to prevent OVOT travel' in either direction.
- **v** Limit and torque switches shall be enclosed in water tight enclosures along with suitable space heaters.

13.2.13 MATERIALS/ DESIGN DETAILS "

Materials, design and other specific requirements of various categories of BF valves shall be as indicated below .

51. No.	Description	Requirement.
a)	Design	As per IS 13095/ BS 5155/API 609
b)	Type	Double flanged /Wafer Series
c)	Material	
	i) Body and Disc	Cast steel grade ASTM-A 276 74 d Gr. WCB

51. No.	Description	Requirement.
		or SG Iron as per IS 1865 gr.500/7, Ductile Iron GGG 40/50, ASTM A 536
	ii) Shaft	Stainless steel AISI: 431/410/Equivalent
	iii) Body Seat	Monel 60 integral/Stainless Steel
	iv) Disc Seat	EPDM/SS
51. No.	**Description**	**Requirement.**
	v) Bearing	PTFE LINED ST.ST./Bronze
	vi) Testing	AWWA-C-504/IS
	vii) Other Requirement	Tight shut off

13.2.14 SPECIFIC PERFORMANCE GUARANTEE

For the rubber seated valves, the contractor shall guarantee that in the closed position and with a disc differential pressure as specified the valves shall be water tight.

The contractor shall guarantee that the operating mechanism shall open and close the valve under the specified maximum differential pressure within the time specified.

The valve shall be suitable for frequent operation during initial commissioning operation after a long period of inactivity.

13.2.15 MARKING

The mark stated by the Employer in the Material Request shall be printed on the body, of all valves and relevant accessories (control columns and relevant connecting elements to the valve, counter flanges. valves for the auxiliary control if separately supplied. etc.).

The face of each hand wheel shall be clearly marked "Open" and "Shut" with arrows indicating the direction of rotation to which they refer. Each hand wheel shall also be fitted with a circular name plate indicating the service for which the valve is intended and valve tag number. The name plates shall be engraved in black lettering Each spare part shall be individually marked with metal plates suitably punched for an easy identification

TESTING AND INSPECTION

13.2.16 All valves shall be checked for correctness in respect of flange details as specified. The valves shall be tested as per the requirement of AWWA C-504 {latest version} IS. Proof of design-tested valve shall not be supplied for the project.

For cast construction: Body and Disc shall be subjected to MPI/LPI and shaft shall be subjected to UT and LPI..

For Fabricated Construction: All Butt welds having thickness 20mm and above shall be subjected to Radiography and, stress relieving. Only qualified welders shall be used for the purpose of carrying out welding shaft shall be subjected to UT and LPI.

SITE TEST

13.2.17 The valves shall be tested at site for opening and closing time, valve operation etc. The valve should operate without any flutter, noise, and vibration.

A. ELECTRIC MOTOR ACTUATORS FOR BUTTERFLY VALVES

DESIGN REQUIREMENTS

13.2.18

Electric actuators shall essentially consist of electric motors, limit switches, hand wheel and gear trains, mechanical position indicators, internal wiring and terminal block.

The electrical actuator assembly inclusive of drive motor and unit switches compartment shall conform to IP 55 degree of protection. Actuators shall be sized so as to. open *I* close the valve at the rated speed against the design differential pressure at 90% of the nominal voltage .lost motion hammer blow feature shall be provided for seating *I* unseating the valve when the operating torque exceeds 11 kg/m. Operators shall be designed to be self locking (i.e. maintains the stem position) upon loss of electric power supply. Motors shall be installed on the operator prior to shipment to the valve manufacturer. Actuators shall be provided with lifting lugs for handling it along with the bonnet Actuator assembly shall have all metal gear trains. Operators shall be flange mounted on the valve bonnet. Welding of operators onto bonnets is not permitted. All actuators shall be as per the approved vendor list or as approved by the employer.

13.2.19 OPERATING SPEED

All actuators shall have operating speeds as per the manufacturer's standard. However, this shall meet .operating requirement of the system. Actuator operating times (opening arid closing) shall be furnished with actuator details.

13.2.20 SERVICE CONDITIONS

The actuator shall be suitable for operation in a hot, humid and tropical atmosphere. Unless otherwise stated in the equipment specification, the ambient air temperature shall be taken as 50 dg. C, relative humidity 100% and mean sea level less than 1000 meters.

13.2.21 RATING

The actuator shall be designed for operation on a 415 V + 10%, 3-Phase 50 Hz + 5% solidly grounded system. The combined voltage & frequency variation shall be *+1-* 10%. The control circuit voltage shall be 2401110 VA.C. or 220V D.C.

The actuator shall be rated for three successive open-close operation of the valve or 15 minutes, whichever is longer.

The normal torque rating of each drive unit shall have adequate margin and at least equal to theoretical brake torque required to drive the equipment under full load, includingalllosses inspeed reducers and power transmission.

The drive shall take into account valve operating speeds and differential and static pressure required for the service. The contractor shall select operating speeds and design pressure to satisfy requirements of the equipment furnished and acceptable to the Employer. Motor actuator assemblies shall have all metal gear trains. Fiber gears are not acceptable.

13.2.22 PERFORMANCE

The actuator shall open and close the valve completely and make lead-tight valve close, without jamming.
The actuator shall attain full speed operation before valve load is encountered and impart an unseating blow to start the valve in motion (hammer blow effect).
The actuator shall operate the valve stem at standard stem speed and shall function against design differential pressure across the valve seat.
The motor reduction gearing shall be sufficient to lock the shaft when the motor isde energized and prevent drift from torque switch spring pressure.
The entire mechanism shall withstand any shock resulting from closing with improper setting of limit switches or from lodging of foreign matter under the valve seat.

13.2.23 SPECIFIC REQUIREMENT

Construction

The actuator shall essentially comprise of the drive motor, torque/limit switches, gear train, clutch, hand wheel, position indicator I transmitter, space heater and internal wiring. The actuator enclosure shall be totally enclosed,. dust tight, whether proof suitable for outdoor use without necessity of any canopy. All electrical equipment, accessories and wiring shall be provided with tropical finish to prevent fungus growth.

The actuator shall be designed for mounting in any position without any lubricant leakage or operating difficult. Motor Drive

The drive motor shall conform to sub-section E2 of this specification

The drive motor shall be three phase, 415V, squirrel cage, induction machine with class B insulation and IP-55 enclosure, totally enclosed and self ventilated and designed for high torque low inertia and reversing service suitable for operation at 50 deg. C ambient temperature

The motor shall be designed for full voltage direct on-line start, with starting current limited to 6 times full-load current

All motors shall have TEFC enclosures with space heaters to maintain the internal temperature above dew point when the motor is idle. Space heaters shall be rated for 240VAC.

The motors shall be capable of operating the valve against the maximum load on the valve disc. with drive bearings in dry and dirty condition.

Each motor shall be provided with two direct temperature sensing thermostats to prevent thermal overload.

All motors shall have 0-ring seals to provide complete environmental protection when the motor is idle.

Earthing terminals shall be provided on either side of the motor.

Double shielded grease prelubricated, regreasble, antifriction bearings having a minimum life rating of 1,00,000 hours shall be furnished.

13.2.4 Limit switch

a. Position Limit Switches

Each actuator shall have rotary drum position limit switches, two {2} for open and two (2) for close position, each with adjustable setting between fully open and fully close positions. Each rotary drum position limit switch shall have two normally closed (NC} and two normally open (NO) independent contacts. The adjusting 'mechanism for the limit switches shall be easily accessible.

c. Torque limit switch

Each actuator shall have two torque limit switches with suitable arrangement to limit the opening *I* closing thrust. The torque switch, actuated by the torque' clutch when the valve is restricted during opening *I* closing shall stop the motor thereby protecting the motor from overloading torque. The torque switches shall be set as near as possible to the pull out torque of the motor without damaging the valve of the operation.

Each torque switch shall have two normally open (NO) and two normally close (NC) independent contacts

The torque limit switch adjusting mechanism shall be easily accessible.

Limit switches along with all necessary electrical wiring shall be housed in a weather proof NEMA-3 enclosure and shall have gasketted cover and space heater to maintain the temperature above dew point.

Each torque *I* position limit switch shall have 2 NO + 2 NC potential free contacts.

Contacts shall be rated to make and carry continuously 10 A at 110 V -c and 0.5A (inductive) 220 V DC.

Manual operation.

All actuators shall have mechanically independent manual drive arrangement with hand wheel and motor declutching mechanism. The manual drive shall be provided with clutch and gearing as required to limit hand wheel effort to 25 kg maximum along with suitable latch and locking arrangement to keep the hand wheel in engaged position using manual operation.

The hand wheel shall disengage automatically during motor operation.

13.2.25 Position indicator *I* Transmitter

All actuators shall have one (1) built-in local position indicator for 0.-10.0.% travel. All actuators shall be provided with mechanical 3-point dial position indicators. Rising steam valve shall additionally have visual position indication through plastic stem covers.

Where required. valves shall be provided with continuous remote position indicators of the potentiometric type. The available voltage sources for the potentiometric position transducers are 220V DC and 240 V AC. The transducer shall be suitable for stablished 4-20 mA current signal. The associate dwiring for the transducers shall be housed in the limit switch compartment. Space Heater

A space heater shall be included in the limit switch compartment suitable for 240. V AC, SO. Hz supply 220. V DC.

Wiring

All electrical devices shall be wired up to and terminated in a terminal box. The internal wiring shall be of sufficient size for the power rating involved but no case less than 1.5mm copper. All wiring shall be identified at both ends with ferrules. Internal wiring diagram shall be neatly pasted on the rear side of the terminal box cover

Motor power, heater and all control wiring shall be wired at shop to suitably rated master terminal blocks located within the limit switch compartment. All internal wiring shall be of 650/1100 V grade flexible standard copper conductor cables with tropical fungicidal treatment and the insulation shall be flame resistant The limit switch terminals should be capable of terminating two nos. 2.5 mm copper cable

Terminal boxes shall be provided with removable undrilled gland plates to terminate following sizes of cable.

I. 1no.- 14 core 2.5^2 (Cu)
II. 1no ..,10 cores - do-
III. 1no.- 2 pair
IV. 1no.- 10 pair
V. 1no. - Power cable

Terminal Box

Actuator terminal box shall be suitable to receive and terminate the following cables:

a) 1No. power cable details of this shall be intimated later.

b) 3 Nos. 19 C x 2.5 copper conductor PVC insulated unarmoured control cable Actuator terminal box shall be provided with a removable front cover plate and an undrilled detachable gland plate

13.2.26 DATA TO BE FURNISHED

Motor data sheet for each type of actuator shall be furnished along with internal wiring diagram, suggested control schematic and torque I limit switch contact development.

B) ELECTRO HYDRAULIC ACTUATORS

13.2.27 DESIGN CRITERIA

Each electro-hydraulic actuator shall be provided with its own power pack. Each actuator shall consist of a double acting cylinder, control cabinet and accessories to cater for following operational requirements.

In the closed position the valve shall be held closed by a substantial counter weight or by any other mechanical device.

Start-up sequence of pump shall initiate powered opening of butterfly valve hydraulic actuator. The actuator shall be adequately sized to open or close the valve against an unbalance. Pressure equal to pump shut-off pressure in either direction within the time period as specified. The necessary limit switches shall be provided on the valves so that at a pre-determined position, the pump circuit breaker shall be closed to start the pump. Valve shall remain open during normal running of the pump. No disc flutter shall take place in the position nor shall there be any creep in this fully open position.

A limit switch be provided (set at about 3 deg from open position) to sense the creeping. Switch shall start the oil pump and return the valve to the fully open position. When the valve is fully open and electric supply in the valve control system fails the butterfly valve shall remain open while the CW pump continues to deliver water.

Normal operational shut down shall enable valve to close at a slow closing rate, which shall be adjustable between 30 to 60 seconds.

In case of any fault causing pump motor trip, the corresponding butterfly valve shall start closing at a fast rate initially and thereafter at a slow rate. The emergency closing facilities shall be duplicated each with its own solenoid valve in the hydraulic circuit.

Provision for local manual operation shall be made.

The lower part to the cylinder shall have a fixed orifice especially designed to achieve a minimum valve closing time in case of failure of oil pipeline.

A locking device shall be provided so that the valve can be maintained in open/shut position during maintenance and inspection.

The hydraulic controls for each valve shall be housed in independent cabinet located on an operating floor near the valve. This shall consist of pumping unit, oil tank, and accumulator of adequate -capacity to hold the valve disc at any position and to prevent any surge including disc flutter during valve travel and to fully open position. Accumulator will also have enough capacity for 2 strokes of operation without external electric AC power. The hydraulic power pack will consist of necessary pressure switches, pressure gauges, flow regulators, solenoid valves; transformers, rectifiers etc. for DC power supply for solenoid valves contactors, relays, fuses, indicating lamps, push buttons etc. for control of solenoid valves and pumping units; throttle valve, filters, non-return valves etc. arranged in a logical circuit to meet operation requirement

All oil pipelines *I* flexible hoses interconnecting the control cabinet to the valve shall be in bidders scope

The electrical controls for the valve such as relays, contactors and fuses shall be housed in the common panel (local) for CW pumps or in a separate panel. Reversible starters for the valves shall however, be provided by the Employer

Each butterfly valve shall have four limit switches, each capable of being set of at any point between full open to full close position to meet desired functions. In addition, one more extra limit switch to be set at an intermediate position shall be provided, each limit switch shall have 2 NO. and 2N C contacts. Limit switch enclosure shall conform to NEMA 4 x standard

13.2.28 SUBMITTALS

The contractor shall submit with his offer full details of valve operating mechanism and hydraulic diagram with description.

13.2.29 TESTS AND INSPECTION

The Contractor shall furnish type test certificates from a recognized test house certifying evaluation of accuracy, reliability and repeatability.

Each valve actuator assembly shall be given a complete operation test at the value manufacturer's shop to demonstrate that each operator is functional and all limit switches have been properly set.

Tests shall be also done for speed of travel, torque rating and calibration.

When practicable, each valve assembly shall be shop tested to open and close against the maximum differential pressure.

All the components of actuators shall be subject to tests at the works of Manufacturer as per relevant Material Specifications and Manufacturer's established practices, to ensure reliability. Details of the same shall be furnished to the Employer

Functional test on accumulators, Oil Pumps and completely assembled unit of

Actuators shall be carried out as per approved procedure and Data Sheet.

Contractor Must Conduct Proof of Design Test on the Actuators as per A\NWA-C- 504

13.3 Kinetic Air valves

13.3.1 General

Kinetic air valves are required with pressure rating appropriate for the working conditions and approved by the Employer, confirming to IS: 14845/AWWA C 512.

13.3.2 Scope and general design features

The air valves shall be capable of exhausting air from pipeline automatically when being filled. Air shall be released at sufficiently higher rate so that there shall be no restriction for the inflow rate. Similarly, the valves shall be capable of ventilating pipeline automatically when being emptied. The air inflow rate should be sufficiently high to avoid development of vacuum in the pipeline.

The design shall be such that, higher the rate of flow the greater the resultant down thrust, keeping the ball 'glued' to its seat until the last drop of air is expelled from the pipe system. Each air valve shall be provided with an isolating sluice valve with flanged end connection.

The possible air velocity (inflow and outflow) must be at least 10 *mls.*

13.3.3. Construction features

The flow of air should be as unobstructed as possible. The low pressure orifice shall be in the same axis as the main discharge *I* incoming air flow and must have a diameter sufficiently large. The valve body shall be designed in such a way that the turbulent air at the time of filling of pipeline shall not circulate and cause the ball to be caught in the discharging air stream and blowing the valve shut permanently. The cone angle of the low pressure

(large orifice) chamber shall be such that even at a critical velocity of air escaping at 344 m *I* sec the total impact force on the Stainless steel ball is less than the suction force on the annular area between the ball and cone. The annulus around the low pressure vulcanite covered ball

is to be generously proportioned for discharge of air under various differential pressures. Normal range of cone angle is 450 to 600.

The orifice shall be carefully profiled to allow the requisite flow of air under varying differential pressures. It shall be in moulded synthetic rubber such that even after extended contact the, Stainless steel ball does not stick to it, when the line pressure becomes zero.

The high pressure chamber having small orifice shall be so designed that the orifice is effectively sealed in working condition. The orifice shall be profiled in such a manner that

the rubber covered ball is not damaged even after extended contact. There should be machined guide in the chamber which ensures that the ball travels vertically and makes contact with the nipple and seals off the orifice without fail. The orifice size shall not be less than 2.5 mm and tapering to 10 mm suitable to release accumulated air within the pipeline. High pressure orifice may be fitted from bottom side of the cover.

13.3.1 Material

The makes given are acceptable makes however the material for different components parts of the air valve shall conform to the requirements given below:

SI.No	**Component**	**Material**	**Reference to IS No.**	**Grade of designation**
1	Body, cover, valve disc, stuffing box, valve guide, cowl, gland, cap, joint	S G. iron *I* Ductile iron GGG 40/50, ASTM A 536	1865	Gr.400/ 15
2	Low Pressure seat ring and face ring	Natural rubber	11855	
3	High pressure orifice	Leaded tin bronze	318	LTB-2
4	Bolts	Carbon steel	1363	Class 4, 6
5	Nuts	Carbon steel	1363	Class 4
6	Gasket	Rubber	638	Type B
7	Float	Stainless steel/Polypropelene / Polycarbonate	-	-
8	Float guide	Leaded tin bronze	318	LTB-2

13.3.2 Floats

Minimum float diameters for kinetic air valves shall be as indicated in table 3 of IS 14845. The inner core of the floats shall be made from stainless steel having sufficient bearing strength and equivalent specific gravity.

13.3.2 Testing

Testing of all the air valves shall be carried out in the suppliers work shop as per IS:14845.

Following tests shall be carried for each valve.

- Function and performance test as per clause 12.4.1
- High pressure orifice test as per clause 12.4.2
- Low pressure orifice test as per clause 12.4.3
- Body test as per clause 12.4.4

The performance of the valve for the above mentioned tests shall be as specified under clause 12.1, 12.2 and 12.3 of IS 14845.

13.3.3 Manufacturer's Test certificate

The manufacture shall provide a test certificate confirming that all the air valves have been tested in accordance with the relevant standards and performance of the test results observed.

13.3.4 Third party inspection

The inspection and testing of the sample air valves shall be carried out by the employer and or inspecting agency appointed by the employer, in the manufacture's workshop before application of any paint. All the tests as required as per IS 14845 shall be conducted in presence of the inspecting agency on the sample valves from the lot (Number of valves to be tested from a lot shall be as per the relevant IS for sampling and testing). The valves shall be dispatched only after issue of the test certificate by the inspecting agency for satisfactory performance of the tested valves. The inspection charges for such tests shall be first paid by the contractor to the inspecting agency, which shall be reimbursed on production of the documentary evidence for the payment made.

35.3.5 Marking

Each valve shall be permanently marked with a plate securely fixed to the body with the information as specified under clause 15.1of IS 14845.

The design, construction material, manufacture, inspection, performance and testing shall comply with all applicable Indian Standards and Codes. Nothing in the specification will be construed to relieve the supplier of this responsibility.

13.3.6 Acceptable makes for the valves

Acceptable makes for the kinetic double orifice air valves shall be as per the approved vendor list. All the valves shall have the same make. Contractor should not placed order with any other manufacturer for the above said item till has been approved in writing by employer for the makes listed above.

13.3.7 Installation

The installation of the air valves shall be done with isolating sluice valve. The job covers supply of the valves at the work site including all taxes and duties, cost of packing, loading, transportation, unloading, stacking and installation at the specified location with cost of all jointing materials such as nuts and bolts, EPDM rubber gaskets etc. The job covers field hydraulic testing of the valves after installation for the specified test pressure for the respective pipeline section.

13.4 Anti Vacuum Valve:

13.4.1 Scope:

The Anti vacuum valve of 380 mm will be installed to prevent the formation of vacuum in large diameter (having of 1000 mm. and above) water mains to prevent line collapse under such conditions of flow as may result, for example, from too rapid a closure of an upstream head gate or shut down valve, a downstream burst or ordinary emptying or recharging of a pipeline.

13.4.2 Design features:

Design of the anti- vacuum valve shall automatically allow induction of large volumes of air to prevent vacuum formation; and also provide an automatic means of ventilating a line when it is being emptied of water and of exhausting air when it is being recharged.

It should be suitable to react automatically, sensitively, and positively even after long periods of inactivity, to changes of pressure within a pipe, and whenever necessary, permit air to flow in at a sufficiently high velocity, and at low enough induction pressure, to safeguard the line against collapse.

Cowled Inlet Type of the anti - vacuum valve should have an annular cowl shrouding the orifice, providing protection to the orifice and the seating. It should be suitable for air to flow through the ports provided around the periphery of the body assembly. Such application is confined to situations where no damage is likely to occur surrounding structures from sudden intakes of air.

13.4.3 Operation :

About Operation, the valve element should be in the form of the disk which is sensitively balanced by a counterpoising mechanism. The disk guide pin should be attached to a crosshead, to which is fitted at either end a cranked lever that should rock about an intermediate pivot pin and should be applicable to carry an adjustable counterweight on its outer arm. The parts should so arranged that by adjusting the position of the counterweights, the valve must be balanced at any desired points on its working travel.

Thus, when swinging freely the valve may be balanced at a partially opened position in which case, if it is closed by hand, it self-opens to the pre determined point of equilibrium, and vice- versa. Also attached to the crosshead should be an oil dashpot which should give free opening, in a downward direction, but offer resistance to closing, in an upward direction, and avoid all possibility of oscillation of the suspended.

In action, therefore, the valve should not remain at either extremity of its travel unless it is acted upon by some external force. During normal operation, the disk should be held shut by the water pressure in the pipe. If the pressure on the underside of the disk falls below

that of the atmosphere, the valve should immediately open to admit air and break vacuum. With very small vacuum, say 1inch of mercury or about Y.i psi below atmosphere, should open fully and offer a wide passage for free flow of air. On the cessation of air inflow, the valve must return to a position of slightly open, which is sufficient for the escape of air during refilling of the line. When the rising water makes contact with the underside of the disk, closure is completed: only a very small water pressure should be required to close the valve, consequently, the quantity of water overflowing through the orifice during final closure will be negligible.

13.4.4 Manufacturer's Test certificate

The manufacture shall provide a test certificate confirming that all the Anti vacuum valves have been tested in accordance with the relevant standards and performance of the test results observed.

13.4.5 Third party inspection

The inspection and testing of the sample Anti vacuum valves shall be carried out by the employer and or inspecting agency appointed by the employer, in the manufacture's workshop before application of any paint. The valves shall be dispatched only after issue of the test certificate by the inspecting agency for satisfactory performance of the tested valves. The inspection charges for such tests shall be first paid by the contractor to the inspecting agency, which shall be reimbursed on production of the documentary evidence for the payment made.

13.4.6 Marking

Each valve shall be permanently marked with a plate securely fixed to the body with the information as specified under relevant standards.

The design, construction material, manufacture, inspection, performance and testing shall comply with all applicable Indian Standards and Codes. Nothing in the specification will be construed to relieve the supplier of this responsibility.

13.4.7 Acceptable makes for the valves

Acceptable makes for the Anti vacuum valves shall be as per the approved vendor list. All the valves shall have the same make. Contractor should not place order with any other manufacturer for the above said item till has been approved in writing by employer for the makes listed above.

13.4.8 Installation

The job covers supply of the Anti vacuum valves at the work site including all taxes and duties, cost of packing, loading, transportation, unloading, stacking and installation at the specified location with cost of all jointing materials such as nuts and bolts, EPDM rubber gaskets etc. The job covers field hydraulic testing of the valves after installation for the specified test pressure for the respective pipeline section.

13.4.9 PAINTING SPECIFICATION FOR VALVES :

Final coating on internal and external surface of the Valve shall be carried out after satisfactory testing, prior to dispatch.

Before inspection : Each valve shall be cleaned and surface shall be prepared by Sand blasting to SA 2% Grade- Near white blast cleaning, and suitably protected by applying one coat of two component high build polyamide cured re-coatable zinc phosphate epoxy primer.

After inspection :One coat of two component high build polyamide crude re-coatable epoxy coating shall be applied to achieve DFT 150 micron, followed by one coat of two component aliphatic polyurethane finish to achieve DFT 80 micron.

13.5 Non-return valves

GENERAL

Each pump will be provided with one Non Return Valve in its delivery pipe. The non- return valves shall be all flanges type single door type *I* multi door type,

(recoil or equivalent) well proven type, free acting quick opening, giving rapid non-slam closure etc. and with low head loss characteristics confirming to IS 5312. The valves shall be provided with by passes valves. The flanges shall be confirming to IS 1538-1976 *I* BS 4504. Multidoor NRV will also be accepted.

13**.5.1 MATERIALS OF CONSTRUCTION** Body, coverdoor, hinges Hinge, pines, door pins C.I. 210 GR FG-200 *I* cast steel Stainless

Suspension pins steel.

Disc facing

Seating in body Leaded in Bronze IS 318 GR LTB2

Bearing bushes, Body rings, Leaded in Bronze IS 318 GR LTB2

Door faces Leaded in Bronze IS 318 GR LTB2

Bolts and nuts

13.5.2 TESTING Stainless Steel *I* Carbon Steel

The valves shall be subjected to seat and body test in accordance with IS 5312 at the manufacturer's works vide table below. These tests shall be carried out at manufacturer's works in presence of Engineer or his representative, before delivery. Test Certificates shall be furnished in triplicate.

Valve rating	Seat Test Pressure	Body Test Pressure
PN -0.6	6.0 Kg/cm.sq.	9.0 Kg/cm.sq
PN -1.0	10.0 Kgfcm.sq..	15.0 Kgfcm.sq.
PN -1.6	16.0 Kgfcm.sq.	24.0 Kgfcm.sq.

Also instead of Non Return Valve, Dual Plate Check Valve Design can be considered

14. PUMP CONTROL VALVE

14.1 SPECIFICATION OF PUMP CONTROL VALVES

The Pump Control Valve shall open fully or shut off in response to electric signals. It shall isolate the pump from the system during pump starting and stopping, to prevent pipeline surges during Pump ON/OFF.

Valve Should be with Rapid-action piston for Fast Opening/Closing action to facilitate stable and accurate control.

Valve Should have High Kvfactor e.g. 4" valve should have KV value of 475 m3/hr,

Valve should have Low head loss at high flow rates,

Valve should be strong, lightweight and corrosion proof surfaces, which resist cavitation damage, thus increasing service life and reducing operation & maintenance cost.

Valve should have Linear flow, Low turbulence to minimize cavitation, and allow high flow velocities with low noise and vibration.

Valve should have "Soft closure" feature to prevent water hammer.

Multi-Valve modular configuration Full redundancy enabled. Individual valves can be possible to separately removed for maintenance or replacement which reduces downtime and maintenance costs & allows maintenance work to be done without halting water flow.

14.2 MATERIAL OF CONSTRUCTION :

Valve Body, :Reinforcedfiber glass nylonor Polypropylene

Pistons, Bushing, Front and Rear Cups: Reinforced fiber glass nylon or Polypropylene Main seal : NBR, VITON or EPDM rubber, 0-rlngs : NBR or EPDM rubber

Inlets, outlets :Stainless Steel/Reinforced Fiberglass nylon

Clamps, bolts : Stainless steel

Multi-Valve manifolds :Spheroid iron with Polyester or Epoxy coating

/Stainless Steel.

Pressure Rating : PN 16

Inspection and Testing of all equipment will be done as per the approved Quality Assurance Plan from the Chief Construction Engineer, Anandapur Barrage Project, Salapada.

15. Manufacture, supply and installation of MS Expansion joints and Cover box

15.1 M.S Expansion joints

15.1.1 Requirement

Expansion joints are necessary on the MS pipeline laid above ground to accommodate expansion and contraction of the MS line due to temperature variations, so that the expansion or contraction is not cumulative over several lengths. These joints permit linear movement of the pipe relative to the packing provided in the joint. Fabricated steel Bellow-type expansion joints, as per the EJMA standards, shall be provided and installed at the locations shown on longitudinal section ofthe pipeline.

Normally, on plain ground, the centre to centre distance of the expansion joints shall not be more than 300m. When the length of above ground pipeline is less than 300 m but more

Than 100m, one expansion joint at the centre shall be provided. The pipe line shall be anchored firmly with concrete anchor blocks between two expansion joints, so that the expansion or contraction between two anchor blocks is accommodated by the expansion joint provided between the blocks. Supports *I* saddles shall be placed on each side of the expansion joint at about one meter distance from the centre of the joint to avoid

unequal deflection of the pipe on either side of the joint.

The item covers providing and packing, transportation to work site and fixing wherever required on the pipeline with hydraulic testing along with the pipeline section.

15.1.2 Acceptable makes

Acceptable makes for the Bellow-type expansion joints shall be as per the approved vendor list. All the expansion joints shall have the same make. Contractor should not place order with any other manufacturer for the above said item till has been recommended in writing by employer for the makes listed above.

15.1.3 MATERIAL OF CONSTRUCTION

BELLOWS MATERIAL	SA 240 GR. 304
CENTRE SPOOL *I* WELDENDS	IS 2062 GR. B
INTERNAL SLEEVE	SA 240 GR. 304
LIMIT RODS *I* NUTS & CHECK NUTS	IS 1367
FLANGES	IS 2062 (AS PER IS 1538IIS 6392)

15.1.4 MS cover for expansion joints

15.1.5 Requirement

Circular MS covers as shown on drawing shall be fabricated and fixed on the expansion joint for protecting the joint from possible damages. The item covers the cost of plates and material required, nut bolts, all taxes and duties, providing and applying two coats of epoxy paint in addition to one primer coat, transportation and fixing charges etc complete

15.1.6 Manufacture, supply. and installation of MS dismantling joint

Bellow type Dismantling joint shall be provided for each online sluice valves, butterfly valve and washout valve to facilitate removal of the valve for repairs whenever required.

The joints shall be fabricated as per EJMA standard .The item covers cost of Bellow type Dismantling joint, including all taxes and duties and cost of coating, packing, transportation, cost of jointing including required material such as nut bolts, rubber packing, labour cost etc complete with hydraulic testing to required pressure.

15.1.7 Material of Construction

BELLOWS MATERIAL	SA 240 GR. 304
CENTRE SPOOL *I* WELDENDS	IS 2062 GR. B
INTERNAL SLEEVE	SA 240 GR. 304
LIMIT RODS *I* NUTS & CHECK NUTS	IS 1367
FLANGES	IS 2062 (AS PER IS 1538IIS 6392), BS EN 1092-2

15.1.8 Acceptable makes

Acceptable makes for the Bellow-type Dismantling joints shall be as per the approved vendor list. All the dismantling joints shall have the same make. Contractor should not place order with any other manufacturer for the above said item till has been recommended in writing by employer for the makes listed above.

15.1.9 Supply and fixing of roller bearings

15.1.10 Requirement

Steel roller bearings shall be provided and fixed on the bearing plates fixed on concrete pedestals for above ground pipeline, as shown on drawing. The bearing boxes shall be firmly fixed to the bearing plate. Number of bearings and rollers, size of rollers etc shall depend on the pressure and thrust on the pipeline and shall be as directed by the Engineerin-Charge in charge.

15.2 METALIC *I* RUBBER EXPANSION JOINTS *I* DISMENTALING JOINTS

Metalic *I* Rubber expansion joints shall be provided between the discharge head outlet and valve in delivery line each pumpfor easy assembling and dismantling of the pipe work. The metallic /rubber expansion joint shall with stand the internal test pressure and vacuum as specified in Schedule- design shall ensure that-

1. When assembled and under dynamic load the rigid bolts together withstand pull, equal to twice the duty head and no torque or pull is extending on the discharge head mounting fasteners.

2. During assembling or dismantling, the sliding flange can slide adequately to enable to detach discharge head and piping from each other.

3. The seal ring that joint shall be designed to withstand test pressure mentioned in Schedule 'B' without any leakage.

15.2.1 DESIGN AND CONSTRUCTION

Design of the expansion joints shall be restrained type with minimum three (3) tie rods. BODY

Expansion bellow shall be manufactured from natural or synthetic rubber, with integral flanges at both ends. Split retaining rings of adequate design shall be supplied for severally holding the expansion joint with connecting pipe flanges. CARCASS

Fabrics of high strength synthetic fibers shall be used in suitable number of pipes to hold the shape of the below at the working condition. All fabric pipe shall be impregnated with rubber or synthetic components to permit flexibility before them.

Copper coated steel wire or solid endless rings embedded in the carcass shall be coated with suitable material to protect the carcass from outside sewage and fluid corrosion. Protective hypalon coatings shall be applied at the exterior.

15.2.2 CONTROL ROD ASSEMBLY

Each expansion joint shall be supplied with control rod assembly to prevent excessive elongation or contraction of the below. Control rod assembly will consist of long bolts, nuts

and lock nuts, spherical washer connecting plates (guest plates) for fixing the assembly with mating flanges.

Control Rod assembly shall allow transverse and rotation movements under limiting axial conditions of the Expansion Joints.

Design of control rod assembly shall take care of the maximum axial thrust across the

Bellow, calculated on the bases of maximum fluid internal pressure and internal diameter of the each.

Expansion joints shall be provided with flanges drilled to suit the Pumps delivery flange.

15.2.3 INSPECTION AND TESTING

Tests at shop shall include but not be limited to the following

15.2.3.1 Material test as per specification requirement.

15.2.3.2 Vacuum test.

15.2.3.3 Hydro- test

15.2.4 HYDRAULIC PRESSURE TEST AND LEAKAGE TEST

All expansion bellows shall be subjected to internal hydrostatic pressure test of equivalent to

1.5 times the shut off head of pumps and the following condition.

1. Free position of the bellow for five (5) minutes.
2. With permitted (design) elongation and lateral deflection for Two (2) minutes and
3. With design contraction and lateral deflection for two (2) minutes.

After the hydro test is over, the bellow shall be dimensionally inspected to check deformation, if any.

During the test, the control assembly shall be suitably adjusted to obtain the test condition of the Bellow.

At tests shall be carried out in presence of the Engineer or his representative.

15.2.5 CLEANING, PROTECTION AND PAINTING

Before installation, all expansion joints shall be properly cleaned, as necessary. All exposed finished metal surfaces shall be greased to prevent dust.

15.2.6 DISMANTLING JOINT

Item Design, Manufacture, Supply & Erection of Dismantling Joints of various diameter including hoisting lowering in position fixing in true plumb & level etc. including tie rods hardware gaskets & other necessary material for making joints including all taxes, central state & local conveyance to site, loading, unloading safe storage till erection etc. complete. General: The item providing & fixing in position dismantling joint of various dia. on the pipes. The design work man ship shall be to the specifications of Engineer & shall comply with one or more of the standards, regulations & codes issued by Bureau of Indian standard*I* B.S.Item to Include: The Unit includes:

- Manufacturing of Dismantling joints, providing gasket, tie rods, nut, bolts & studs.
- Quality control
- Conveyance to site.
- Storage till erection
- Erection with all jointing material and labour
- Successful commissioning.
- All taxes central, state and local and any other incidental expenses. Design to be approved before manufacturing:

Before manufacturing the contractor shall submit to the Engineer-in-charge, the detailed drawing with relevant IS. The contractor shall not manufacture joints with not written approval of Engineer-in-charge to the design.

Material of construction & Design data:

i) Name of Fluid Raw River Water ii) Working Pressure 10 Kgfcm.sq.

iii) Material of Construction

Inner shell f- MS as per IS 2062 Gr. B. Outer Sheet f- MS as per IS 2062 Gr. B.

Pressure flange f- MS as per IS 2062 Gr. B.

Nuts bolts tie bar f- CS IS 1367 Gr. B.(Galvanized) studs

Gasket f- Rubber

'0' Ring f- Neoprene {50 shore hardness) iv) Governing standard

Flanges f- IR 1318

Fabrication f- IS 3589

v) Testing f- Test Pressure 16 Kgfcm.sq.

Test Certificate f- Hydraulic Test Certificate &

Material Test Certificate

Before the joints are actually fixed, they shall be cleaned, greased & it should seen that all the parts are perfectly in working conditions.

37.2.7 Dismantling joints shall be suitable for flange bolting individual to flanges of BFV & NRV. Flange made segments & welded shall be stress relived after welding.

Flange & machined surfaces shall be protected from corrosion during shipment and

Subsequent storage by casting rust pan, preventative or equivalent which is easily removable with petroleum.

15.3 SURGE PROTECTION DEVICES

15.3.1 General

Doing Surge analysis and designing system to control anticipated Water hammer by installation of 'Spring operated Zero Velocity Valves' and 'Air Cushion Valves' etc. shall be responsibility of the Contractor.

The Water hammer control system should be such that :

i. There is no significant head loss

ii. Positive pressure shall not exceed 140% of the maximum Working pressure of the Pipeline and

iii. Fall in pressure during forward flow shall not be below Atmospheric pressure.

The agency engaged for doing Surge analysis and supply of Water hammer control devices should have sufficient experience of doing similar to the proposed job and should guarantee control of Water hammer pressures within above parameters.

The design shall be got approved from "Indian Institute of Science, Bangalore" / IIT/NIT or Institute as approved by the Engineer-in-Charge. The design charges shall be at the cost of the contractor.

The specifications for above specified hammer control devices shall be as specified below:

15.3.2 BLADDER VESSEL (Water Hammer Control Device)

Supply, Erection, Testing & Commissioning of Surge protection system (Bladder Vessel) required following features.

1. Large inlet size to water chamber as per water hammer analysis.
2. Minimum vessel thickness is 6 mm inclusive of 2 mm corrosion allowance.
3. Water does not come in contact with vessel.
4. Full size floating bladder rein forced with high strength nylon coated with food grade impervious butyl rubber for long life.
5. Drain arrangement to check pre charged air pressure.
6. Easy availability of spares.
7. The vessel is subject to test pressure for 10 minutes at 1.5 time maximum pressure.
8. Vessel should be epoxy coated internally & externally
9. Bend, NRV, Butterfly Valve, Bypass lines, Air valve, are fitted as per the design.
10. The piping between rising main and bladder vessel has to be carried out as per contract.
11. Required foundation for the bladder vessel.
12. The vessel should be charged with air pressure as per Requirement.
13. The Bladder vessel shall be connected to rising main within 5*D Where D= Diameter of rising main

Any other Bladder Vessel Design can be considered alongwith necessary recommended equipment as per approved Surge Analysis Report by

"Indian Institute of Science, Bangalore" / IIT/NIT or Institute as approved by the Engineer-in-Charge

15.3.3 CONSTRUCTION

Bladder vessel consists of Air Chamber and Water chamber. Both are separated by floating impervious bladder. The Air chamber is pre charged via air inlet valve. The bottom flange

can be connected to pipe line via throttling orifice and control valve.

15.3.4 Zero Velocity Valve

The valve has an outer fabricated casing ('Main Body') in which a Central Rod' is held by struts. A 'Stationary Central Dome' creates an annular streamlined passage for smooth flow of water. Closing Disc is mounted on "Central Rod'. Disc is held in closed position by a number of 'Stainless Steel Springs' (of AISI 304).Two 'Anti Rotation Guide' are provided on the edge of 'central disk' with minimum resistance to flow. 'Anti Rotation Guide' is lined with Stainless Steel Strip (of AISI 304) and 'Guide Fork' with brass liners. 'Bypass' with a

'Valve'

connects upstream and downstream sides of Zero Velocity Valve. A 'Man Hole' is provided on 'outlet' cone of main body, for maintenance and replacement of springs (if required) without removing the valve from line. A stainless steel sleeve (of AISI 304) is fitted on 'Central Shaft' and moves in brass bush fitted in 'Disc' for free movement. The 'Outer Shell

'Dome' and 'Disc' are fabricated out of M.S. plates (of IS 2062.). The valve will be painted in Black Tar Enamel Paint from inside and outside.

MATERIAL OFCONSTRUCTION :

51. No.	**Description**	**Material**
1	Entry Barrel and Cone	MS-15- 2062
2	Exit Barrel and Cone	MS-15- 2062
3	Central Lap Ring	MS-15 -2062
4	Guide Dome	MS-15 -2062
5	Central Disk (With Spring Guides)	MS-15 -2062
6	Central Shaft(S.S. Lined)	MS-ST42
7	Entry Cone Support Ribs	MS-15-2062
8	Exit Cone Support Ribs	MS-15-2062
9	Springs	SS-AISI -3 04

10	Anti Rotation Guide (with SS Strip on Plate & Brass on fork)	MS+SS304+ BRASS
11	Stiffener	MS-ST-42
12	Hand Holes	MS-15- 2062
13	Support Bush	MS- ST-4 2
14	Bush for Disc (With Brass Inner Bush)	MS+BRASS
15	Support Bush	MS- ST-4 2
16	Bypass With Valve	1.5.-1239

15.3.5 Air Cushion Valve

The valve consists of a 'Main Body' and Top Housing'. On the side of main body, two 'Air Inlet Valves' loaded with a light spring are fitted. The 'Inlet' is protected by a cover. The 'Top Housing' has an opening for air escape. A spring loaded 'Poppet' with a brass seal and Neoprene 'Sealing Ring' covers the top of the opening. The spring pressure on the valve is adjustable by a screw (S.S. as per AISI-304). The 'Housing' has a tapered outlet, the opening of which is adjustable by a tapered plug and Screw (S.S. as per AISI-304).

The outlet is protected by a cover on its lower side a cage holding a ball float is fitted. 'Main Body', 'Top Flange', are fabricated from M.S. (as per 1.5. 2062/1.5. 1239). The 'Top Housing' is made from high grade cast iron. Main body, float ball and air inlet flange are hydraulically pressure tested. Stems of valves are in stainless steel (as per AISI-304), and work in 'Brass Bushes'. Sealing rings are of good quality rubber and seats are of brass.

The 'Valve' will be painted in "Black Tar Enamel Paint' from inside and outside'.

15.3.6 **Material of Construction** :

51. No.	**Description**	**Material**
1	Adjustable Screw	Stainless Steel
2	Spring (Out Let)	Spring Steel
3	Poppet Spindle	Stainless Steel

4	Poppet Valve Disc	C. I.
5	Seal (Out Let)	Neoprene Rubber
6	Seat (Out Let)	Brass
7	Cage	C. I.or M.S.
8	Ball Float Wood	(Rubber Coated)
9	Tapered Outlet	C. I.
10	Tapered Plug	Brass
11	Screw	Stainless Steel
12	Outlet Cover	C.l or M.S.
13	Seat For Ball	Brass
14	Top Housing	C. I.
15	Main Body	M.S. (Fabricated)
16	Air Inlet Body	M.S. (Fabricated)
17	Seat (Inlet)	Brass
18	Stem	Stainless Steel
19	Spring (Inlet)	Spring Steel
20	Inlet Cover	M.S. (Fabricated)
21	Inlet Disc	C.l *I* M.S.
22	Seal (Inlet)	Neoprene Rubber
23	Mounting Flange	M.S.

15.4 FLOW MEASUREMENT DEVICES:

15.4.1 **Scope** :

Electromagnetic Flow Meter of appropriate size shall be installed at the end of the manifold to measure the quantity of water discharged in to the Distribution Chamber.

15.4.2 Electromagnetic Full Bore Type Flow Meter

Full bore electromagnetic flow meter shall consist of flow sensor (i.e. flow tube), flow transmitter and flow indicator and integrator and any other item required to complete the system. To avoid the effects of disturbances in the velocity profile, a straight and uninterrupted run, upstream as well as downstream from the location of the flow meter shall be provided, as required by the flow meter manufacturer and in line with the

applicable standards. Contractor shall finalize the exact location of flow meter in consultation with Representative of Employer.

Flow measurement shall not be affected by physical properties of water viz., temperature, pressure turbidity etc., within given limits. Contractor shall provide compensating Electronic circuits, if required.Fiow meter shall be installed as per OEM guideline & verify accuracy after installation by OEM.

A lockable enclosure shall be provided for the flow transmitter cum computing unit, if required.

Flow meters shall be suitable for the water turbidity at site during various seasons. Flow tube shall be rugged in construction and shall be suitable for continuous operation. Flow tube shall have waterproof construction and shall be suitable for installation on underground /above ground pipe lines.

The flow computer and transmitter shall be a single unit suitable for panel mounting. It shall accept inputs from flow tube, process the signals and shall provide an output proportional to the flow rate. The distance between transmitter and flow tube shall be maximum 250 mtrs. Taper pieces required for installation of flow meter shall not exceed an angle of 8" in order to avoid disturbance in flow profile.

a) General:

(i)	Accuracy of flow measurement during FAT	±0.5% of measured value
(i)	Overall accuracy of flow measurement	±1.0% of measured flow

loop.

b)

Flow tube

		The water pumping mains
(i)	Application :	In line full bore electromagnetic
(ii)	Type :	As approved by the Employer.
(iii)	Size offlow tube :	Flanges as per BS 4504
(iv)	Process connection :	IP 68 as per IS 13947
(v)	Weather Protection Class :	
(vi)	Surge protection devices (SPD) between flow tube and flow transmitter:	Required for protection from lightningsurges
(vii)	Material of Construction :	

Electrodes :	SS 316, self cleaning pipe
Coil Housing :	SS 316, fully welded construction.
Flanges: Grounding ring:	/S.S flow tube with carbon steel coil housing
Flowtube lining:	Carbon steel ss 316
	ETFE/Neoprene/PTFE.

(viii)

Flow Transmitter Unit	Microprocessor based with facility to configure the ranges.
(i) Type:	4 digit backlit LCD/ LCD, for flow rate in m3/hr. 8 digit backlit LCD/ LCD for totalized flow in ML
(ii) Typeof display :	Flow rate -m' *I* hr
(iii) Unitsof display :	Totalized flow- ML

c)

(iv) Input:	From flow tube

4-20 DC(V) Output : 4-20mA (isolated) proportional to flow rate

(v)	Power Supply :	230VAC
(vi)	Zero and Span Adjustment :	Required
(vii)	Weather Protection Class :	IP 68 as per IS 13947
(viii)	Battery backup for totalized	

flow

Type Online

Capacity 2.5 mVA

Backup Time 8 hrs

(xi) Facility for on line diagnosis :

15.4.3 Calibration:

The Electromagnetic flow meter shall be wet calibrated for the full flow range specified as per BS EN 29104 (Methods of evaluation of electromagnetic flow meters). The calibration method shall be either gravimetric method as per ISO 4185 (Measurement of fluid flow in closed conduits -weighing method) or volumetric method as per ISO 8316 (Calibration by

Volumetric Method). The Contractor shall produce accreditation certificates for the test facility and calibration certificate for the flow meter for the review by representative of the Employer. The Contractor shall also demonstrate complete wet calibration on the test bed in the flow meter laboratory. The flow meter shall be acceptable if the accuracy and repeatability is equal to or better than those specified.

15.4.4 Flow Indicator and Integrator

Flow indicator and integrators shall be modular in design. It shall consist of two separate dedicated displays for flow rate indication and total flow indication. It shall accept 4-20 rnA DC isolated input. The flow integration shall be carried out in the Programmable Logic Controller (PLC). The flow indicator cum flow integrator shall provide 4-20 rnA retransmission output proportional to flow rate.

51. **No.**	**Details**	**Description**
1	Type	Microprocessor based
2	Mounting	Front facia of Control Panel
3	Display	Digital, seven segment back lit LCD *I* LED display
4	Digit Height	14 mm or Higher
5	No. of Digits for Flow indicator Flow integrator	 4 Digits 6 Digits
6	Input	4-20 rnA DC (Isolated) from flow transmitter through analogue signal multiplier (Refer Note 2)
7	Zero and span adjustment	Required
8	Manual Reset Facility	Required (shall be password protected)

51. No.	Details	Description
	for flow integrator	
9	Engineering units: -Flow rate indicator - Flow integrator	Cum/h r ML
10	Battery backup for integrator	Required
11	Retransmitted output	4-20 rnA proportional to flow rate
12	Alarm outputs	1NO+ 1NC for high and low alarms (adjustable)
13	Communication port	RS-485 (With Mod bus protocol) for interfacing with PLC
14	Weather Protection	Class IP-52 of IS 13947 Part I
15	Accuracy	± 0.25% of span or better.

Notes:

1. Digital flow indicator and flow integrator shall be a combined unit.

2. Facility shall be available inthe analog signal multipliers and in the flow indicator and integrator for providing excitation voltage for the flow transmitter in case of 2- wire flow transmitters.

15.4.5 Acceptable makes for Electromagnetic Flow meters

Acceptable makes for the Electromagnetic Flow meters shall be as per the approved vendor list. All the Electromagnetic Flow meters shall have the same make. Contractor should not place order with any other manufacturer for the above said item till it has been recommended in writing by employer for the makes listed above.

15.4.6 Installation

The installation of the Electromagnetic Flow meters shall be done at the locations decided by the Engineer-in-Charge. The job covers supply of the Electromagnetic Flow meters at work site with cost of all the required material and all types of taxes and duties, cost of packing, loading, transportation, unloading, stacking and installation at the specified location with cost of all jointing materials such as nuts and bolts, EPDM rubber gaskets etc. The job also covers field hydraulic testing of the Electromagnetic Flow meters after installation for the specified test pressure for the respective pipeline section.

15.5 PIPE,VALVES, FITTINGS OFAUXILLARY SYSTEM

15.5.1 CODE & STANDARDS

The design, manufacture, shops testing, erection testing and commissioning of piping and valves shall conform to the latest revisions of applicable Indian standards.

15.5.2 SCOPE

The equipment & material to be supplied for each Pumping station under this section shall include but not be limited to the following. Pipes, bends elbows, tees, branches laterals, crosses, reducing unions, couplings, cap, expansion joints, flanges, blank flanges, saddles, shoes, sampling connections etc. necessary for making a reliable piping system.

Gaskets, ring joint, bracing rings, jointing material etc. as required.

Instrument tapping connection, stub and thermo wells.

Supply and machining work of flanges, pipe spools and matching pipes to conned flow measuring orifice nozzles etc., pressure accumulators as necessary.

Valve to start stop and regulate flow.

Strainers

Anchor block (for buried/ over ground piping), support brackets, clamps, supports etc. for the piping

Bolts, nuts, fasteners as required for interconnecting piping, valves and fitting as well as for terminal point.

Secondary steel for pipe supports and embedded steel. Also pipe supports and necessary embedment required to be embedded in concrete for under ground/above ground pipe.

Painting anti-corrosive coatings, etc. inside and outside of pipes as necessary. All embedded parts required for all tanks, water-retaining structures made of RCC including puddle pipes shall be supplied by the contractor.

15.5.3 DESIGN, CONSTRUCTION AND ERECTION Piping

{General)

Material of construction for pipes carrying various fluids shall as below:

51. No	**Service**	**Recommended Material**
I	I Filtered Water	I Carbon Steel/ GRP
1.		
I 2.	I Acidic Water	I Rubber lined Steel
3.	Acid (hydrochloric)	Rubber lined Steel
4.	Alkali (Sodium Hydroxide)	

	a. Strong (5% to 50%)	Stainless' Steel
	b. Dilute	Rubber lined steel/Stainless steel
5.	Waste effluent from OM Plant vessels & chemical solution tank's etc.	HDPE *I* Rubber lined Steel

15.5.4 Pipelines carrying water, chemicals, air etc., shall be sized on the following velocities.

		Velocity in m/sec.		
	Pump Size	**Below 50 mm**	**50-l00mm**	**200mm & above**
a)	Pump suction	-	1.2-1.5	1.2- 1.8
b)	Pump discharge	1.2 -1.8	1.8-2.4	2.1- 2.5
I c) I Header I I		I 1.5- 2.4 I	I	2.1- 2.4 I

Pipe line under gravity flow shall be restricted to a flow velocity of *1m/sec* generally. Channels under gravity flow shall be sized for a flow velocity in the range of 0.6 *ml* sec. (maximum).

Material & Dimensional" Standards for piping

All piping system shall be capable of withstanding the maximum pressure and temperature in the corresponding line.

The steel pipes (welded type) for the services of water/ clarified - water/ Filtered water shall conform to the following standard or codes.

15.5.4.1 Pipes up to 150 NB

15.5.4.1.1 IS: 1239 Part-1 (Heavy grade- Black)

15.5.4.1.2 ASTM-A53 Grade B Welded), such 80 up to 2 inch nominal size

15.5.4.2 Pipes 200 NB and above

15.5.4.2.1 IS: 3589- Grade 410

15.5.4.2.2 ASTM- A53 Grade B (welded)- Sch. 40

If pipes are manufactured from steel plates, the plates shall conform to IS: 2062, B grade. The thickness shall be as per the pressures to be handled but should not be less than 8 mm.

Pipes to be used for the rubber-lined construction shall conform the above clause

3.02.02 and Inside surface shall be completely de beaded and made suitable for lining.

various fittings to be used in the piping shall conform to the IS/BS/ANSI Standards

and In conformity with the parent pipe standard.

15.5.5 Design of Piping Systems

For water, air and other services where steel pipes are used, joints of this size range shall be screwed/flanged type;

All unlined steel pipes 65 NB and above (other than .CI pipes and air service pipes) shall be jointed by butt welding.

All rubber lined pipes shall have flanged joints. Miter bends shall not be used· on RL piping. Only forged fittings shall be used.

Steel pipe flanges shall be generally slip on or raised face type. Welded neck flanges shall be used when flange follows immediately after a butt-welding or where it is required with respect to service conditions. When weld neck or socket weld flanges are used, their bore must be made the same as that of the pipe being welded to Socket welded or threaded flanges may be used, with the appropriate piping system for connection of pipe to the flanged equipment

All the piping flanges and counter flanges shall conform to ANSI B 16.5 Cl. 150.

For easy handling & removal of equipments, valves etc. and for maintenance purpose, break up flanges for 65 'NB and above sizes and suitable type of compression flexible coupling for flanged joints of 50 NB and below size shall be provided. The overgrown piping, wherever routed inside building, shall have a clear head room of minimum 2.1 meter from operating floor.

Buried piping shall be generally installed so that the top of pipe is 1.0 meter below the ground level unless otherwise specifically mentioned.

Complete supporting system for the pipe line shall be designed, fabricated and supplied by the Bidder. Inside the building, the overhead portion of the pipe line may be supported from the building structures. No support shall be taken from the brick wall. Outdoor, pipes other than buried pipes shall run on steel trestles. Crossing of the road shall be on a pipe bridge with a clear height to at least 6.1 meters over the road surface. All the steel structures for the pipe bridge, and the supporting posts *I* trestles along with all necessary hangers clamps, connecting steel, fixing bolts, nuts etc., shall be supplied and erected by the Bidder.

Miter bends will not be accepted for steel pipes of 250 NB and below. For sizes 300 and above, the miter bends shall conform to BS: 534.

For rubber lined pipe, lining should be applied in two (2) layers, giving a total thickness not less than 3 mm.

15.5.6 Painting and application procedures shall be as follows:

a) Surface to be painted shall be thoroughly cleaned of loose mill scale, rust etc, by wire brushing.

b) For over ground exposed steel pipes, two coats of red oxide primer (zinc chromate). primer shall be applied on

the cleaned surface. There after minimum two (2) coats of synthetic enamel paint of approved colour shall be applied on the same to total dry film thickness of not less than 200 microns.

c) The protective coating of buried pipe shall consist of coal tar primer2 coast· and 2 wraps of coal tar enamel and glass fiber inner wrap followed by glass fibber or coal tar impregnated kraft paper outer wrap. Min. thickness for each layer of application shall be as per IS: 10221, and the total thickness of the completed coating shall not be less than 3.2 mm.

15.5.7 VALVES AND STRAINERS

Valves will be used to start/stop & control flow.

All valves shall be suitable for service conditions i.e. flow temperature and pressure under which they are required.

Valves in Clarified Filtered water application

Either Butterfly type or sluice/ gate valves shall be used for isolation purposes.

Sluice/gate valve shall conform to IS: 780 & IS: 2906 of rating PN 1.0 (min).

Stem, body,- seat ring and wedge facing ring shall· be of stainless steel construction.

Other parts shall be as per IS:780. Flanges shall be designed as per ANSI B 16.5 Cl. 150. to meet with the piping flanges. Valves shall be of outside screw and rising stem type. Sluice/Gate valves shall be provided with the following accessories in addition to the standard items.

a) Hand wheel

b) Manual Gear reduction unit operator for valves 200 NB and above.

c) Bypass valves for valves of sizes 350 NB and above.

d) Draining arrangement wherever required.

e) Arrow indicating flow direction

f) Position indicator

Sluice/ Gate Valves shall be provided with back seating bush to facilitate gland renewal during full open condition.

Butterfly valves shall be of double flanged or lugged wafer type of low leakage

rate confirming to AWWA-C-504 class 150 orBS: 5155 Class 150.

The various components of butterfly valves shall be of the following:

i)	Body	:	Cast Iron- ASTM A 48 Cl. 40; BS: 1452 Gr. 220 SG Iron - BS : 2789
I ii)	Disc	: : :	Cast Steel- ASTM A 216 GR. WCB; 85:1504 Eq. Gr. Cast Iron- ASTM A 48 Cl. 40:BS1452, Gr. 220 SG Iron- 8S 2789. Cast Steel- ASTM A216 Gr. WCB: 8S:1504 Eq. Gr.
iii)	Shaft	:	ASTM A 296 Gr. CF8M/AISI 316: AISI 420: BS 970 Gr. 316; BS 970 Gr. 420
iv)	Seat rings	:	Nitrile rubber, EPDM (Ethylene propylene rubber), Hypalon

Butterfly valves shall be fitted w1th sleeve type bearmg such as PTEF. Valves of 350 NB and above shall be provided with one or two thrust bearings to hold the disc securely in the of valve seat without hydraulic or external axial shaft loads. Sleeve and other bearings fitted into the valves body shall be of self lubricated materials that do not have any affect on the fluid handled and other components of the valves.

All the butterfly valves shall be provided with Hand wheel or level as per the requirements. For larger sizes i.e. 150 NB and above hand wheel shall be provided. For level/wrench operated valves, means shall be provided for positively holding the disc in not less than three intermediate positions. Manually operated valves shall be provided with reduction gear unit for valves of size 200NB and above. Valve provided with motorized pneumatic actuator shall be with a hand wheel for manual operation. All the valves shall be equipped with adjustable mechanical stop-limiting devices to prevent over travel of the valve disc in the pen and closed positions. The valve operators (Hand wheel Gear reduction unit motor actuator etc. shall be designed as per relevant International Standard.

All the butterfly valves shall be provided with an indicator to show the position of the disc. Flanges shall conform to ANSI B 16.5 Cl. Conforming to the following technical specifications. a) Ball Valves

i) Design Standard BS:5351 Class 150 ii) Type :Welded/Flanged ends; Fullbore; Shlit Body & Seat supported construction

A. Material of Construction

Body Carbon Steel/ Cast Iron

Ball Stainless steel ANSI 420

Seat ring PTFE

Stem Stainless steel AISI 420 Seats Nitrile rubber; PTFE. iv) Valves shall be designed to be directly operable by a wrench/Hand lever. v) Suitable stops be provided for both the fully open & close condition.

vi) All the valves shall be provided with an indicator for showing the position of the spindle.

b) Globe Valve

i) Design Standard IS:778 Class-1

ii) Type :Straight, rising stem, with outside screw iii) Material of construction

1. Body, Bonnet, stuffing Box&: Leaded Tin

Bronze conforming seat rings/Disc IS:318 Gr.

2. Stem : Stainless Steel, AISI - 316

3. Disc : 15:318 Gr. 2/AISI-316

i) Back seat shall be provided on the stem or on the disc.

B. Renewable disc assembly shall consist of disc holder, disc, disc guide, Check nut and disc retaining nut with washer.

C. Disc of globe valve may be provided with renewable rubber seating ring.

iii) Handy wheels shall be marked with the word: 'OPEN' or 'SHUT 'with arrow to indicate direction of opening or closing. **The valves shall conform to the following requirements:**

i)	Design Standard	:	IS 780/ IS :2906 rating PN 1.0 or Equipment
ii)	Type	:	Double Flanged or wafer body, outside screw and rising stem type
iii)	Material Construction Body	: :	Cast Iron: 15:210 Gr. FG. 260
	Stem	:	Stainless Steel AISI 420
	Disc	:	Cast Iron 15:210 Gr. FG 260

The valves shall conform to the following specifications.

i)	Design	:	IS: 5312, BS: 1868, BS: 5153 or Eqvt.
ii)	Type	:	Swing check Type and Flanged ends.
iii)	Material of Construction (For non corrosive application)		
a) Body & Cover Hinge disk/ door :			Cast iron IS: 210 Gr. FG 260/or Cast Iron BS: 1452 Gr. 220 or Eqvt.
I b)	Hinge Pin and Door/Disc. Pin I	I	I Cast steel ASTM A 216 Gr. WCB

c)	Disc facing ring		Stainless steel
d)	Body Seated ring		Stainless steel
e)	Bearing Bushes		Leaded Tin Bronze: IS: 318 Gr. 2
f)	Bolts		Carbon Steel

Flanges shall conform to ANSI B 16.5 Cl . 150 to match with the piping flanges as specified elsewhere.

Body shall be permanently marked with an "arrow" Indicating the direction of motion of the fluid for all the check valves.

Check valves for clarified/ filtered water may be offered in Gun metal construction

& with threaded ends for sizes 50 NB and below conforming to 15:778 or Equipment.

15.5.8 Strainers

a. Basket Strainers

b. Basket strainers of simples design shall have the following materials of construction of raw/ clarified/ filtered water.

Body :Fabricated mild steel: IS:226 (Tested quality) Wire shall be stainless steel

{AISI:316 18 BWG 30 mesh suitable reinforced. Reinforcement material shall also be of stainless steel construction.

Drain plug *I* Nuts: Gun metal;

c. Inside of basket body shall be protected with one coat or red lead primer and minimum three coats of chlorinated rubber paints to a Total thickness of 200 microns.

d. Suitable Vent and drain valves shall be provided for the strainers.

e. Screen (strainer) flow are shall be a least four times pipe sectional area. Flow area in any portion of Basket strainer assembly shall not be less than the pipe cross sectional area.

f. Pressure drop in clean condition shall not be more than 1.0 MWC.

g. Basket Strainer shall be provided with lifting lugs and suitable mounting arrangement.

h. For OM water service. body shall be rubber lined to minimum 4.5 mm thickness (soft rubber of shore Hardness 85 ±5" A).

15.5.9 Y- Type Strainer

a) Y-Type strainer for water application shall be constructed of following materials:

Body Cast Iron 15:210 Gr: FG 260

Strainers :Wires, of stainless steel AISI - 316. 18 BWG 30 mesh suitably reinforced. Reinforcement material shall also be of stainless steel construction. Drain Plug/Nuts : Gun metal (threaded construction).

b) Y-Type strainers shall also conform to Cl. 4.-9.01 {b), {d), (e), end (t).

c) Body of the Y -type strainers for alkali, and dematerialized water shall be of Cast Iron {IS: 210. Gr. FG 260) and lined with soft or hard rubber to a thickness of.3 mm.

D) For acid services, apart form the rubber lined body material, the screen material, shall be polypropylene or HOPE wire cloth of suitable mesh and thickness.

15.5.10 **TEST FOR PIPING, VALVES & FITTINGS**

A) Piping & Fittings

i) Pipe shall be hydraulically tested as per relevant standards ii) Pipe which are .to be of internal bead removed quality and subjected to pressure test after based removal but before rubbing lining.

iii) All rubber lining is to be subjected to the following test as per IS: 4682 Part -1

a) Adhesion test b) Bleeding Test c) Thickness of lining d) Shore harness e) Spark

test 5 KV/mm of lining f) Ageing test on the samples of rubber sheets shall be one as per ASTM- D 471, part 37 before lining g) visual inspection. Valves *I* Gages/ Strainers

All the valves shall be hydraulically tested for the body and test leak test as per relevant standard. For rubber lined valves, body shall be subject to hydro test before rubber lining.

Back seat leakage test shall be done wherever applicable. Seat Air leakage test a kg/cm2 shall be carried out wherever applicable as per relevant standards.

iv) Elastomers wherever coated or lined for the valves shall be tested for the corrosion resistance against the medium for which those are selected as per relevant Standard and the test certificates shall be furnished for the Owner's approval.

v) Rubber lining on valves/ Gates Strainers shall be checked in accordance with IS:4682 Part-1 including all tests as indicated above for piping & fittings.

vi) Strainer shall be hydraulically tested for its strength. The pressure drop across the strainer assembly shall be verified at design flow for clean condition for each type and size. If already conducted for each size! type, test certificates may be produced of Owner's review and approval.

15.5.11 TEST AT SITE

a) All piping, valves, Gates, resin traps, strainers and other fittings after erection at site shall be tested to hydraulic test pressure of two times the operating pressure or 1.5 times the maximum allowable pressure whichever is higher for a period of one hour.

b) All valves (Manual/ Automatic) shall be operated throughout 100% of the travel manually and as well as from control panel and these should function without any trouble whatsoever.

N.B:- All the above specifications and material of construction are for guidelines. However the EPC contractor can propose for any new or combination type for approval by the Chief Construction Engineer, Anandapur Barrage Project, Salapada which should satisfy the relevant IS code or international code mentioned in the above Guidelines.

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SECTION VIII

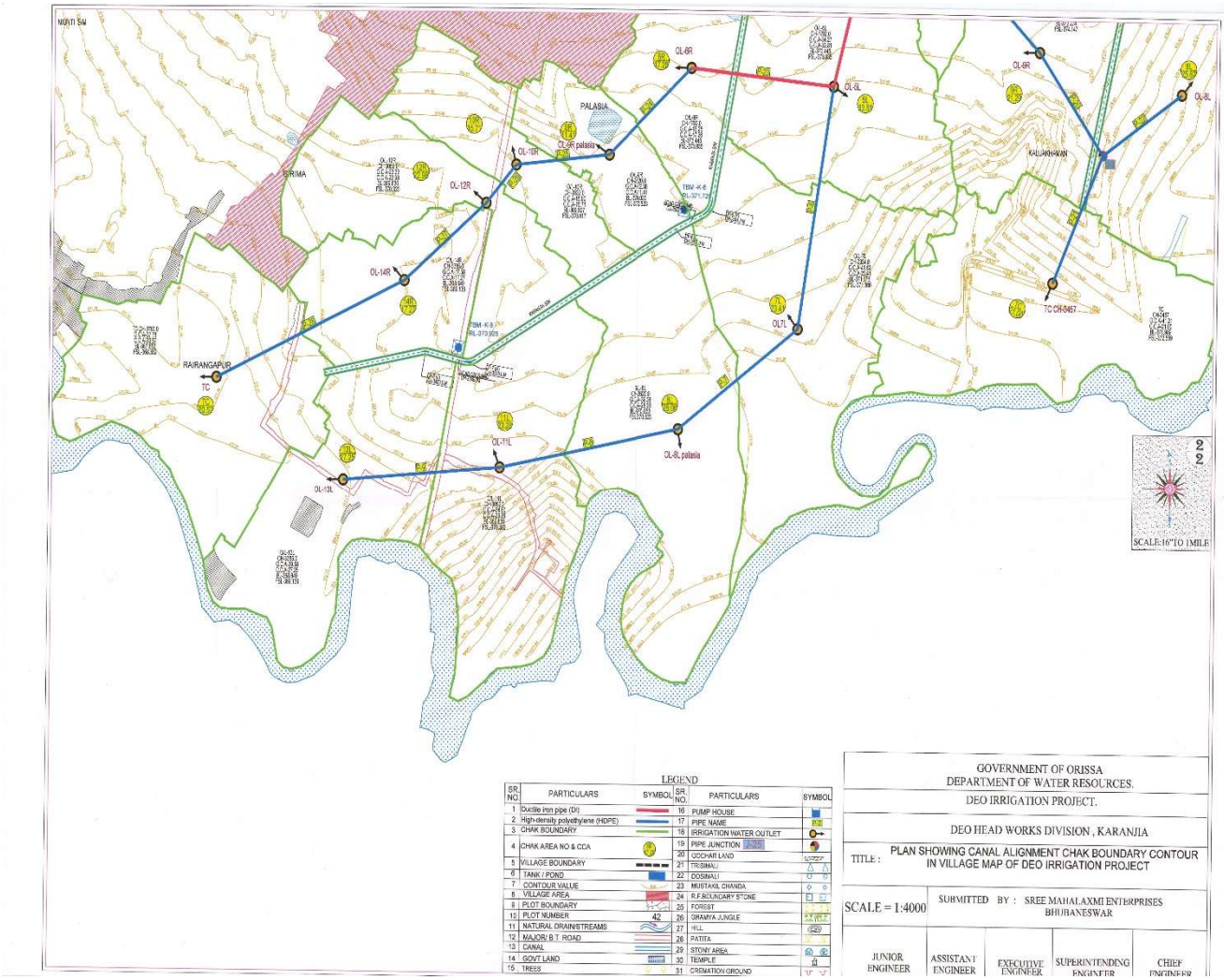
DRAWINGS

DRAWINGS & DESIGNS PROVIDED IN THE SECTION ARE INDICATIVE ONLY.

DURING EXEUCTION DRAWING AND DESIGNS APPROVED

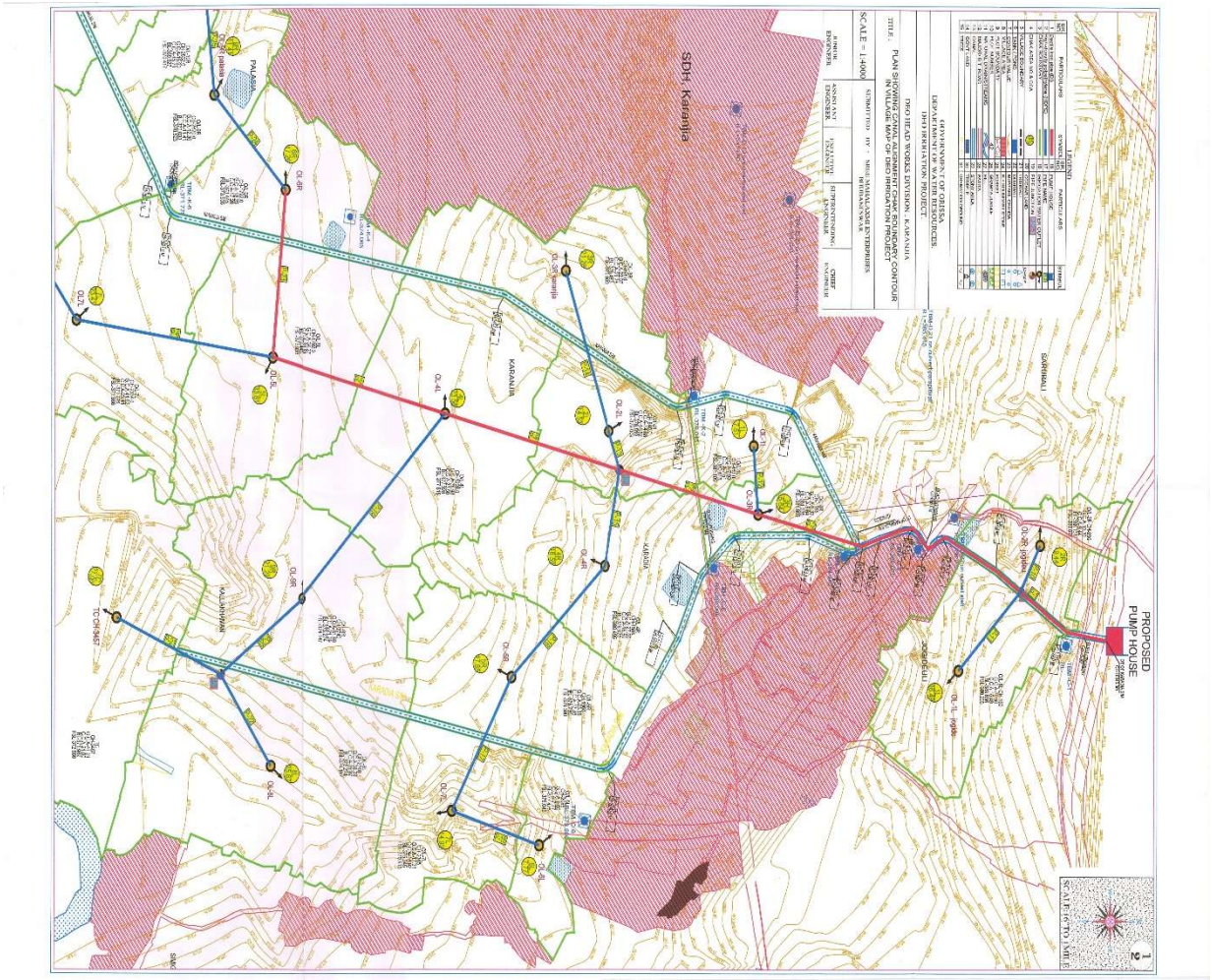
BY THE CHIEF ENGINEER_____,

WILL BE FOLLOWED.



SR NO.	PARTICULARS	SYMBOL	SR NO.	PARTICULARS	SYMBOL
1	Ductile iron pipe (DI)		16	PUMP HOUSE	
2	High-density polyethylene (HDPE)		17	PIPE NAME	
3	CHAK BOUNDARY		18	IRRIGATION WATER OUTLET	
4	CHAK AREA NO & CCA		19	PIPE JUNCTION	
5	VILLAGE BOUNDARY		20	GOCHAR LAND	
6	TANK / POND		21	TRISIMALI	
7	CONTOUR VALUE		22	DOSIMALI	
8	VILLAGE AREA		23	MUSTAKIL CHANDA	
9	PLOT BOUNDARY		24	R.F.BOUNDARY STONE	
10	PLOT NUMBER	42	25	FOREST	
11	NATURAL DRAIN/STREAMS		26	GRAMYA JUNGLE	
12	MAJOR/ B.T. ROAD		27	HILL	
13	CANAL		28	PATITA	
14	GOVT LAND		29	STONY AREA	
15	TREES		30	TEMPLE	
			31	CREMATION GROUND	

SHEET 1 FOR GENERAL ALIGNMENT FOR UGPL



SHEET 2 FOR GENERAL ALIGNMENT FOR UGPL

**DRAWING & DESIGN PROVIDED IN THE SECTION ARE INDICATIVE ONLY.
DURING EXECUTION DRAWING AND DESIGNS APPROVED
BY THE CHIEF CONSTRUCTION ENGINEER,
KHAIRIBHANDAN & DEO IRRIGATION PROJECT, KARANJIA
WILL BE FOLLOWED.**

SECTION - IX

VENDOR LIST

SECTION –IX

VENDOR LIST

A. LIST OF ACCEPTABLE MAKES OF EQUIPMENT / MATERIAL

Sl. No.	Product	Name of Manufacturer	Product Brand	REMARKS
1	**Welding Electrodes**	AdvaniOrlekon ESAB ,Modi Electrodes, Honavar Electrodes Ltd. D & H Secherone Electrodes M/s D& H Welding Electrodes Pvt.Ltd.	Over Cord-S Esab-28/Esab Ferro Speed Plus Steel on ultra Regular-S Medio **DH**	The Manufacture or product band provided are indicative only. The Chief Engineer ____ can add or delete any of this vendor or product during execution period.
2	**Ordinary Portland Cement**	A.C.C, KONARK, ULTRATECH AMBUJA, RAMCO JAYPEE, LAFARGE		
3	**HYSD Bars (TMT)**	SAIL , TATA & ZINDAL VIZAG STEEL.		
4	**M.S. Plate / H.R. Coil/RS Joist/Channels & Angels**	TATA, SAIL, TISCO, ESSAR, Jindal ISPAT Ltd. ,RINL.		
5	**External Polyurethane coating**	i)Poly coat products, Mumbai ii)Vasu chemicals, Mumbai iii)Sonabarsa Projects, Kolkata. Iv) Demac Chemicals, Pune v) Lalita Infra Projects, Pvt. Ltd, Kolkata. vi) M.P Tar products.		
6	**Food Grade Epoxy**	i)Demac Chemicals, Pune. ii)Berry Plastics, Delhi. iii)Lalita Infra Projects Pvt. Ltd., Kolkata. iv)Poly coat Products, Mumbai. v) Sonabarsa Projects, Kolkata. vi) Cippy poly urethane Pvt. Ltd, vii) Grauer&Well (I) Ltd. viii) M.P Tar products.		

B. LIST OF APPROVED MAKES OF MECHANICAL EQUIPMENTS & COMPONENTS

Sl. No.	Mechanical Equipment	Name of Manufacturer	REMARKS
1	Vertical Turbine Pump	KIRLOSKAR BROTHERS LIMITED WPIL MATHER & PLATT (I) LTD VOLTAS, FLOW MORE LTD.	The Manufacture or product band provided are indicative only. The Chief Engineer _____ can add or delete any of this vendor or product during execution period.
2	Vertical Squirrel Cage Induction Motor(HV/LV) & Other Squireel Cage Motor(LV)	KIRLOSKAR ELECTRIC CO. LTD. SIEMENS INDIA LIMITED CROMPTON GREAVES LIMITED& Industrial Solution Limited MARATHON (ALSTOM) BHEL ABB	
3	Motorize Valve Actuators	ROTORK LIMITORK AUMA INDIA ANTRIED TECHNIK PVT.LTD	
4	Sluice Valves	INDIAN VALVE COMPANY, NASIK KIRLOSKAR BROTHERS LIMITED DURGA VALVES R & D MULTIPLES HAWA VALVES (INDIA) PVT.LTD. FOURESS ENGINEERING. G. M. DALUI & SONS CHEMFLO INDUSTRIES (INDIA) Pvt. Ltd., HAKOHAV, SAI SANKET.JUPITER Engineering co. Sigmaflow Control India Ltd.KamalaValve&Engg.Calsens Private Ltd.	
5	Butterfly Valves	INDIAN VALVE COMPANY, NASIK KIRLOSKAR BROTHERS LIMITED R & D MULTIPLES FOURESS ENGINEERING PLATE INDIA L & T, CHEMFLO INDUSTRIES (INDIA) Pvt. Ltd., HAKOHAV, SAI SANKET, G. M. DALUI & SONS, JUPITER Engineering.co), Sigma flow control India Ltd.KamalaValve&Engg.Calsens Private Ltd.	
6	Non – Return Valve	INDIAN VALVE COMPANY, NASIK KIRLOSKAR BROTHERS LIMITED R & D MULTIPLES, FOURESS ENGINEERING, CHEMFLO INDUSTRIES (INDIA) Pvt. Ltd., HAKOHAV, SAI SANKET, G. M. DALUI & SONS. JUPITER Engineering.co (upto 600	

Sl. No.	Mechanical Equipment	Name of Manufacturer	REMARKS
		mm), Sigma Flow Control India Ltd.Calsens Private Ltd.	
7	Kinetic Air Valve	INDIAN VALVE COMPANY, NASIK KIRLOSKAR BROTHERS LIMITED R & D MULTIPLES,FOURESS ENGINEERING CHEMFLO INDUSTRIES (INDIA) Pvt. Ltd., ARIFLOW, CONTROL ACCESSORIES, SAI SANKET, G. M. DALUI & SONS.JUPITER Engineering.co . Sigma Flow Control India Ltd. Kamala Valve&Engg.Calsens Private Ltd.	The Manufacture or product band provided are indicative only. The Chief Engineer _____can add or delete any of this vendor or product during execution period.
8	Ultrasonic type Level measurement Device	FISHER ROSEMOUNT FORBES MARSHALL, E&H ABB MILITRONS(TOSHNIWALA),SBEM	
9	Electronics Pressure Measurement System	FISHER RESEMOUNT E&H ABB FOXBRO	
10	Electromagnetic flow meter	KROHNE MARSHALL ABB SIEMENS E & H SAI SANKET, SBEM	
11	EOT Crane & Hoist and Motorized Chain Pulley Block	ACME MANUFACTURES ENGINEERS ELECTROMECH ENGINEERS HI-TECH EDDY CRANES ENGINEERS PVT. LTD BRADY AND MORRIS ENGG. PVT. LTD. FAFECO ENGINEERS PVT.LTD ANUPAM INDUSTRIES LTD. JAPS SAFEX BATLIBOI MEKA SUFFIX STEELAGE INDUSTRIES, JHARSUGUDA, ALPHA SERVICES.	
12	Expansion Bellow	DHRUV D.WREN INDUSTRIES PVT LTD. STANFAB ENGINEERING PVT. LTD. BELOFLEX(B.D ENGINEERS)	
13	Window Air Conditioner	VOLTAS LTD CARRIER AIRCON LTD SAMSUNG	e only. The Chief Engineer _____can add
14	Tools	TAPARIA ,RECORD LEADER,	

Sl. No.	Mechanical Equipment	Name of Manufacturer	REMARKS
		EVEREST,GEDOR JHALANI MEKASTER	
15	Test Equipments	CIE, CE, MITUTOYO,WACO, SYSTEM, YOFUNG MECO,KEW,ACD	
16	Receiver / Indicator	MASIBUS ABB NISHKO LECTROTEK	
17	Surge Control Devices	PERFECT ENGINEERING ASSOCIATES PVT. LTD. MANNSMANN JASH ENGINEERING LTD DEMAG, VAN ENGG. COMPANY, ARI, SAI SANKET, BERMAD, SIDOMA	

C. LIST OF APPROVED MAKES OF PIPES.

Sl. No.	Pipe	Name of Manufacturer	REMARKS
1	HDPE	Jain Irrigation Pipes. Oriplast,Time Techno plast Godavary Polymer, Kataria Plastics, PurmaplastLtd.VijayaPolymer.MohitPolytechPvt. Ltd.	The Manufacture or product band provided are indicative only. The Chief Engineer _____ can add or delete any of this vendor or product during execution period.
2.	DI PIPES.	ELECTRO STEEL CASTING LTD., KOLKATA TATA METALIKS D.I PIPES LTD., KOLKATA JINDAL SAW LTD., GUJRAT Sri Kalahasthi Pipes Ltd., ELECTRO THERM INDIA LTD., GUJRAT, RashmiMetaliks Limited.	

NOTE:

1) **The materials/equipments shall be procured from the shortlisted vendors only given above and shall have been successfully type tested during the last five years from the date of agreement by the EPC Contractor.**
2) **For other items which are not covered in the vendor list, the material offered shall be in accordance with the REC Specification/ODSSP Specification and**

procured from a vendor who must have at least five years of experience in manufacturing of the same. The materials shall have been successfully type tested during the last five years from the date of agreement by the EPC Contractor. The Type Test reports shall be submitted by the bidder for approval of the vendor by the Owner.

3) **For all items covered under the scope, the manufacture should have production facility in India for at least Five years from the date agreement by the EPC Contractor.**
4) **All the materials like pipe, valve and fittings etc shall confirm as per relevant IS/BIS specifications.**
5) **Eligibility criteria of pipe manufacturing companies to supply pipes will be as per DoWR Letter No.32624/WR, dt.28.11.2024.**

SECTION – IX

FINANCIAL BID

&

MILE STONE

SECTION - IX

FINANCIAL BID

1.0 GENERAL

Details of the Financial Bid has been described under Section IV Clause-40.The work, excluding O&M, has been broadly divided into three components. Each component has been assigned a value in terms of percentage of Bid amount excluding the bid amount for O & M in Appendix F. In case of any deviation/alterations/modifications of methodology leading to change in components or its quantity or incorporation of new items of work after approval of detailed design and estimates, the competent authority shall have full powers to revise the percentage breakup of components keeping the contract price same as quoted by the bidder. Each component is further sub-divided into four stages as given below.

Sl. No.	PARTICULARS
1.	Planning & Design and Approval
2.	Procurement of various components, Supply at site, Testing, QA & QC
3.	Construction of the various components, QA & QC
4.	Testing & Commissioning

The percentage break up of each Component to Stages is given in Appendix F-1 to F-2. The Chief Engineer shall have power to revise the percentage breakup of the stages within the components, if felt necessary, after approval of the design and drawing. The bidder may furnish further breakup of the stages into sub-components before signing of agreement, duly approved by the Chief Engineer, keeping the percentages of stages intact, to facilitate payment. This break up to sub-components shall be finalized only after the finalization of design and approval of estimate. All payments shall be limited to the amount arrived on the basis of percentage of Bid value as specified in Appendix FB to Appendix F-2

2.0 EVALUATION OF BID

Evaluation of Bid shall be carried out as per Clauses of Section II: Instruction to Bidder**.**

FINANCIAL BID (Appendix-FB)

Tender Inviting Authority: Chief Construction Engineer, Khairibhandan & Deo Irrigation Project, Karanjia, Mayurbhanj, Odisha						
Name of the work: Construction of distribution system for 467 Ha of CCA including Command Area Development (CAD) of Karadiha and Karanjia Sub-Minor off-taking from R.D. 16045m of Right Main Distributary of Deo Irrigation Project through Underground Pipeline Irrigation system (Gravity flow) in Mayurbhanj District of Odisha on EPC turnkey basis including Operation and Maintenance of complete commissioned project for 05 (five) years.						
Tender Reference No-17/CCEKDIP of 2026-27						
Bidder's Name:						
SCHEDULE OF WORKS						
Sl No.	Description of work	Quantity	Unit	Rate in Figures to be entered by the Bidder Rs. P.		AMOUNT Rs. P.
				Figures	Words	
1.	Execution of canal distribution network including Command Area Development (CAD) works up to 1 hectare sub-chak for Karadiha and Karanjia Sub-Minor off-taking from RD 16045m of Right Main Distributary of Deo Irrigation Project through Under Ground Pipe Line System (Gravity Flow) for CCA of 467Ha on "EPC - Turn Key" basis to provide irrigation facility including Survey, investigation, planning, Designing, procurement of all material etc. complete as per the relevant clauses of Technical Bid Document, guidelines of CWC, Govt. of Indiaand IS standards.		As per BOQ			
2.	Operation & Maintenance for Distribution Network including CAD works for 467 Ha CCA of Karadiha and Karanjia Sub-Minor off-taking from RD 16045m of Right Main Distributary of Deo Irrigation Project through Under Ground Pipe Line System on "EPC - Turn Key" basis to provide successful irrigation for five years or five Khariff / five Rabi crop season whichever is later after commissioning of UGPL irrigation system as per the relevant clauses of Technical Bid Document and guidelines of CWC, Govt.of India.					
Total in Figures						
Total in Words						

APPENDIX -F 1

PAYMENT SCHEDULE FOR

Construction of distribution system for 467 Ha of CCA including Command Area Development (CAD) of Karadiha and Karanjia Sub-Minor off-taking from R.D. 16045m of Right Main Distributary of Deo Irrigation Project through Underground Pipeline Irrigation system (Gravity flow) in Mayurbhanj District of Odisha on EPC turnkey basis including Operation and Maintenance of complete commissioned project for 05 (five) years.

Sl. No.	PARTICULARS OF THE COMPONENT	PERCENTAGE OF COMPONENT AMOUNT *
1	2	3
1.	After detail survey, investigation, Planning, design, drawing, fixing alignment on the village maps for Distribution Network including Command Area Development Work through UGPL Irrigation system up to 1 Ha chalk, getting approval of the design and drawing from the competent authority as per design criteria of the Department, preparation of detail working estimate as per SOR of Odisha on the basis of approved design, drawing for clubbing of items for record of measurement and basis of payment, getting approval from the competent authorities as per design criteria of Department, relevant I.S. Codes, IRC Publications and circulars issued by the Department from time to time, processing of Land Acquisition (Private land, Government land), Forest clearance and right of way / right of use cases if required within the approved alignment of Distribution Network & CAD Network and getting approval from the Appropriate Authority etc complete.	3
2.	After completion of fabrication / manufacturing and supplying of pipes with all accessories for all distributaries, minors, sub-minors & outlets up to 1 Ha chalk as per approved design, drawing, Tech specifications laid down by the Department, relevant I.S. Codes and circulars issued by the Department from time to time and keeping record of measurement of items etc. complete. Amount of running Bill = Bill amount as per actual quantity of work executed based on clubbing of items as approved by the competent authorities in Sl. No. 1 x "A" Where "A" = (Amount derived from percentage of "BID AMOUNT" of this item) ÷ (Estimated amount based on SR as per Sl. No.1 of Appendix-FB)	52
3.	After completion of laying & fixing of pipes with all accessories, controlling structures and successful testing for all distributaries, minors and sub-minors, outlets up to 1 Ha chalk as per approved design, drawing, specifications of Department, relevant I.S. Codes, IRC Publications and circulars issued by the Department from time to time and keeping record of measurement of items corresponding to the items of detail estimates etc. complete. Amount of running Bill = Bill amount as per actual quantity of work executed based on clubbing of items as approved by the competent authorities in S. No. 1 x "A" Where "A" = (Amount derived from percentage of "BID AMOUNT" of this item) ÷ (Estimated amount based on SR as per Sl. No.1 of Appendix-FB)	30
4.	After commissioning and successful trial irrigation to the command area through UGPL network.	15
	Total	**100**

* Values to be filled up before Invitation of Tender.

The Chief Engineer shall have full powers to fix interim percentage within the components. In case of any deviation/alternations/modifications of methodology leading to change in

components or its quantity or incorporation of new items of work after approval of Detailed design and estimates, the competent authority shall have full powers to revise the breakup components keeping the contract price same as quoted by the bidder. The contractor will submit breakup of the components into subcomponents for cash flow before work is awarded. However, the total % of each component as stated above shall remain unaltered which will form part of the contract.

Stages involved in the component

Sl. No.	PARTICULARS
1	**2**
1.	Detailed Survey Investigation, Planning & Design and Approval
2.	Procurement of various components, Supply at site, Testing, QA&QC
3.	Construction of the various components, QA & QC
4.	Testing & Commissioning

APPENDIX -F 2

PAYMENT SCHEDULE FOR

Construction of under Ground Pipe Line Irrigation System (Gravity Flow) up to 1 Ha chalk of Micro irrigation network for ____ Ha within the CCA of _____ ha of _____ Project on EPC – Turn Key basis

Sl. No.	PARTICULARS OF THE COMPONENT	PERCENTAGE OF COMPONENT AMOUNT *
1	2	3
1.	After detail survey, investigation, Planning, design, drawing, fixing alignment on the village maps for micro irrigation system through UGPL Irrigation system, getting approval of the design and drawing from the competent authority as per design criteria of the Department, preparation of detail working estimate as per SOR of Odisha on the basis of approved design, drawing for clubbing of items for record of measurement and basis of payment, getting approval from the competent authorities as per design criteria of Department, relevant I.S. Codes, IRC Publications and circulars issued by the Department from time to time, processing of Land Acquisition (Private land, Government land), Forest clearance and right of way / right of use cases if required within the approved alignment of Distribution Network & CAD Network and getting approval from the Appropriate Authority etc complete.	
2.	After completion of fabrication / manufacturing and supplying of pipes with all accessories for micro irrigation network for all distributaries, minors, sub-minors & outlets as per approved design, drawing, Tech specifications laid down by the Department, relevant I.S. Codes and circulars issued by the Department from time to time and keeping record of measurement of items etc. complete. Amount of running Bill = Bill amount as per actual quantity of work executed based on clubbing of items as approved by the competent authorities in Sl. No. 1 x "A" Where "A" = (Amount derived from percentage of "BID AMOUNT" of this item) ÷ (Estimated amount based on SR as per Sl. No.2)	
3.	After completion of laying & fixing of pipes with all accessories, controlling structures and successful testing for micro irrigation network as per approved design, drawing, specifications of Department, relevant I.S. Codes, IRC Publications and circulars issued by the Department from time to time andkeeping record of measurement of items corresponding to the items of detail estimates etc. complete. Amount of running Bill = Bill amount as per actual quantity of work executed based on clubbing of items as approved by the competent authorities in S. No. 1 x "A" Where "A" = (Amount derived from percentage of "BID AMOUNT" of this item) ÷ (Estimated amount based on SR as per Sl. No.2 of Appendix FB)	
4.	After commissioning and successful trial irrigation to the command area through UGPL of CAD work & micro irrigation network.	
		Total
100		

* Values to be filled up before Invitation of Tender.

DELETED

APPENDIX -F 3

BREAK UP OF O&M COST OF DISTRIBUTION NETWORK INCLUDING CAD WORKS YEAR-WISE FOR 5 YEARS

(To be furnished by the bidder in Cover –II in pdf Format)

Sl.No.	Name of System	Ayacut Area (ha.)	O&M Cost per year in Rs.					Total Cost in Rs.
			1st	2nd	3rd	4th	5th	
1	Operation & Maintenance for Distribution Network including CAD works for ____Ha CCA of _____Project through Under Ground Pipe Line System on "EPC - Turn Key" basis to provide successful irrigation for five years or five Khariff / five Rabi crop season whichever is later after commissioning of UGPL irrigation system as per the relevant clauses of Technical Bid Document and guidelines of CWC, Govt.of India.							

DELETED

APPENDIX- F-4

BREAK UP OF O&M COST OF MICRO IRRIGATION SYSTEM YEAR-WISE FOR 5 YEARS

(To be furnished by the bidder in Cover –II in pdf Format)

Sl.No.	Name of System	Ayacut Area (ha.)	O&M Cost per year in Rs.					Total Cost in Rs.
			1st	2nd	3rd	4th	5th	
1	Operation & Maintenance for micro irrigation system network for ____ Ha within the CCA of _____Project through Under Ground Pipe Line System on "EPC - Turn Key" basis to provide successful irrigation for five years or five Khariff / five Rabi crop season whichever is later after commissioning of UGPL irrigation system as per the relevant clauses of Technical Bid Document and guidelines of CWC, Govt. of India.							

APPENDIX – F 4 (a)

O& M cost quoted by bidder of Execution of canal distribution network for 5 year in sl.3 of FB : **Rs…….**

Year wise O& M cost break up of Execution of canal distribution network for 05 year		
Year	**% of quoted amount**	**Amount in Rs.**
1st	16.38 %	
2nd	18.02 %	
3rd	19.82 %	
4th	21.8 %	
5th	23.98 %	
	TOTAL	

The quoted amount by the bidder for O&M shall be derived by Engineer-in-Charge in upward incremental order @10% from 1st year to 5th year at the time of agreement as provided in Form-F 4(a).

(The total derived cost for 5 year break up shall not exceed the Year wise O& M cost quoted by bidder in sl.3 of FB)

APPENDIX – F 4 (b)

O& M cost quoted by bidder for Execution of Micro Irrigation System for 5 year in sl.4 of FB : Rs……

Year wise O& M cost break up Execution of Micro Irrigation System for 05 year		
Year	**% of quoted amount**	**Amount in Rs.**
1st	16.38 %	
2nd	18.02 %	
3rd	19.82 %	
4th	21.8 %	
5th	23.98 %	
TOTAL		

The quoted amount by the bidder for O&M shall be derived by Engineer-in-Charge in upward incremental order @10% from 1st year to 5th year at the time of agreement as provided in Form-F 4(b).

(The total derived cost for 5 year break up shall not exceed the Year wise O& M cost quoted by bidder in sl.4 of FB)

APPENDIX – MS

MILE STONES			
Milestone No.	Particular	Milestone to be achieved as physical % of respective item	Time in month for achieving milestone from the commencement of work
MS 1	survey, investigation, Planning, design, drawing, fixing alignment on the village maps for Distribution Network including Command Area Development Work through UGPL Irrigation system up to 1 Ha chalk with micro irrigation, getting approval of the design and drawing from the competent authority as per design criteria of the Department, preparation of detail working estimate as per SOR of Odisha on the basis of approved design, drawing for clubbing of items for record of measurement and basis of payment, getting approval from the competent authorities as per design criteria of Department, relevant I.S. Codes, IRC Publications and circulars issued by the Department from time to time, processing of Land Acquisition (Private land, Government land), Forest clearance and right of way / right of use cases if required within the approved alignment of Distribution Network & CAD Network and getting approval from the Appropriate Authority etc complete. (a) UGPL for Distribution system ___ ha. (b) UGPL for CAD works ____ ha. ~~(C) UGPL for Micro irrigation works ____ ha.~~	100% 100% 100%	By end of 3rd month By end of 3rd month ~~By end of ____month~~
MS 2.	Completion of fabrication / manufacturing and supplying of pipes with all accessories for all distributaries, minors, sub-minors & outlets with micro irrigation up to 1 Ha chalk as per approved design, drawing, Tech specifications laid down by the Department, relevant I.S. Codes and circulars issued by the Department from time to time and keeping record of measurement of items etc. complete. (a) UGPL for distribution system ____ ha. (b) UGPL for CAD ____ ha. ~~(C) UGPL for Micro irrigation works ____ ha~~	100% 100% 100%	By end of 6th month By end of 6th month ~~By end of ___~~ month

MILE STONES			
Milestone No.	Particular	Milestone to be achieved as physical % of respective item	Time in month for achieving milestone from the commencement of work
MS 3.	laying & fixing of pipes with all accessories, controlling structures and successful testing for all distributaries, minors and sub-minors, outlets with micro irrigation up to 1 Ha chalk as per approved design, drawing, specifications of Department, relevant I.S. Codes, IRC Publications and circulars issued by the Department from time to time andkeeping record of measurement of items corresponding to the items of detail estimates etc. complete. (a) UGPL for distribution system ___ ha. (b) UGPL for CAD ____ ha. ~~(C) UGPL for Micro irrigation works ____ ha~~	 100% 100% 100%	 By end of 9th month By end of 11th month ~~By end of ____month~~
MS 4.	Testing & Commissioning of the UGPL System.	100%	By end of 11th month

*The time in month for achieving milestone from the commencement of work will be fixed by the "Tender Inviting Authority" as per the Project Requirement.