



Ministry of Non-Conventional Energy Sources

Govt. of India, New Delhi

Model Bid Document

For

Remote Village Electrification

Through

Micro Hydro Power

Prepared by:



**Alternate Hydro Energy Centre
Indian Institute of Technology
Roorkee-247 667**

May 2006



Ministry of Non-Conventional Energy Sources

Govt. of India, New Delhi

Model Bid Document

For

Remote Village Electrification

Through

Micro Hydro Power

Prepared by:



**Alternate Hydro Energy Centre
Indian Institute of Technology
Roorkee-247 667**

May 2006

FOREWORD

(This forward is not part of the Model Bid Document)

Use of hydropower can be made only where suitable natural water source is available nearby. Since the civil works are site specific and the hydro-mechanical works site parameter specific, it is quite difficult to draw common specifications for all types of hydro power schemes. Common specifications can, however, be made for different ranges of parameters/installation capacities. These model specifications have been prepared for Remote Village Electrification (RVE) based on Micro Hydro Power (MHP).

The initial costs of installation of the hydro power plants and the power evacuation and distribution systems of all the MHP are quite high and therefore, the cost of energy is generally beyond the reach of affordability of the inhabitants of remote areas. Therefore, it seems desirable to limit the scope of use of electricity to the extent of important needs as per the type of the localities / inhabitants so that the schemes can be made reasonably viable.

With the above in view, following criteria has been preferred for these Model Specification:

- i. Electrification of villages of the following two categories:
 - a. Category 'A' - Villages having 40 households
 - b. Category 'B' - Villages having 200 households.
- ii. Use of electrical energy to the extent the inhabitants of such areas can reasonably afford (with the help of Govt./Non – Govt. Agencies).
- iii. Encourage the people of such villages to explore the possibility and take up job-oriented activities to improve their health, education, earnings, etc. thereby contributing to improvement of the living conditions and the economy of the society.

These Model Specifications have been prepared to fulfill the RVE requirements for the said two categories. However, these can be applied for other categories of remote village also with slight modifications.

It is hoped that these Model Specifications will not only be of much use in accelerating the RVE achievement(s) but also in ensuring their successful, reliable and long operational lives. Any suggestions on the same are welcome from individual(s), institution(s), organization(s), and field agency(s) engaged in such works so as to make the same more useful. The suggestion may be sent to:

Head,
Alternate Hydro Energy Centre,
Indian Institute of Technology,
Roorkee- 247667,Uttranchal ,India

E-mail: ahec@iitr.ernet.in
Fax: +91-1332-273517

TABLE OF CONTENTS

	Page No.
i. FOREWORD	
ii. TABLE OF CONTENTS	
iii. NOTICE INVITING BID	
SECTION – 1 PROJECT DETAILS /SALIENT FEATURES AND DRAWINGS	1
SECTION – 2 INSTRUCTIONS TO BIDDERS	
2.1 Notice Inviting Bid	4
2.2 Scope	4
2.3 Qualification of The Bidder	4
2.4 Submission of Bid	4
2.5 Performa /Schedules to be Filled In	4
2.6 Signing of Bid	4
2.7 Price Revision	4
2.8 Site Visit	5
2.9 Language of Bid	5
2.10 Composition of Bid	5
2.11 Bid Currency	5
2.12 Bid Validity	5
2.13 Earnest Money	5
2.14 Format, Signing, Sealing & Marking of Bid	5
2.15 Deadline for Submission of Bids	6
2.16 Late Bids	6
2.17 Opening of Technical Proposals	6
2.18 Evaluation of Bid Document	6
2.19 Award of Contract	6
SECTION-3 GENERAL CONDITIONS OF CONTRACT	
3.1 Definitions	7
3.2 Law	8
3.3 Contract Agreement	8
3.4 Assignment	8
3.5 The Purchaser	9
3.6 Purchaser's Administration	9
3.7 The Contractor	9
3.8 Design	10
3.9 Labour Laws	10
3.10 Plant Materials and Workmanship	11
3.11 Commencement, Delays and Suspension	11
3.12 Tests on Completion	12
3.13 Purchaser's Taking Over	13

3.14	Defects Liability	13
3.15	Contract Price and Payment	14
3.16	Termination by Purchaser	15
3.17	Risk and Responsibility	16
3.18	Insurance	16
3.19	Force-Majeure	17
3.20	Claims, Disputes and Arbitration	18

SECTION – 4 SPECIAL CONDITIONS OF CONTRACT

4.1	Delivery/Completion of Works	19
4.2	Assignment, Subletting of Contract and Purchased Items	19
4.3	Submission of Bank Guarantees	19
4.4	Manuals	19
4.5	Safety	19
4.6	Water etc. for Contractor's Use	19
4.7	Work Schedule / Re-Scheduling & Progress of Work	19
4.8	Guarantee & Warranty	19
4.9	Price Variation, Taxes, Duties & Levies etc.	20
4.10	Contract Drawings and Detailed Technical Specifications	20
4.11	Inspection & Testing	21
4.12	Packing	22
4.13	Delivery of Plant and Despatch Documents	22
4.14	Liquidated Damages	22
4.15	Terms of Payment	23
4.16	Power to Vary or omit Work	23
4.17	Negligence	24
4.18	Deaths, Bankruptcy etc.	24
4.19	Liability for Accidents and Damage	24
4.20	Replacement of Defective Plant or Materials	25
4.21	Certificates of Purchaser's Representative	25
4.22	Certificate Not to Effect Rights of the Purchaser or Contractor	25
4.23	Price Reduction Clause	25
4.24	Test on Completion	26
4.25	Rejection of Defective Plant	26
4.26	Taking over	26
4.27	Maintenance	26
4.28	Certificate of Completion of Works	27
4.29	Final Acceptance Certificates	27
4.30	Clearance of Site on Completion	27
4.31	Training of Purchaser's Personnel (Optional)	27
4.32	Miscellaneous	27
4.33	Judicial Jurisdiction	27
4.34	Application	27

SECTION – 5 GENERAL TECHNICAL SPECIFICATIONS

5.1	Standards	28
5.2	Drawings/Documents/Manuals	28
5.3	Spare Parts, Tools And Site Consumables	30
5.4	Design Requirements	31
5.5	Manufacturing Requirements	32
5.6	Technical Works and Steel Structure	33
5.7	Electrical Works	35
5.8	Instrumentation and Control Equipment	38
5.9	Erection and Commissioning	40
5.10	Site Inspection and Tests	40
5.11	Commissioning Test	41
5.12	Trial Run	41
5.13	Acceptance	41
	Appendix: List of Applicable Standards	42

SECTION- 6 CIVIL WORKS

6.1	Introduction	47
6.2	Scope	47
6.3	Components of Civil Works	47
6.4	Materials, Construction, Finishing, Testing and Commissioning	49
6.5	Mild Steel or Iron work in Small sizes and Sections	49

SECTION- 7 POWER GENERATION EQUIPMENT

7.1	Hydro-Mechanical Equipment	50
7.2	Electro-Mechanical Equipment	52
7.3	Maintenance Manual	55
7.4	Proposed Spares	55

SECTION– 8 POWER EVACUATION AND DISTRIBUTION SYSTEM

8.1	Consumer Voltage Variation & P.F.	56
8.2	Generator Neutral Earthing	56
8.3	Provision of EICBs & Load Limiters	56
8.4	Lightning Protection	56
8.5	Earthing	56
8.6	Distribution Plan	56
8.7	Isolators / Fuses / ELCBS	57
8.8	Load Limiters	57
8.9	Cables	57
8.10	Type Of Poles	58
8.11	House Wiring	58
8.12	Temper Proofing	58
8.13	Maintenance Manual	59

8.14	Labels and Notices	59
8.15	Line Distribution System	59
8.16	Selection of Cable	59

SECTION- 9 TESTING AND COMMISSIONING

9.1	Testing	60
9.2	Commissioning	60
9.3	Acceptance Tests at Site	60

SECTION – 10 SCHEDULE OF GUARANTEED PERFORMANCE, COMMERCIAL & TECHNICAL FORMS AND SCHEDULES

Schedule – GP		61
Form – 10.1: Form of Bank Guarantee as Earnest Money		63
Form – 10.2: Bid From		64
Form – 10.3: Form of Commitment		65
Form – 10.4: Form of Contract Agreement		66
Form – 10.5: Form of Bank Guarantee for Security		67
Form – 10.6 : Form of Performance Bank Guarantee		69

Schedules:

10.7	:	Declaration	71
10.8	:	General Particulars	72
10.9	:	List of Drawings Etc.	73
10.10	:	Deviation from Technical Specifications	74
10.11	:	Deviation from Special Conditions of Contract	75
10.12	:	List of Recommended Spare Parts	76
10.13	:	List of Recommended Tools and Tackles	77
10.14	:	List of Recommended Test Sets Etc.	78
10.15	:	Schedule of Guaranteed / Project Completion	79

SECTION – 11 SCHEDULES OF PRICE

Schedules:

11.1	:	Design, Drawings & Documents	80
11.2	:	Civil Works	81
11.3	:	Electro Mechanical Works	82
11.4	:	Distribution System	83
11.5	:	Grand Summary of Prices	84
11.6	:	Schedule of Payment	85

NOTICE INVITING BID

1. REQUIREMENT

Bids are invited by(insert details of the Authority /Purchaser inviting the Bids) for supply of equipment and completion of works at site on **TURN KEY BASIS** for Remote Village Electrification (RVE) ofDistrict,.....State ofby Micro Hydro Power for following two categories.

- i. Category – ‘A’ : 10 kW (1 x 10 kW)
- ii. Category – ‘B’ : 50 kW (2 x 25 kW)

2. ELIGIBILITY OF BIDDER

The bidder should have installed successfully at least 1 (One) plant of a similar or larger capacity during the last 5 (Five) years and which must be running successfully. The bidder should have an annual turnover of Rs. 50 (Fifty) lakh during the last 2 (Two) years.

3. **BID No. AND DATE** :

4. TIME AND DATE FOR

- i. Sale of Bid Document :
- ii. Receipt of Bids :
- iii. Opening of Bids :

5. COST / PAYMENT DETAILS

- i. Cost of Bid Document : Rs.....
- ii. Mode of Payment : Cash/Bank Draft in the name of(Insert details)
- iii. Name of Purchaser & Address :(Insert details of the Authority inviting the Bids)

SECTION - I

PROJECT DETAILS/SALIENT FEATURES AND DRAWINGS

(To be filled in by Purchaser. The information in respect of Equipment/Works may be tried to be given as far as possible)

1.1 LOCATION OF SCHEME

- i. Village :
 - ii. Block :
 - iii. Tehsil :
 - iv. District :
 - v. State :
- i. Access**
- a. Rail :
 - b. Road :
 - c. Bridal path, if any :
- ii. Geographical Co-ordinates**
- a. Latitude : -----deg. -----min.
 - b. Longitude : -----deg. -----min.
 - c. Topographical Maps : -----
- iii. Climatic Conditions**
- a. Temperature (C) : ----Normal----Max.----Min.
 - b. Humidity (%) : ---- -do- ---- -do- ---- -do-
- iv. Availability of Land for Project Construction**
- a. At source (Stream) Site : -----(Also Refer Map No...Placed (in Drawing Section)
 - b. At Village Site : -----(Also Refer Map No.....Placed in Drawing Section)
 - c. Any other place : -----(Give Details)
- v. Approximate distance of Stream from Village** : ----- km

1.2 HYDROLOGY

- i. Name of Stream : -----
- ii. Catchment Area : -----sq. km.
- iii. Precipitation in the Area : -----mm.
- iv. Snow Fall, if any : -----mm.
- v. Design Discharge : -----cumecs

1.3 CIVIL STRUCTURES (Date Given here are Tentative only)

- i. Diversion Structures/ Intakes**
- a. Structure Type :

	b.	Length	:	-----m.
	c.	Discharge Capacity	:	-----cumecs (maximum)
	d.	Gates, if any	:	Yes/ No, if Yes : --(Nos. & Size)
	e.	Top Level	:	-----m (Not related to M.S.L.)
	f.	Maximum Height	:	-----m.
ii.		Feeder Channel		
	a.	Length	:	-----m.
	b.	Shape	:	
	c.	Full Supply Depth	:	-----m.
	d.	Width	:	-----m.
	e.	Free Board	:	-----m.
	f.	Design Discharge	:	-----cumecs.
	g.	Slope	:	----- : -----
	h.	Type of Material	:	
	i.	Type of Lining	:	
iii.		De-silting- cum- Forebay Tank		
	a.	Size of Tank	:	----m x ----m x----m (depth)
	b.	Material	:	
	c.	Lining	:	
	d.	Particle Size	:	
	e.	Free Board	:	----m.
	f.	Silt Flushing Pipe Dia. with gate valve	:	----m
iv.		Penstock		
	a.	Number	:	
	b.	Material	:	
	c.	Length	:	----m.
	d.	Diameter	:	----m.
	e.	Design Discharge	:	----cumecs.
	f.	Installation	:	
v.		Power House		
	a.	Type	:	
	b.	Size	:	----m x ----m ----m.
	c.	Material	:	
	d.	Gross Head	:	----m.
	e.	Net Head	:	----m.
vi.		Tail Race		
	a.	Length	:	----m.
	b.	Shape	:	
	c.	Size	:	----m (width) x----m (depth).
	d.	Material	:	
vii.		Levels (Not related to M. S. L.)		
		Intake water level	:	----m.
		De-Silting Tank W. L	:	----m.
		Power House	:	----m.

1.4 POWER HOUSE (Date Given here are Tentative only)

- i. Turbine**
 - a. Type & Nos. :, 2
 - b. Rating :kW at ...m head,
.....cumecs, ...% gate.
 - c. Rated Speed :
- ii. Generator**
 - a. Type & Nos. : Synchronous, 1/2 for
category 'A'/'B'
 - b. Power Output Rating : 10 kW / 25 kW Each
 - c. Nominal Voltage of generation : 415 V \pm 5%
 - d. Frequency : 50 Hz \pm 3%
 - e. Power Factor : 0.8 lag.
 - f. Cooling : Natural / Open

1.5 POWER EVACUATION AND DISTRIBUTION SYSTEM

- i. Transformer**
 - a. Type & Nos. :
 - b. Rating :
- ii. Distribution Line Etc.**
 - a. No. of House Holds :
 - b. Length of Line :
 - d. No. of Street Light Points :

LIST OF POSSIBLE DRAWINGS

I. Civil Drawings

- C-1 Index Map
- C-2 General Layout of Works
- C-3 L-Section of Water Conductor System
- C-4 Diversion Weir
- C-5 X-Section of Feeder Channel
- C-6 Desilting Tank
- C-7 X-Section Power Channel
- C-8 Forebay Tank
- C-9 Alignment of Penstock
- C-10 Power House and Tail Race

II. Electrical Drawings

- E-1 Single Line Diagram
- E-2 Distribution Diagram

SECTION – II

INSTRUCTIONS TO BIDDERS

2.1 NOTICE INVITING BID

----- (here-in-after called the “Purchaser”) invites sealed Bids, in triplicate, from **Eligible Bidders** for setting up of Micro Hydro Plant (MHP) and Distribution System for Remote Village Electrification (RVE) in plain/hilly region.

2.2 SCOPE

The scope comprises planning, design, execution of Civil, Hydro-mechanical and Electro-mechanical equipment / works including manufacture of equipment, Tests at works, delivery FOR site, erection, Testing & Commissioning of MHP and power distribution system; spares for 5 (Five) year’s successful O&M; special tools, etc. and O&M of the MHP and the Distribution system for 5 years on **TURN KEY BASIS. Offers with incomplete scope shall be ignored.**

2.3 QUALIFICATION OF THE BIDDER

The bidder should have installed at least 1 (One) plant of a similar or larger capacity during the last 5 (Five) years which must be running successfully. The bidder should have an annual turnover of Rs. 50 (Fifty) lakh during the last 2 (Two) years.

2.4 SUBMISSION OF BID

The bid must be submitted by Registered Post / Speed Post / by hand / by courier so as to reach the Purchaser by the scheduled date and time. Any bid received after the due date and time of submission on account of delay of any kind shall not be opened. **Telegraphic / Faxed Bids shall not be considered.**

2.5 PROFORMA/SCHEDULES TO BE FILLED IN

The bidder must furnish required information in the specified Proforma / Schedule. If this information is not furnished, the Purchaser shall not be responsible for any error in evaluation of bid and the bidder shall have no claim whatsoever, on this account.

2.6 SIGNING OF BID

Bidder shall put initials on each and every page of the bid. Last page of each document shall bear full signatures under official seal fully disclosing the Name, Designation and Relationship of the Signatory with the firm / bidder. In case of partnership concern, the bid shall be signed by one of them, holding Power of Attorney. In case of Corporation / Companies, bid shall be signed either by the President or the Secretary or any other person authorized to bid in the legal name of Corporation / Company. Copies of such Authorities are to be furnished with the offer.

2.7 PRICE REVISION

Any action on the part of the bidder to revise the price(s) and / or change the structure of price (s) at his own after the opening of the bid may result in **rejection** of the bid and **forfeiture of the earnest money.**

2.8 SITE VISIT

The bidder is advised to visit the Site and obtain all the information as required.

2.9 LANGUAGE OF BID

The bid, any correspondence and the documents shall be in English language.

2.10 COMPOSITION OF BID

The bid shall comprise two envelopes to be submitted simultaneously, **one containing only the Commercial & Technical proposal and the other, the Price proposal.**

2.10.1 BID PART-I (Commercial and Technical)

2.10.1.1 Earnest Money

An amount of Rs. (in words) , in any of the following forms, shall be submitted as Earnest Money along with the bid:

- i. A Demand Draft of any bank payable at pledged / drawn in favour of(insert details). **Or,**
- ii. A Bank guarantee executed on a non-judicial stamp paper of requisite value in specified form (Form-10.1, Section - X) in favour of.....(insert details).

2.10.1.2 Forms, Schedules and Documents to be Submitted Duly Filled- in

- i. Forms and Schedules given in Section–X.
- ii. Design Documents / Technical Information / Data / Drawings / Catalogues etc. as Specified in various Sections of these Specifications.

NOTE : No price shall be indicated in any form in these Forms & Schedules.

2.10.2 BID PART-II (Prices)

Schedules (Section- XI), duly Filled-in, must be submitted in the Bid Part-II (Prices).

2.11 BID CURRENCY

Prices shall be quoted and payable in Indian Rupees only.

2.12 BID VALIDITY

Bids shall be valid for 120 calendar-days form the date of opening / extended date of opening of bids. **Bid with lesser validity will not be considered qualified.**

2.13 EARNEST MONEY (EM)

2.13.1 Bidder shall furnish with Bid Part-I, EM in a separate envelope superscribed as “EM”.

2.13.2 EM shall remain valid for 120 days from the date of bid opening plus claim period.

2.13.3 The Earnest money may be forfeited:

- i If bidder withdraws his bid
- ii If the successful bidder, **fails** within the specified time limit, to:
 - a. Sign the **Contract Agreement** (Form-10.4, Section - X),
 - b. Furnish **Performance Security** (Form-10.5, Section - X).

2.14 FORMAT, SIGNING, SEALING AND MARKING OF BID

2.14.1 Bidder shall submit an original and 2 copies of technical proposal and the financial

proposal, clearly marking each one as: "ORIGINAL-TECHNICAL PROPOSAL", "ORIGINAL-PRICE PROPOSAL", and "COPY NO I - TECHNICAL PROPOSAL", "COPY NO. I - PRICE PROPOSAL", etc.

2.14.2 Bidder shall seal in an inner and outer envelope, original copy of technical proposal, original copy of price proposal, each copy of technical proposal and each copy of price proposal in separate envelopes clearly marking each one as: "ORIGINAL TECHNICAL PROPOSAL", "ORIGINAL PRICE PROPOSAL", "COPY No. I - TECHNICAL PROPOSAL", "COPY NO. I-PRICE PROPOSAL", etc. as appropriate.

2.14.3 The inner and outer envelopes shall be addressed to.....(give details) and bear the following identification:

- i. Bid for : Remote Village Electrification.
- ii. Bid Reference Number:
- iii. DO NOT OPEN BEFORE at Hrs.

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

2.15 DEADLINE FOR SUBMISSION OF BIDS

Bids must be received by the Purchaser no later than(give details).

2.16 LATE BIDS

Any bid, received after the dead line for submission of the bids, shall be rejected.

2.17 OPENING OF TECHNICAL PROPOSALS

2.17.1 The Purchaser will open the technical proposals, (including modifications made) in the presence of bidders' representatives, who choose to attend; athours at the Office of(give details).

2.17.2 The time, date and location of opening of Bid price proposals will be advised in writing or by fax by the purchaser.

2.18 EVALUATION OF BID DOCUMENT

2.18.1 If any bidder quotes payment terms, which amount to an advance and/ or payment which is in deviation from payment terms given in General Conditions/ Special Conditions of this bid document, the bid shall be loaded @ 20% interest per annum on the amount of advance payment and period involved.

2.18.2 Any rebate/discount linked with quality, term of payment or any other condition shall not be considered for the purpose of evaluation and comparison of such offer vis-à-vis others. However, the same will be availed while placing orders with such successful bidders. Where slab rates are quoted, each slab will be treated as separate offer.

2.18.3 If the bidders fail to quote prices for any of the items components as asked for, the highest prices as quoted in other bid documents for the same, shall be added.

2.19 AWARD OF CONTRACT

2.19.1 The successful bidder, would have to enter into a contract agreement with the purchaser as per conditions of the bid document.

2.19.2 For signing the contract, a duly authorized representative of the successful bidder shall be required to sign and accept the contract at(insert details) within the time specified in the letter of intent failing which action as deemed fit shall be taken.

SECTION-III

GENERAL CONDITIONS OF CONTRACT

3.1 DEFINITIONS

The following words and expressions shall have meanings stated. Words indicating persons or parties include corporations and other legal entities, except where the context requires otherwise.

3.1.1 The Contract

- i. **“Contract”** means the Contract Agreement, these conditions, the Purchaser’s Requirements, the Bid, and the further documents (if any) which are listed in the contract agreement.
- ii. **“Purchaser’s Requirement”** (**“Specifications”**) means the document entitled Purchaser’s requirement, as included in the Contract, and any additions and modifications to such document in accordance with the Contract.
- iii. **“Bid”** means the contractor’s signed offer for the works and documents submitted therewith as included in the Contract.
- iv. **“Performance Guarantees”** and **“Schedule of Payments”** mean the documents so named (if any), as included in the contract.

3.1.2 Parties And Persons

- i. **“Party”** means the Purchaser or the Contractor, as the context requires.
- ii. **“Purchaser”** means (insert details) as Purchaser in the contract agreement and the legal successors in title to this person(s).
- iii. **“Contractor”** means the person(s) named as contractor in the contract agreement and the legal successors in title to his person(s).
- iv. **“Purchaser’s Representative”** or **“Engineer”** means the person(s) named/appointed by the Purchaser from time to time who acts on behalf of the Purchaser.
- v. **“Contractor’s Representative”** means the person(s) named/appointed by the contractor in the contract or appointed from time to time, who acts on his behalf.
- vi. **“Arbitrator”** means the person(s) appointed under Sub-Clause 3.20.4.

3.1.3 Dates, Tests, Periods and Completion

- i. **“Base Date”** means the date 28 days prior to the date for submission of Bid.
- ii. **“Commencement Date”** means the date notified under Sub-Clause 3.11.1(*Commencement and Time for Completion of Works*), unless otherwise stated in the contract agreement
- iii. **“Time for Completion”** means the time for completion of works or a section (as the case may be) under Sub-Clause 3.11.1 (*Commencement and Time for completion of works*), as stated in the Special Conditions (with any extension under Sub-Clause 3.11.3 (*Extension of Time for Completion*), calculated from the commencement date.
- iv. **“Tests on Completion”** means the tests which are specified in the contract or agreed by both the parties or instructed as a variation, and which are carried

out under Clause 3.12 (*Tests on Completion*) before the works or a section [as the case may be] are taken over by the Purchaser.

- v. **“Taking-Over Certificate”** means a certificate issued under Clause 3.13(*Purchaser’s Taking Over*)
- vi. **“Tests after Completion”** means the tests specified in the contract and are to be done under Clause 3.14(*Defects Liability*) after the works or a section (as the case may be) are taken over by the Purchaser.
- vii. **“Defects Notification Period”** means the period for notifying defects in works or a section under Sub-Clause 3.14.1 (*Completion of Outstanding Works and Remedying Defects*) and 3.14.3 (*Extension of Defects Notification Period*) calculated from the date on which the works or section is complete as certified under Sub-Clause 3.13 (*Purchaser Taking over*). If no such period is stated in the Special conditions, the period shall be 1 (One) year.
- viii. **“Performance Certificate”** means the certificate issued under Sub-Clause 3.14.7 (*Unfulfilled Obligations*).
- ix. **“Day”** means a calendar day, **“month”** means a calendar month and **“Year”** means a calendar year.
- x. **“Commercial Use”** means the use of the plant, machinery, material and works which the contract contemplates for which it is commercially capable.

3.1.4 Money and Payments

- i. **“Contract Price”** means the agreed amount stated in the contact agreement.
- ii. **“Cost”** means all expenditure reasonably incurred / or to be incurred by the contractor, whether on or off the site, including overhead and similar charges, but does not include profit.
- iii. **“Final Statement”** means the statement defined in Sub-Clause 3.15.4 (*Statement at Completion and Applicable for Payment*).

3.1.5 Equipment and Works

- i. **“Materials”** means things of all kinds intended to form/forming part of works.
- ii. **“Permanent Works”** means permanent works to be executed by Contractor.
- iii. **“Plant”** means apparatus, machinery and vehicles forming part of works.
- iv. **“Works”** include Plant Equipment, Material and Works.

3.1.6 Others

- i. **“Force-Majeure”** is as defined in Clause 3.19 (*Force-Meajure*).
- ii. **“Performance Security”** means the security (or securities, if any) under Sub-Clause 3.7.2 (*Performance Security*).
- iii. Wherever, the word “Approved” “Subject to Approval”, “As directed” “Determined”, “Accepted”, “Permitted”, “Judged”, “As per Approval” or words and phrases of like importance, are used, the approval, judgment, direction etc. is understood to be a function of the Purchaser or Engineer.

3.2 LAWS

Contract shall be governed by the laws of the land (Bharat and the State concerned).

3.3 CONTRACT AGREEMENT

The contract shall come into full force and effect on the date stated in the contract agreement. The costs of stamp duties and similar charges (if any) imposed by law in connection with entry into the contract agreement shall be borne by the Purchaser.

3.4 ASSIGNMENT

The Contractor shall not assign the whole or any part of the contract or any benefit or interest in or under the contract unless Approved otherwise.

3.5 PURCHASER'S CLAIM

If Purchaser considers himself entitled to any payment, he shall give notice to the contractor as soon as practicable after the Purchaser became aware of the event or circumstances giving rise to the claim. The Purchaser may deduct this amount from any moneys due, or to become due, to the contractor.

3.6 PURCHASER'S ADMINISTRATION

3.6.1 Purchaser's Representative / Personnel

The(insert details) shall be the Purchaser's Representative (also referred as "Engineer") and he may, from time to time, assign duties and delegate authority to assistants, and may also revoke such assignment or delegation.

3.6.2 Delegated Persons

- i.** Unless otherwise stated in the delegated person's communication relating to such act, it shall not relieve the contractor from responsibility he has under the contract.
- ii.** Any failure to disapprove any work, plant or materials shall not constitute approval, and shall, therefore, not prejudice the right of the Purchaser to reject the work, plant or materials.

3.6.3 Determinations

Whenever these conditions provide that the Purchaser shall proceed to agree or determine the matter, the Purchaser shall consult the contractor in an endeavor to reach agreement. If agreement is not reached, the Purchaser shall make a fair determination as per the contract and give notice to the contractor of each agreement or determination, with supporting Specials. Each party shall give effect to each agreement or determination, unless the contractor gives notice of his dissatisfaction with a determination within 14 days of receiving it. Either party may then refer the dispute to the arbitration in accordance with Sub-Clause 3.20.4 (*Arbitration*).

3.7 THE CONTRACTOR

3.7.1 Contractor's Representative

The contractor may appoint his representative who shall carry out all the duties assigned to him by the contractor and the contractor shall be responsible for his acts.

3.7.2 Performance Security

Contractor shall provide (at his cost) a performance security for proper performance, as per the Special conditions, which shall be returned to the contractor within 21 days after the contractor has become entitled to receive the performance certificate.

3.7.3 Safety Procedures

The contractor shall comply with all applicable safety regulations and provide fencing, lighting, guarding and watching of the works until Completion and Taking Over under Clause 3.13 (*Purchaser's Taking Over*).

3.7.4 Site Data

The Purchaser shall have made available to the contractor for his information, prior to the base date, all relevant data in the Purchaser's possession. The contractor shall be responsible for verifying and interpreting all such data and the Purchaser shall have no responsibility for the accuracy, sufficiency or completeness of such data.

3.7.5 Rights of Way and Facilities

The contractor shall bear all costs and charges for special and/or temporary rights-of-way which he may require.

3.7.6 Protection of the Environment

The contractor shall take all reasonable steps to protect the environment.

3.7.7 Electricity, Water and Gas etc.

The contractor shall be responsible for the provision of all power, water and other services he may require at the site.

3.7.8 Progress Reports

Unless otherwise stated in the Special Conditions, monthly progress reports shall be prepared by the contractor and submitted to the Purchaser in 3 copies.

3.7.9 Security of the Site

Contractor shall be responsible for keeping un-authorized persons off the site,

3.7.10 Fossils

All fossils, coins, articles of value or antiquity, and structures and other remains or items of geological or archaeological interest found on the site shall be placed under the care and authority of the Purchaser. The contractor shall take reasonable precautions to prevent contractor's personnel or other persons from removing or damaging any of these findings.

3.8 DESIGN

3.8.1 General Design Obligations

The contractor shall be deemed to have scrutinized, prior to the base date, the Purchaser's requirements and be responsible for the design of the works and for the accuracy of such Purchaser's requirements (including design criteria and calculations).

3.8.2 Technical Standards and Regulations

The design, the contractor's documents, the execution and the completed works shall comply with the relevant Standards, environmental laws, laws applicable to the product being produced for the works etc.

3.8.3 Training

The Contractor shall carry out the training of Purchaser's Personnel in the O&M of the Works.

3.8.4 As-Built Documents

The Contractor shall prepare and keep up-to-date, a complete set of '**As-Built**' records 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. 2 (Two) copies shall be supplied to the Purchaser prior to the Commencement of the Tests on Completion. In addition, the Contractor shall supply to the Purchaser "**As-Built**" drawings of the Works, showing all works as executed, and submit them to the Purchaser for review.

3.8.5 Operation and Maintenance (O&M) Manuals

Prior to commencement of the Tests on Completion, the Contractor shall supply to the Purchaser provisional O&M manuals in sufficient detail for the Purchaser to operate, maintain, dismantle, reassemble, adjust and repair the Plant.

3.9 LABOUR LAWS

The Contractor shall comply with all the relevant labour Laws.

3.10 PLANT, MATERIALS AND WORKMANSHIP

3.10.1 Inspection

Engineer shall, at all times, have full access to all parts of the Site, places from which natural Materials are being obtained, during production, manufacture and construction and be entitled to examine, inspect, measure and test materials and workmanship, and check the progress of manufacture of Plant and production of Materials. No such activity shall relieve the Contractor from any obligation or responsibility.

3.10.2 Testing

This Sub-Clause shall apply to all tests specified in the Contract, other than the Tests after Completion (if any). The Purchaser may vary the location or details of specified tests, or instruct the Contractor to carry out additional tests. If these varied or additional tests show that the tested Plant, Materials or workmanship is not in accordance with the Contract, the cost of carrying out this Variation shall be borne by the Contractor, notwithstanding other provisions of the Contract.

The Contractor shall forward to the Purchaser duly certified reports of the tests.

3.10.3 Rejection

If, as a result of an examination, inspection, measurement or testing, any Plant, Materials, design or workmanship is found defective or not in accordance with the Contract, the Purchaser may reject the Plant, Materials, design or workmanship by giving notice with reasons. The Contractor shall then promptly make good the defect and ensure that the rejected item complies with the Contract.

If the Purchaser requires this Plant, Materials, design or workmanship to be retested, the tests shall be repeated under the same terms and conditions. If the rejection and retesting cause the Purchaser to incur additional costs, the Contractor shall subject to Clause 3.5 (*Purchaser's Claim*) pay these costs to the Purchaser.

3.10.4 Royalties

The Contractor shall pay all royalties, rents and other payments for: i. Natural Materials obtained from outside the Site and ii. The disposal of material from demolitions and excavations and of other surplus material (natural or man-made), except to the extent that disposal areas within the Site are specified in the Contract.

3.11 COMMENCEMENT, DELAYS AND SUSPENSION

3.11.1 Commencement and Time for Completion of Works

The Commencement Date shall be within 15 days after the date on which the Contract comes into full force and effect under Clause 3.3 (*Contract Agreement*) and the Contractor shall complete whole of the Work within the Time for Completion as per Clause 4.1 (Delivery / Completion of Works): Section-IV.

3.11.2 Programme

The Contractor shall submit a time programme within 28 days after commencement date and a revised programme, whenever the previous one is inconsistent with actual progress. Unless otherwise stated in the Contract, each programme shall include:

- i. The order in which the Contractor intends to carry out the Works, including the anticipated 'timing of each major stage of the Works.
- ii. The periods for reviews.
- iii. The sequence and timing of inspections and tests specified in the Contract.

3.11.3 Extension of Time for Completion

The Contractor shall be entitled, subject to Sub-Clause 3.12.1(*Contractor's Obligations*), to an extension of the Time for Completion if and to the extent that

completion for the purposes of Sub-Clause 3.13 (*Purchaser's Taking over*) is or will be delayed by any of the following causes:

- i. A Variation (unless an adjustment to the Time for Completion has been agreed.
- ii. Any delay attributable to the Purchaser.

3.11.4 Delay Damages

If the Contractor fails to complete the work in time, he shall, subject to Clause 3.5 (*Purchaser's Claims*), pay delay damages.

These shall be the only delay damages due from the Contractor for such default, other than in the event of termination under Sub-Clause 3.16.2 (*Termination by Purchaser*). These delay damages shall not relieve the Contractor from his obligation to complete the Work, or from any other duties, obligations or responsibilities under the Contract.

3.11.5 Suspension of Work

The Purchaser, may at any time, instruct the Contractor to suspend progress of part or all of the Works. During such suspension, the Contractor shall protect, store and secure such part or the Works against any deterioration, loss or damage.

3.11.6 Consequences of Suspension

If Contractor suffers delay and /or incurs cost from complying with the Purchaser's instructions under Sub-Clause 3.11.5 (*Suspension of Work*) and /or from resuming the work, the Contractor shall give notice and be entitled subject to Sub-Clause 3.20.1 (*Contractor's Claims*) to: i. An extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 3.11.3 (*Extension of Time for completion*), and ii. Payment of any such Cost, which shall be added to the Contract Price.

On receipt of this notice, the Purchaser shall proceed as per Sub-Clause 3.6.3(*Determinations*) to agree or determine these matters. The Contractor shall not be entitled to an extension of time for, or to payment of the Cost incurred in, making good the consequences of the Contractor's faulty design, workmanship or materials, or of the Contractor's failure to protect, store or secure in accordance with Sub-Clause 3.11.5 (*Suspension of Works*).

3.11.7 Payment for Plant and Materials in the Event of Suspension

The Contractor shall be entitled to payment of the value (as at the date of-suspension) of Plant and /or Materials which have not been delivered to Site if the work or Plant or delivery of Plant and /or Materials has been suspended for more than 28 days.

3.11.8 Resumption of Work

After the permission or instruction to proceed is given, the Parties shall jointly examine the Works and the Plant and Materials affected by the suspension. The Contractor shall make good any deterioration or defect in or loss of the Works or Plant or Materials, which has occurred during the suspension.

3.12 TESTS ON COMPLETION

3.12.1 Contractor's Obligations

The Contractor shall carry out the Tests on Completion as per Clause and Sub-Clause 3.10.2 (*Testing*), after providing the documents in accordance with Sub-Clause 3.8.5(*Operation and Maintenance Manual*).

Unless otherwise stated in the Special Conditions, the Tests on Completion shall be carried out in the following sequence:

- i. Pre-commissioning tests
- ii. Commissioning tests

- iii. Trial operation, which shall demonstrate that the Works or Section perform reliably and in accordance with the Contract.
- iv. Trial operation shall not constitute a taking-over under Clause 3.13 (*Purchaser's Taking over*).

3.12.2 Re-Testing

If the Works, or a Section, fail to pass the Tests Sub-Clause 3.10.2 (*Testing*) shall apply, and the Purchaser or the Contractor may require the failed Tests, and Tests on Completion on any related work, to be repeated under the same terms and conditions.

3.12.3 Failure to Pass Tests on Completion

If the Works, or a Section, fail to pass the Tests on Completion repeated under Sub-Clause 3.12.2 (*Re-Testing*), the Purchaser shall be entitled to:

- i. Order further repetition of Tests under Sub-Clause 3.12.2 (*Re-Testing*);
- ii. If the failure deprives the Purchaser of substantially the whole benefit of the Works or Section, reject the Works or Section (as the case may be), in which event the Purchaser shall have the same remedies as are provided in Sub Paragraph (iii) of Sub-Clause 3.14.4 (*Failure to Remedy Defects*).

3.13 PURCHASER'S TAKING OVER

Except as stated in Sub-Clause 3.12.3 (*Failure to Pass Tests on Completion*), the Works shall be taken over by the Purchaser when (i) the Works have been completed in accordance with the Contract, including the matters described in Sub-Clause 3.11.1 (*commencement and time for completion of works*) and (ii) a Taking-Over Certificate for the Works has been issued, or is deemed to have been issued in accordance with this Sub-Clause.

3.14 DEFECTS LIABILITY

3.14.1 Completion of Outstanding Work and Remedying Defects

The Contractor shall complete any work which is outstanding and execute all work required to remedy defects or damage.

3.14.2 Cost of Remedying Defects

All work referred to in Sub-Clause 3.14.1 (*Above*) shall be executed at the risk and cost of the Contractor, if and to the extent that the work is attributable to:

- i. The design of the Works,
- ii. Plant, Materials or workmanship not being in accordance with the Contract,
- iii. Improper O&M attributable to matters for which the Contractor is responsible under Sub-Clauses 3.8.4 (*As built Documents*) to 3.8.4 (*Operation and Maintenance Manual*).

3.14.3 Extension of Defects Notification Period

The Purchaser shall be entitled, subject to Clause 3.5 (*Purchaser's Claims*) to an extension of the Defects Notification Period for the Works or a Section if and to the extent that the Works, Section or a major item of Plant (as the case may be, and after taking over) cannot be used, for the purpose for which they are intended, by reason of a defect or damage.

3.14.4 Failure to Remedy Defects

If the Contractor fails to remedy any defect or damage within a reasonable time, a date may be fixed by the Purchaser, for remedying. If the Contractor fails to remedy by this notified date and this remedial work which was to be executed at the cost of the Contractor under Sub-Clause 3.14.2 (*above*), the Purchaser may (at his option):

- i. Carry out the work himself or by others, at the Contractor's cost, but the Contractor shall have no responsibility for this work.
- ii. Agree or determine a reasonable reduction in the Contract Price in accordance with Sub-Clause 3.6.3 (*Determinations*).
- iii. If defect or damage deprives the Purchaser of substantially the whole benefit of the Works or a major part thereof, terminate the Contract as a whole, or in respect of such major part which cannot be put to the intended use. Without prejudice to any other rights, under the Contract or otherwise, the Purchaser shall, then, be entitled to recover all sums paid for the Works or for such part (as the case may be), plus financing costs and the cost of dismantling the same, clearing the Site and returning Plant and Materials to the Contractor.

3.14.5 Removal of Defective Work

If the defect or damage cannot be remedied expeditiously on the Site and the Purchaser gives consent, the Contractor may remove from the Site for the purposes of repair such items of Plant as are defective or damaged. This consent may require the Contractor to increase the amount of the Performance Security by the full replacement cost of these items or to provide other appropriate security.

3.14.6 Performance Certificate (PC)

Performance of the Contractor's obligations shall not be considered completed until the Purchaser has issued PC, which shall be issued by him within 28 days after the latest of the expiry dates of the Defects Notification Periods, or as soon thereafter as the Contractor has supplied all the Contractor's Documents and completed and tested all the Works, including remedying any defects. If the Purchaser fails to issue the Performance Certificate accordingly:

- i. Performance Certificate shall be deemed to have been issued on the date 28 days after the date on which it should have been issued, as per this Sub-Clause
- ii. Sub-Paragraph (a) of Sub-Clause 3.15.5 (*Discharge*) shall be inapplicable.

Only the P C shall be deemed to constitute acceptance of the Works.

3.14.7 Unfulfilled Obligations

After the Performance Certificate has been issued, each Party shall remain liable for the fulfillment of any obligation which remains unperformed at that time. For the purposes of determining the nature and extent of unperformed obligations, the Contract shall be deemed to remain in force.

3.15 CONTRACT PRICE AND PAYMENT

3.15.1 The Contract Price

Unless otherwise stated in the Special conditions

- i. Payment for the works shall be made on the basis of the lump sum contract price, subject to adjustments in accordance with the contract.
- ii. Contractor shall pay all taxes, duties and fees required to be paid by him as per the contract and the contract price shall not be adjusted for any of these costs.

3.15.2 Schedule of Payments

- i. Contractor shall, on submitting the bill(s) as per Payment Schedule-11.6 Section –XI, be entitled to receive payment provided the bill is complete, duly supported by details, in order in every respect, and is for the actual quantities of the work.
- ii. Deduction towards Income Tax (as per the Act in force) shall be made from the gross amount of bill including the cost of material etc. Income Tax shall

not be deducted, if the contractor produces a certificate from the Income Tax Department stating that he is exempted from such deductions.

3.15.3 Payment of Retention Money

When the Taking-over certificate has been issued, and the works have passed all specified tests, the first half of the retention money shall be paid to the contractor.

Promptly after the latest of the expiry dates of the defects notification periods, the outstanding balance of the retention money shall be paid to the contractor.

3.15.4 Statement at Completion and Application for Payment

The contractor shall submit to the Purchaser 3 (Three) copies of a statement at completion with supporting documents showing:

- i.** The value of all work done in accordance with the contract up to the date stated in the Taking – Over certificate for the works.
- ii.** Any further sums which the contractor considers to be due.
- iii.** An estimate of any other amounts which the contractor considers will become due to him under the contract. Estimated amounts shall be shown separately in this statement at completion.

The Purchaser shall then give notice to the contractor and make payment which may be found due after checking.

If the Purchaser disagrees with the draft final statement, the contractor shall submit such further information as the Purchaser may reasonably require and make such changes in the draft as may be agreed. The contractor shall then prepare and submit the final statement as agreed.

3.15.5 Discharge

When submitting the final statement, the contractor shall submit a written discharge, which confirms that the total of the final statement represents full and final settlement of all moneys due to the contractor under or in connection with the contract.

3.15.6 Final payment

The Purchaser shall pay to the contractor the amount which is finally due, less all amounts paid.

3.15.7 Cessation of Purchaser's Liability

Purchaser shall not be liable to the Contractor for any matter under or in connection with the Contract or execution of the Works, except to the extent that the Contractor shall have included an amount expressly for it in the Final Statement and also in the statement at completion described in Sub-Clause-3.15.4 (Statement of Completion).

3.16 TERMINATION BY PURCHASER

3.16.1 Notice to Correct

If the Contractor fails to carry out any obligation, the Purchaser may, by notice, require the Contractor to make good the failure within a specified reasonable time.

3.16.2 Termination by the Purchaser

The Purchaser shall be entitled to terminate the Contract, if the Contractor:

- i.** Fails to comply with Sub-Clause 3.7.2 (*Performance Security*) or with notice; under Sub-Clause 3.16.1 (*Notice to Correct*).
- ii.** Abandons the Works or otherwise plainly demonstrates the intention not to continue performance of his obligations under the Contract.
- iii.** Without reasonable excuse, fails to proceed with the Works in accordance with Clause 3.11 (*Commencement, Delay and Suspension*).
- iv.** Subcontracts the whole of the Works without the required agreement,

- v. Becomes bankrupt or insolvent, goes into liquidation,' has a receiving or administration order made against him, compounds with his creditors, or carries on business under a receiver, trustee or manager for the benefit of his creditors, or if any act is done or event occurs which (under applicable Laws) has a similar effect to any of these acts or events.

3.16.3 Valuation at Date of Termination

As soon as practicable after a notice of termination under Sub-Clause 3.16.2 (*Termination by Purchaser*) has taken effect, the Purchaser shall proceed in accordance with Sub-Clause 3.6.3 (*Determinations*) to agree or determine the value of the Works, Goods and Contractor's Documents, and any other sums due to the Contractor for work executed.

3.16.4 Payment after Termination

The Purchaser may:

- i. Proceed in accordance with Clause 3.5 (*Purchaser's Claims*).
- ii. With-hold further payments to the Contractor until the costs of design, execution, completion and remedying of any defects, damages for delay in completion (if any), and all other costs incurred by the Purchaser, have been established, and / or
- iii. Recover from the Contractor any losses and damages incurred by the Purchaser and any extra costs of completing the Works.

3.17 RISK AND RESPONSIBILITY

3.17.1 Indemnities

The Contractor shall indemnify and hold harmless the Purchaser, the Purchaser's Personnel, against and from all claims, damages, losses and expenses (including legal fees and expenses) in respect of:

- i. Bodily injury, sickness, disease or death, of any person whatsoever arising out of or in the course of or by reason of the design, execution and completion of the Works and the remedying of any defects, unless attributable to any negligence, willful act or breach of the Contract by the Purchaser, the Purchaser's Personnel, or any of their respective agents, and
- ii. Damage to or loss of any property, real or personal (other than the Works), to the extent that such damage or loss:
 - a. Arises out of or in the course of or by reason of the design, execution and completion of the Works and the remedying of any defects.
 - b. Is not attributable to any negligence, fulfill act or breach of Contract by the Purchaser, the Purchaser's Personnel, their respective agents, or anyone directly or indirectly employed by any of them.

3.17.2 Contractor's Care of the Works

The Contractor shall be fully responsible for care of the Works and Equipments from the Commencement date until the Taking-Over Certificate.

3.18 INSURANCE

- i. The contractor shall arrange, secure & maintain insurance to protect his own interest and the interests of the purchaser against all risks.
- ii. All damages and shortages after its delivery to site and storage there-after shall be notified by the contractor's site representative by registered post to purchaser and action taken by him within 30 days for making good the damage or loss by way of

- replacement/ repair/new supply against the equipment damaged or lost.
- iii. The contractor shall take up the matter with insurance company on its own for finalization of claims. All actions in connection with making and settling of claims, if any, will be carried out by the contractor himself for which no extra payment will be made by the purchaser to the contractor in this regard.
 - iv. The contractor shall be responsible to make good the damage or loss by way of repairs and/ or replacement of equipment free of cost, irrespective of the fact whether claim is accepted by the insurance company or not, without waiting for settlement of claims.

3.19 FORCE-MAJEURE (FM)

3.19.1 Definition of FM

The "FM" means exceptional event (s) / circumstance (s), here-in-after called the “**Eventualities**”, which are:

- i. Beyond a Party's control,
- ii. Which such Party could not reasonably have provided against before entering into the Contract,
- iii. Which, having arisen, a Party could not reasonably have avoided or overcome,
- iv. Which is not substantially attributable to the other Party.

FM may include, but is not limited to, eventualities of the kind listed below, so long as conditions (i) to (ii) above are satisfied:

- a. War, hostilities, invasion, act of foreign enemies,
- b. Rebellion, terrorism, revolution, insurrection, military, usurped power, or civil war, riot, commotion, disorder, strike or lockout by persons other than the Contractor's Personnel/Employees of the Contractor and Subcontractors.
- c. Munitions of war, explosive materials, ionising radiation or contamination by radio-activity, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity.
- d. Natural catastrophes such as earthquake, hurricane, typhoon or volcanic activity.

3.19.2 Notice of FM

If a Party is prevented from performing its obligation(s) under the Contract by FM, then it shall give notice to the other Party of the event / circumstances constituting the FM and specify the obligations, the performance of which is or will be prevented.

The Party shall, having given notice, be excused performance of such obligations for so long as such FM prevents it from performing them.

3.19.3 Consequences of FM

3.19.3.1 If the Contractor is prevented from performing any of his obligations under the Contract by FM of which notice has been given under Sub-Clause 3.19.2(Notice of FM), and suffers delay and /or incurs Cost by reason of such FM, the Contractor shall be entitled to:

- i. An extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 3.11.3 (*Extension of Time for Completion*)
- ii. If the event or circumstance is of the kind described in Sub-Paragraphs (a) to (e) of Sub-Clause 3.19.1(*Defination of FM*) and, in the case of Sub-Paragraphs (b) to (d) occur in the Country, payment of any such Cost.

3.19.3.2 After receiving this notice, the Purchaser shall proceed in accordance with Sub-Clause 3.6.3 (*Determinations*) to agree or determine these matters.

3.20 CLAIMS, DISPUTES AND ARBITRATION

3.20.1 Contractor's Claims

- i. If the Contractor fails to give notice of a claim within such period of 15 days, the Time for Completion shall not be extended, the Contractor shall not be entitled to additional payment, and the Purchaser shall be discharged from all liability in connection with the claim, otherwise, the following provisions of this Sub-Clause shall apply.
- ii. Within 30 days after the Contractor became aware (or should have become aware) of the event or circumstance giving rise to the claim, or within such other Approved period, the contractor shall send to the Purchaser a fully detailed claim which includes full supporting Specials of the basis of the claim and of the extension of time and/or additional payment claimed. If the event or circumstance giving rise to the claim has a continuing effect:
 - a. This fully detailed claim shall be considered as interim.
 - b. The Contractor shall send further interim claims at monthly intervals, giving the accumulated delay and/or amount claimed, and such further Specials as the Purchaser may reasonably require.
 - c. The Contractor shall send a final claim within 15 days after the end of the effects resulting from the event or circumstance, or within the Approved such other period.
 - d. Within 30 days after receiving a claim or any further Specials supporting a previous claim, or within such other period as may be proposed by the Purchaser and approved by the Contractor, the Purchaser shall respond with approval, or with disapproval and detailed comments.

The Purchaser shall proceed in accordance with Sub-Clause 3.6.3 (*Determinations*) to agree or determine (i) the extension (if any) of the Time for Completion (before or after its expiry) in accordance with Sub-Clause 3.11.3 (*Extension of Time for Completion*), and/or (ii) the additional payment (if any) to which the Contractor is entitled under the Contract.

3.20.2 Disputes

Dispute (s), if any, shall be settled by mutual agreement through Amicable Settlement (Sub-Clause 3.20.3 (*Amicable Settlement*)) and in case of failure, through Arbitration Under Sub-Clause 3.20.4 (*Arbitration.*)

3.20.3 Amicable Settlement

Both parties (the contractor and the purchaser) shall attempt to settle the dispute amicably before the commencement of arbitration. However, unless both Parties agree otherwise, arbitration may be commenced on or after the forty-fifth day after the day on which notice of dissatisfaction was given, even if no attempt at amicable settlement has been made.

3.20.4 Arbitration

Unless settled amicably, any dispute shall be finally settled by arbitrator(s) who shall be appointed from amongst the suitably qualified person(s) to be agreed by both the parties for arbitrations.

SECTION - IV

SPECIAL CONDITIONS OF CONTRACT

4.1 DELIVERY/ COMPLETION OF WORKS

- 4.1.1** The delivery should be effected in serviceable lots / sets of equipment.
- 4.1.2** The completion period shall be 18 months counted from the date of signing of Contract Agreement

4.2 ASSIGNMENT, SUBLETTING CONTRACT AND PURCHASED ITEMS

The Contractor shall not sublet his Contract, or any substantial part thereof other than for supply of raw materials, for minor details, or for any part of the work of which the makers are named in the Contract provided that consent of the Purchaser is taken by him. Such a consent shall not relieve the Contractor from any obligation, duty or responsibility under the Contract.

4.3 SUBMISSION OF PERFORMANCE BANK GUARANTEE

- 4.3.1** The Contractor shall also furnish Performance Security @ **10% (Ten percent)** of the Contract Value towards successful performance of the plant in accordance with the guaranteed technical particulars of the equipment immediately after taking over the machines by the purchaser. The above guarantee shall be submitted to the Purchaser within 15 days of signing of contract by both the parties and kept valid up to **60 (Sixty)** days after the date of completion of performance obligations including Guaranteed/Warranty obligations.
- 4.3.2** Performance security shall be in the form of a BANK GUARANTEE (Form-10.6 Section – X), duly executed on non-judicial stamp paper of requisite value.

4.4 MANUALS

The contractor shall furnish 5(Five) sets of bound copies of erection, commissioning and operation, maintenance manuals giving detailed instructions, procedures, precautions for all the equipments to the Purchaser.

4.5 SAFETY

All units with respect to their location, layout, general arrangement and design and equipment, structural design, etc. shall be safe to the personnel and conform to the relevant safety rules and regulations / statutory requirement issued by the State Government and the Central Government as well as to: i. Indian Electricity Rules ii. Indian Electricity Act iii. Indian Explosives Manual and iv. Fire Protection Manual issued by Tariff Advisory Committee (India).

4.6 WATER FOR CONTRACTOR'S USE

The contractor can use the water available at site suitably.

4.7 WORK SCHEDULE/RE-SCHEDULING & PROGRESS OF WORK

Contractor shall submit a detailed PERT network within 15 (Fifteen) days after the date of Award of Contract Approved PERT network shall form part of the contract to be signed within 15 (Thirty) days from the date of receipt of Letter of Intent/ Letter of Award of Contract.

4.8 GUARANTEE & WARRANTY

- 4.8.1** The Contractor shall guarantee/warranty the performance of the equipment and works as specified in Technical Specifications of the items.

4.8.2 The Contractor shall further warrant that the equipment supplied/ works executed shall have no defect arising from design, material or workmanship or from any act or omission of the Contractor that may develop under normal use. Warranty shall remain valid for **8000 hours of operation or 18 (Eighteen) months** after commissioning and handing over the equipment, whichever earlier.

4.8.3 If it becomes necessary for the Contractor to replace or renew any defective parts of the plant/works pursuant to the warranty clause, the Warranty Period for such parts shall, notwithstanding anything to the contrary contained herein, be operative for a further period of 12 (Twelve) months from the date of such repair/replacement or until the end of the above mentioned period of 18 (Eighteen) months, whichever later.

4.9 PRICE VARIATION, TAXES, DUTIES & LEVIES ETC.

Prices to be charged by the Contractor under the contract shall not vary from the quoted price in his Bid during the entire duration of Contract. Payments of taxes/ duties shall be made as per actual on production of proof of payments actually made, for which the amount included in the contract value shall be deemed to be based on the rates prevailing on the date 15 (Fifteen) days prior to the date of opening of the Bid and the balance amount payable shall be the difference between the amount calculated at the rates as per the documentary proof and the amount already included in the contract value.

4.10 CONTRACT DRAWINGS AND TECHNICAL SPECIFICATIONS

4.10.1 Within 30 (Thirty) days from the effective date of the Contract, the Contractor shall send to the Engineer a list of all the drawings with their respective titles and the dates on which they shall be supplied to the Purchaser.

4.10.2 The contractor shall furnish 3 (Three) prints of each of the following drawings within 4 (Four) weeks of the date of order:

- i.** General arrangement drawings of the equipment offered.
- ii.** Dimensional drawings and descriptive literature of the components.
- iii.** Basic electrical drawings.

4.10.3 The Purchaser's Representative shall return to the contractor one print of each drawing; (a). Stamped APPROVED or (b). Marked up with Comments. In case of (b), the contractor shall correct his drawings to conform to the comments and re-submit in the same manner as stated above, within 2(Two) weeks after the receipt of the marked up print by him.

4.10.4 The contractor shall furnish one direct reading reproducible of each drawing and bill of materiel within 2 (Two) Weeks of receipt of APPROVED set.

4.10.5 Approval Category Drawings/Documents

The contractor shall submit the following:

4.10.5.1 Calculations

- i.** Grounding / Earthing calculations and drawing(s).
- ii.** Calculation to justify CT/PT Parameters like VA burden, knee point voltage etc. for all cores.

4.10.5.2 Others

- i.** Single line diagram of all electrical equipment and Electrical equipment lay out.
- ii.** Front view and General Arrangement diagrams for panel(s).
- iii.** Control and schematic drawings for control / protection, Lightning protection, drawings showing coverage of all equipment, structures,

buildings etc.

- iv. Grounding / Earthing layout drawing covering internal / external rings and connections to equipment structures etc.

4.10.5.3 Information Category Drawings/Documents

- i. Cable schedule indicating type of cables, from to via, route, total length size of cable and a final summary sheet indicating total requirement of all types of cables (for control and power both).
- ii. Core wise control cable termination details indicating ferrule no. terminal block no. for each cable/each equipment.
- iii. Internal wiring diagram for panel(s).
- iv. Catalogues for each type of equipment, relays, meters etc.
- v. Installation and commissioning manuals for each equipment, relay etc.
- vi. O & M Manuals indicating trouble shooting procedure for all Equipment.
- vii. Type Test Certificates for all the major equipment.
- viii. Details of Test results, for test conducted at works for all equipment.
- ix. Details of Test results, for tests conducted at site for all equipment.
- x. Spare part list, Nos, and ordering procedure for all recommended spares.
- xi. Overall General Arrangement (GA) of all the panels/equipment.
- xii. Fixing details of all the panels/equipment supporting structures etc.
- xiii. Static and dynamic loading of each equipment.
- xiv. Floor cutouts and wall opening details for cables and light conduits etc.
- xv. Details and location of various inserts, base plates, bolts, etc. required to be provided for support of cable structure, panel etc.
- xvi. As executed drawings incorporating site changes along with reproducible.

4.11 INSPECTION & TESTING

4.11.1 The Engineer shall, on giving 10 (Ten) days notice in writing to the contractor setting out any ground of objections which he may have in respect of the work, be at liberty to reject all or any plant or workmanship connected with such work, which, in his opinion, are not in accordance with the contract, or are, in his opinion, defective for any reason whatsoever; provided that, if such notice be not sent to the contractor within reasonable time after the grounds upon which such notice is based have come to the knowledge of the engineer, he shall not be entitled to reject the said plant or workmanship on such grounds. Unless specifically provided otherwise, all tests shall be made on contractor's works before shipment.

4.11.2 The contractor shall give the Engineer notice of any material being ready for testing, and the Engineer (and his Representatives) if so desired, shall, on giving 24 (Twenty Four) hours previous notice in writing to the contractor, attend at the contractor's premises within 15 (Fifteen) days of the date on which the material is notified as being ready; failing which visit the contractor may proceed with the tests, which shall be deemed to have been made in the Engineer's presence, and he shall forthwith forward to the Engineer duly certified copies of the test, in duplicate.

4.11.3 The contractor shall give 15 (Fifteen) days notice to the Purchaser's Representative of every lot of material being ready, duly packed for dispatch, along with routine test results of the material offered and details of dispatches made against last authorization for dispatch.

4.11.4 The purchaser reserves the right to draw required number of samples of other major items of raw material. These samples shall, however, be drawn and sealed in the presence of contractor (or his Authorized Representative). The Purchaser

further reserves the right to get these samples tested from any Govt. recognized test house/ laboratory or Govt. test house/ laboratory.

4.11.5 At Works

- i.** The offered equipment must have been fully type tested as per relevant ISS and/ or other specified International Standards, during the last 5 (Five) years' period, to be reckoned from the date of opening of tender. Photocopy of such type test reports/certificates must be submitted along with the tender. Type test certificate(s) of prototype manufactured and tested by foreign collaborators of the bidder(s) at their works shall not be acceptable for indigenously manufactured equipment.
- ii.** If the equipment is being manufactured in India under foreign collaboration, it shall have 3 (Three) years' satisfactory operating experience under tropical climate.
- iii.** The offered indigenously manufactured equipment should have been type tested and the test report submitted with the bid.

4.11.6 Inspection of Works

- i.** During erection, re-assembly, commissioning and trial operation, the Contractor shall perform at suitable intervals all inspections and tests in the presence of the Engineer in order to prove the orderly execution of the works in accordance with the Contract.
- ii.** Sts for testing at site and of the works and charges associated with it shall be borne by the Contractor. This includes the measuring devices - properly calibrated, and any pertinent accessories which shall be made available by the Contractor for the entire duration of the tests. The Contractor shall delegate his experts to perform the tests at site.

4.12 PACKING

The Contractor shall make separate package for each consignment and mark all containers with the implementing document number pertinent to the shipment. Each shipping container shall also be clearly marked on at least two sides as follows:

a. Consignee, b. Contract No, c. Package No., d. Description e. Item No. f. Net and gross weight g. Volume.

4.13 DELIVERY OF PLANT AND DESPATCH DOCUMENTS

Following dispatch documents shall be sent with the packages:

- i.** 3 copies of the invoice showing description, quantity, unit price, and total amount.
- ii.** 3 copies of packing list showing contents of Package, Container, Bundle and loose materials forming part of each consignment shall be described in full in the packing account and full details of the contents of packages and quantity of material(s) shall be given.
- iii.** Delivery note / railway receipt / truck receipt.
- iv.** Manufacturer's / Contractor's guarantee certificate.
- v.** Inspection certificate issued by the nominated inspection agency, and the Contractor's factory inspection report.

4.14 LIQUIDATED DAMAGES (LD)

- i.** If the work(s) is not completed within Time, the Purchaser shall be entitled to LD payable @ 0.5 % of the Contract Price per week or part of week subject to maximum of 10 (Ten) % of the Contract Price.

- ii. Without prejudice to the right of the Purchaser under the Contract and to the LD, the Purchaser shall be entitled additionally to terminate the Contract without being liable, in any manner whatsoever, to the Contractor and / or to have the WORKS completed at the risk and cost of the Contractor, by a communication in writing to the Contractor in the following events:
 - a. LD have become payable but the maximum limit of the amount of LD payable hereunder by the Contractor has been reached / not reached and the Contractor has failed to complete the delayed WORKS within 30 (Thirty) days of receipt of notice; **OR**
 - b. The Contractor, being in breach of any of the provisions of the Contract, has failed to remedy such breach/default within 30 (Thirty) days or such further period as may be mutually agreed between the Purchaser and the Contractor.

4.15 TERMS OF PAYMENT

Subject to any deductions from the contract price as per the Contract, the contractor shall be entitled to receive the contract price in the following manner:

- i. **Terms**
 - a. Payment shall be made as per the Schedule – 11.6 (Section –XI) within 30 days after receiving the bills from him subject to terms and conditions laid down in the preceding clauses.
 - b. 10% of the contract price on demonstration of Performance Guaranteed Parameters against submission of Bank Guarantee for equal amount to be kept valid till expiry of the Guaranteed Period.
- ii. **Mode of Payment**
 - a. All payments to be made to the Contractor under the contract shall be in Indian rupees only.
 - b. All costs, damages or expenses which the Purchaser may have paid to the Contractor, for which under the Contract the Contractor is liable, may be deducted by the Purchaser from any money due or may become due by him to the Contractor under this contract, or may be recovered by due process of law.

4.16 POWER TO VARY OR OMIT WORK

No alterations, amendments, omissions, additions, suspensions or variations of the work (hereinafter referred to as “Variations”) under the Contract as shown by the contract drawings or the Specifications shall be made by the Contractor except as directed in writing by the Engineer, but the Engineer shall have full power, subject to the provision hereinafter contained, from time to time during the execution of the Contract by notice in writing to instruct the Contractor to make such variations without prejudice to the Contract, and the Contractor shall carry out such instructions, and be bound by the same conditions, as far as applicable, as though the said variations occurred in the specification. If any suggested variations would, in the opinion of the Contractor, if carried out, prevent him from fulfilling any of the obligations or guarantees under the Contract, he shall notify the Engineer thereof in writing, and the Engineer shall decide forthwith whether or not the same shall be carried out, and if the Engineer confirms his instructions, the Contractor’s obligations and guarantees shall be modified to such an extent as may be justified. The difference of cost if any,

occasioned by any such variations, shall be added to, or deducted from, the contract price as the case may require.

4.17 NEGLIGENCE

If the Contractor shall neglect to execute the work with due diligence and expedition, or shall refuse or neglect to comply with any reasonable orders given to him in writing by the Engineer in connection with the work, or shall contravene any provision of the Contract, the Purchaser may give seven day's notice in writing to the Contractor, to make good the failure, neglect, or contravention complained of, and if the Contractor shall fail to comply with the notice within a reasonable time from the date of service thereof then in such case the Purchaser shall be at liberty to employ other workmen , and forthwith perform such work as the Contractor may have neglected to do , or if the Purchaser shall think fit , it shall be lawful for him to take the work wholly, or in part, out of Contractor's hands and give it to another person on contract at a reasonable price.

4.18 DEATHS, BANKRUPTCY ETC.

If the Contractor shall die or commit any act of Bankruptcy, or being a corporation commence to be wound up except for reconstruction purposes or carry on its business under a Receiver, the executors, successors, or other representative in law of the estate of the Contractor or any such Receiver, liquidator, or any person in whom the contract may become vested, shall forthwith give notice thereof in writing to the Purchaser and shall for one month, during which he shall take all reasonable steps to prevent a stoppage of the works, have the option of carrying out the contract , subject to his or their providing such guarantee as may be required by the Purchaser, but not exceeding the value of the work , for the time being remaining unexecuted.

4.19 LIABILITY FOR ACCIDENTS AND DAMAGE

- i. Contractor shall be responsible for the loss, damage or depreciation of the plant until the same is Taken Over under Clause 4.26(Taking over) or is deemed under that Clause to have been taken over, provided ALWAYS that the Contractor shall not be responsible for any such loss, damage and depreciation occurring during such period that plant is operated by the Purchaser's staff prior to being taken over in accordance with Clause 4.25. (Rejection of defective plant).
- ii. Until the plant is taken over or is deemed to have been taken over as aforesaid, the Contractor shall also be liable for and shall indemnify the Purchaser in respect of all injury to person or damage to property resulting from the negligence of the Contractor or his workmen or sub-contractors or from defective design or work, but not from any other cause.
- iii. The Contractor shall indemnify and keep the Purchaser harmless against all actions, suits, claims, costs, or expenses arising in connection with injuries other than such as may be attributable to the Purchaser or his employees suffered prior to the date when the plant shall have been taken over under Clause 4.26 hereof, by persons employed by the Contractor or his sub-Contractor on the works, whether at Common Law or under the Workmen's Compensation Act 1923, or any other Statute in force.

4.20 REPLACEMENT OF DEFECTIVE PLANT OR MATERIALS

If during the progress of the work the Purchaser's Representative shall decide and notify in writing to the Contractor that the Contractor has executed any unsound or imperfect work or has supplied any plant inferior in quality to that specified, the contractor, on receiving details of such defects or deficiency shall, at his own expense, within such time as may be reasonably necessary for making it good, proceed to alter, reconstruct or remove such work, or supply fresh materials up to the standard of the specification, and in case the Contractor shall fail so to do, the purchaser may, on giving the Contractor 10 (Ten) days' notice in writing of his intention so to do, proceed to remove the work complained of, and at the cost of the Contractor, perform all such works or supply all such materials, provided that nothing in this clause shall be deemed to deprive the purchaser of or affect any rights under the Contract which he may otherwise have in respect of such defects or deficiencies.

4.21 CERTIFICATES OF PURCHASER'S REPRESENTATIVE

Every application to the Purchaser's Representative for a certificate must be accompanied by a detailed invoice (in duplicate) setting forth in the order of the Schedule of prices, particulars of the plant supplied and the certificates as to such plant, as is in the reasonable opinion of the Engineer in accordance with the Contract, shall be issued within 14 (Fourteen) days of the application for the same as is reasonably necessary on communication with the site. The Engineer may, by any certificate, make any correction or modification in any previous certificate which shall have been issued by him and payments shall be regulated and adjusted accordingly.

4.22 CERTIFICATE NOT TO EFFECT RIGHTS

No certificate of the Engineer on account, nor any sum paid on account by the Purchaser, nor any extension of time granted shall affect or prejudice the rights of the Purchaser against the Contractor, either under this Agreement or under the law, or relieve the Contractor of his obligations for the due performance of the contract, or be interpreted as approval of the work or of the material supplied. No certificate of the Engineer shall create liability on the purchaser to pay for any alternation, amendments, variations or additions not ordered in writing by the Engineer, or absolve the Contractor of his liability for the payment of damages whether due, ascertained, or certified or not or of any sum against the payment of which he is bound to indemnify the Purchaser nor shall any such certificate nor the acceptance by him of any sum paid on account or otherwise affect or prejudice the rights of the Contractor against the Purchaser, under this agreement or under the law.

4.23 PRICE REDUCTION CLAUSE

If the Contractor shall fail in the due performance of his Contract within the time fixed by the Contract or any extension thereof, the Contractor agrees to accept a reduction of the Contract price by ½% (Half Percent) per week reckoned on the contract value of such portion only of the plant as cannot, in consequence of the delay, be used commercially and efficiently during each week between the appointed or extended time, as the case may be, and the actual time of acceptance under Clause 4.27 (Maintenance), and such reduction shall be in full satisfaction of the Contractor's liability for delay but shall not in any case exceed 10% (Ten percent) of the contract value of such portion of the plant.

4.24 TEST ON COMPLETION

Whenever possible all tests shall be carried out before shipment. Should, however, it be necessary for the final test as to performance and guarantees to be held over until plant is erected at site, they shall be carried out in the presence of the Contractor's representative within one month of completion of erection. If the result of these tests shall not come within the margin specified, the tests shall, if required, be repeated within one month from the date the plant is ready for re-test, and the Contractor shall re-pay to the Purchaser all reasonable expenses to which he may be put by such tests.

4.25 REJECTION OF DEFECTIVE PLANT

- i. If the completed plant, or any portion thereof, before it is Taken Over under Clause 4.26 (Taking over) be found to be defective, or fails to fulfill the requirements of the Contract, the Engineer shall give the Contractor notice setting forth particulars of such defects of failure, and the Contractor shall forthwith make the defective plant good, or alter the same to make it comply with the requirements of contract. If the Contractor fails to do so within a reasonable time the Purchaser may reject and replace, at the cost of the contractor, the whole or any portion of the plant, as the case may be, which is defective
- ii. In the event of such rejection, the Purchaser shall be entitled to the use of the plant in a reasonable and proper manner for a time reasonably sufficient to enable him to obtain other replacement plant. During the period the rejected plant is used commercially the Contractor shall be entitled to a reasonable sum as payment for such use.

4.26 TAKING OVER

In the event of final or any outstanding tests being held over until the plant is erected, such Taking Over Certificate shall be issued subject to the results of such final or outstanding tests which shall be carried out as per the Clause 4.25.

4.27 MAINTENANCE

For a period of 18 (Eighteen) calendar months, commencing from the date on which the plant is taken over or is deemed to have been Taken Over under Clause 4.26 (Taking over), the Contractor shall remain liable to replace any defective parts that may develop in plant of his own manufacture or those of his sub-contractors approved under Clause 4.2, under conditions provided for by the Contract under proper use and arising solely from faulty design, materials or workmanship, PROVIDED ALWAYS that such defective parts as are not repairable at the site and are not essential in the meantime to the maintenance in commercial use of the plant, are promptly returned to the Contractor's works at the expense of the Contractor unless otherwise arranged.

If it becomes necessary for the Contractor to replace or renew any defective parts of the plant under this clause, the provisions of the first paragraph of this clause shall apply to the parts of the plant so replaced or renewed until the expiration of 6 (Six) months from the date of such replacement or renewal or until the end of the above mentioned period of the 12 (Twelve) months, whichever may be the later. If any defects be not remedied within a reasonable time, the Purchaser may proceed to do the work at the Contractor's risk and expense, but without prejudice to any other rights which the purchaser may have against the

Contractor in respect of such defects. The Contractor shall bear reasonable cost of minor repairs carried out on his behalf at site.

4.28 CERTIFICATE OF COMPLETION OF WORKS

Before taking over the works into commercial use, the purchaser shall issue a certificate of completion based on the following certifications by the Engineer:

- i. Acceptable quality and workmanship of works.
- ii. Acceptance of field tests by the Engineer after commissioning the works.

4.29 FINAL ACCEPTANCE CERTIFICATES (FAC)

- i. It shall be issued by Purchaser within 30 (Thirty) days of expiry of the Guarantee/Warranty Period or the date of rectification of outstanding deficiencies/ damages/defects, whichever is later.
- ii. Request for issue of FAC by the Contractor shall be accompanied by a list of documents already handed over, as per the Contract.

4.30 CLEARANCE OF SITE ON COMPLETION

On completion of works, contractor shall clear away and remove from the site all the remaining construction equipment, surplus materials, rubbish and temporary works of every kind, and leave the whole of the site and works of every kind clean and in a workmanlike condition to the satisfaction of the Engineer.

4.31 TRAINING OF PURCHASER'S PERSONNEL

The Contractor shall train Purchaser's Representatives at the latter's expense for a period of training shall be approximately 4 (four) man-months period. These Representatives shall be given special training in the shops where the equipment will be manufactured and where possible in any other power plant where similar manufactured equipment is under installation or test to enable them to become familiar with the equipment being supplied by the contractor. In the event of the Purchaser, for any reasons, failing to avail of the training facilities, he shall not be entitled for any rebate whatsoever on this account. The Contractor will arrange necessary accommodation and other facilities such as conveyance etc. at the site of training for trainees or representative of the Purchaser free of cost. The operating staff may also be imparted training for approximately 2 (two) man-months.

4.32 MISCELLANEOUS

Stores required at site by contractor shall be constructed by him at his own cost.

4.33 JUDICIAL JURISDICTION

All disputes arising out of and touching or relating to subject matter of the Agreement / Contract shall be subject to jurisdiction of local courts of.....(insert the name) and the High Court of judicature(insert the name).

4.34 APPLICATION

These Special Contract Conditions shall prevail over the General Conditions Of Contract, in case of contradiction, if any.

SECTION – V

GENERAL TECHNICAL SPECIFICATIONS

5.1 STANDARDS

Standard(s) referred to shall mean the current Edition / Revision together with Amendments issued. A list of some of the Standards is given in the Appendix.

5.2 DRAWINGS / DOCUMENTS / MANUALS

5.2.1 Drawings to be submitted

i. General Arrangement (GA) and Layout Drawings

ii. Assembly and Sub-Assembly Drawings

These shall show: a. All elements, dimensions of components, embedments in plan, cross-section, side and top views and include erection drawings, piping diagrams piping arrangement etc. b. Sub-assembly of principal components of Works requiring dismantling, assembly and adjustments at site for maintenance, giving overall dimensions, adjustment, clearances, fitting tolerances etc. c. Instructions for heat treatment, pressure tests, surface preparation, anti-corrosive protection etc. d. Details of parts subject to wear and also for which adjustment is provided, e. Methods. and sequencing of installation, field joints, erection and lifting devices, jacks, grout plugs, anchoring details, etc.

iii. Foundation Drawings

The Contractor shall submit drawings indicating all pertinent dimensions, static and dynamic loads, etc. The drawings shall clearly indicate the embedments and 1st, 2nd, 3rd stage C.C. lines. These shall include openings, sleeves, details of conduits, drainage and dewatering system slopes, arrangement of supporting structure.

iv. Schematic Diagrams

Schematic diagrams of turbine control and auxiliary systems.

v. Single-Line Diagrams

A single line diagram, containing all required technical information of electrical works and those of individual main components and switchboards showing control, metering, protection devices etc. shall be supplied.

vi. Circuit Diagrams

Power circuits in all phases with the main apparatus as well as pilot circuits shall be shown. The control part shall be subdivided into separately drawn "current paths", each showing all its components regardless of their actual physical location. Individual circuits shall be drawn in a straight-line sequence, avoiding line crossings. The current paths, designated by numbers, shall be drawn starting from two horizontal lines, which represent the control voltage source. All devices shall appear between these two lines.

vii. Block Diagrams

Block Diagrams shall be used to show, in a simplified manner, the main inter-relationships between the elements of a system' by means of symbols, block symbols and pictures without necessarily showing all the connections.

viii. Terminal Diagrams

These shall be prepared for terminal box / kiosk, marshalling rack, control cubicle, switchboard, etc. and contain: a. Terminal No. of terminal board with targets (terminal no. and current path) of incoming and outgoing cables and wires b. Cable type, designation, No. and Cross-section of conductors.

5.2.3 Lists and Schedules

i. Cable Lists / Interconnection Lists

Cable Lists shall include for each individual cable : a. Cable number as per Identification System. b. Cable type, voltage, Overall dia. c. Connection point at each end with Cubicle / Works identification and terminal numbers. d. Cable routing, Termination, Number, material and size of conductors.

ii. Alarm Lists

List shall indicate all alarms and contain: a. Description and denomination of alarm b. Data of alarm detector (contact) referring to applicable circuit diagram and c. Data of alarm enunciator (location and clear text labelling).

iii. List of Final Control Elements

List shall indicate control actuators, control valves and contain : a.Data of pipe, valve connections and layout b. Maximal required and rated power.

5.2.4 Calculations

- i. The Contractor shall submit for checking, the calculations for determining the main sizes, stress levels, dimensions and operational characteristics, safety factors, clearly indicating the principles on which the calculations were based.
- ii. The calculations shall include formulae, standards, test results, basic assumptions, etc.

5.2.5 Operation and Maintenance Manuals

O&M Manuals shall be prepared in MS Word with enclosures (computerised drawings and scanned figures and supplied on CD along with 3 (Three) hard copies These shall contain following information in sufficient details to enable maintain, dismantle, re-assemble, adjust and operate the Works with all its items installations:

- i. Table of Contents, List of Illustrations, Introduction.
- ii. Detailed description of Works, components and ancillaries, their assembling and dismantling, list stating clearances, tolerances, temperatures, fits, etc.
- iii. Operating Instructions containing sequences of individual manipulations required for operation making use of tables, lists and graphic presentations, wherever possible, for making the description readily understandable and an appropriate trouble-shooting list.
- iv. Entire testing and adjustment procedure required for the Works after overhauls and during operation.
- v. Preventive maintenance instructions indicating periodical inspections, a tabular summary of required Daily, Weekly, Monthly, Quarterly and Yearly activities containing: a. Repair and adjustment procedures including fault tracing b. List of spare parts, containing all necessary data for ordering. The list shall include all spare parts (to be supplied and those not to be supplied under the present Contract). ***Detailed drawing for each item of spare parts shall be supplied.*** c. Tool lists, containing all necessary data for identification of tools to be delivered under the present Contract. d. As-built drawings

5.2.6 Installation and Commissioning Manuals

These shall be prepared in MS Word with enclosures (computerised drawings and

scanned figures) and supplied on CD along with 3 (Three) hard copies in properly bound form. The manuals shall contain i. Installation Procedures, ii. Pre-Commissioning Tests and Procedures, iii. Commissioning Procedures

5.2.7 Progress Reports During Design and Manufacturing

Contractor shall submit 3 (Three) copies of progress reports in an Approved format. The report shall contain (but not be limited to) the following information:

- i. General description of Works performed during the reporting period on each main activity, including any notable problems encountered.
- ii. Total overall % of design and manufacturing works completed, w. r. t. the CPM programme with appropriate comments explaining differences, if any.
- iii. % of each main work activity completed during the reported quarter w. r. t. the scheduled programme with comments explaining difference(s), if any.
- iv. A list of activities to be started within the next 2 (Two) months, with expected starting and completion date(s), with explanation if dates differ from the CPM network.

5.2.8 Progress Reports during Installation at Site

The Contractor shall submit during erection 3 (Three) copies of the fortnightly progress reports in Approved format detailing the progress of the work during the preceding month. The report shall contain the following information with appropriate comments explaining problems and differences, if any:

- i. Works performed during the reporting period on each main activity.
- ii. Total overall % of erection work completed, w. r. t. the CPM programme.
- iii. % of each main activity completed during the reported fortnight w. r. t. scheduled programme.
- iv. A list of activities scheduled to be started within the next period of 2 (two) months, with expected starting and completion date(s).
- v. Progress photographs of significant events.
- vi. A statement detailing the status of progress on the overall programme and how to regain any lost time or setbacks which may have occurred.

5.3 SPARE PARTS, TOOLS AND SITE CONSUMABLES

5.3.1 Spare Parts

- i. All the spare parts supplied shall be of same material / workmanship and interchangeable with the corresponding parts of the executed work, protected against corrosion and marked **Approved** with identification labels. Spare parts supplied shall not be given to the Contractor for use during erection and commissioning for replacing the defective or damaged original components of his supplies of works.
- ii. The Contractor shall provide 5 (Five) %, but at least two pieces of all types of bolts, screws, nuts, washers, spanner rings and coffer.

5.3.2 Tools and Appliances

- i.. The scope of works include:
 - a. All customary and special tools, as well as auxiliary devices i.e. lifting devices, ropes, etc. necessary for assembly and disassembly of all parts.
 - b. All accessories for maintenance.
 - c. Special lifting devices and tools designed and supplied for the project, can be used by the Contractor during erection and handed over to Purchaser in good working condition without any wear and tear. However, ropes, slings, small hoists and winches etc. shall be handed over in new condition.

- ii. All lifting devices and wire ropes slings to be used at site shall be tested at works and test certificate supplied.

5.3.3 Site Consumables, Lubricating Oil and Grease for First Filling

The Scope of work shall include:

- i. All site consumables in fairly sufficient quantity so that erection and commissioning activity is not held up for want of these items.
- ii. Lubricating oils, insulating oils and greases etc. required for first filling in the plant and equipment plus 20 (Twenty) %.

5.4 DESIGN REQUIREMENTS

5.4.1 Working Stress

Conservative factors of safety shall be used throughout the design. For rotating parts of the generator and exciters due to runaway speed of turbine shall not exceed two – thirds of the yield point. For other materials used in the manufacture of the generator and exciter etc. the maximum stresses due to the most severe operating conditions shall not exceed one-third of the yield point nor one-fifth of the ultimate strength of the material. For temporary overloads, unit stresses not exceeding one-half the yield point stress will be permitted.

5.4.1.1 Steel Casting

- i. All steel castings shall conform to 'Standard Specification for Mild to Medium strength carbon steel casting' (A.S.T.M. Designation A27-46-T, grade 63-35, of the American Society for Testing Materials).
- ii. Casting shall not be warped or otherwise distorted, nor shall their dimensions be oversized to such an extent as to interfere with the proper fit with other parts of the apparatus. The structure of the casting shall be homogeneous. An excessive segregation of impurities or alloys at critical points in a casting will be cause for its rejection.

5.4.1.2 Steel Plates

- i. Steel plates for all the principal stress-carrying parts shall be fire-box quality grade B and for generating housing cover plates and other moderately stressed parts shall be fire box quality grade A or B, conforming to the 'Standard specifications for Low Tensile Strength Carbon-Steel plates of Flange and Fire box Qualities' (ASTM Designation: 185-49 T) or other relevant Standards.
- ii. The dimensions of the parts, which are exposed to repetitive and alternating stresses as well as to impacts and vibrations, shall take into account the safety measures and appropriate allowable stresses.

5.4.2 Seismic Loads

The forces being caused by earthquake including hydraulic loads, which may occur additionally, shall be taken into account for the computations. Stresses resulting after including these loads shall not exceed permissible stresses.

5.4.3 Mechanical Strength

Generator, turbine, switchyard equipment and structure be designed to safely withstand earthquake acceleration force (insert value as per site requirement) of both in the vertical and horizontal direction.

5.4.4 Natural Frequency

Natural frequency of the machine be kept well away (higher) from the magnetic frequency of 100 Hz (twice the generator frequency). The natural frequency must be much away from multiple of runner blades passing frequency.

5.4.5 Generator Stator Support and Bearing Brackets

Generator stator and bearing brackets of turbine and generator shall be designed to safely withstand horizontal and vertical forces due to earthquake.

5.4.6 Vibration Detector

Vibration detectors or eccentricity meters on turbines and generators should be provided for alarm and shut down.

5.4.7 Mercury Contacts

Anti-vibration type mercury switch shall be used.

5.4.8 Fits and Tolerances

Fits and tolerances shall be given in accordance with ISO Standard. Fits shall be selected for the smooth functioning of the components for fairly long life.

5.4.9 Materials

Due regard shall be given to the humid tropical conditions under which equipment is to work while choosing materials and their finishes. Material specifications, including grade or class shall be shown on drawings submitted to the Purchaser.

5.5 MANUFACTURING REQUIREMENTS

5.5.1 Materials

Materials used, shall be new and of first class quality free from rust, defects and imperfections. Inspection records of all materials shall be compiled before actual use. The Engineer shall review the inspection records of materials of major components. Materials of limited shelf life shall not be used after their expiry date.

5.5.2 Welding and Heat Treatment

5.5.2.1 Welding

- i. All welding (except welding of thin plates or piping of small sizes) shall be performed by the electric-arc method.
- ii. Butt welds, which can be welded from one side only, shall be provided with back strips on the whole length of the seam to be welded.
- iii. Welds shall be cleaned of slag and show uniform sections, smoothness of weld metal, feathered edges without overlap, and no porosity and clinker. Each layer shall be thoroughly preened before the next layer is applied.
- iv. All welds transverse to the direction of flow shall be ground flush with the plates on the inside and on the outside, wherever dynamic stress occurs.
- v. Due care shall be taken in aligning and separating the edges of the members to be joined by butt-welding so that complete penetration and fusion at the bottom of the joint is ensured. Where fillet welds are used, the members shall fit closely and be held together during welding.
- vi. The cut surfaces of plates requiring weld joints shall be free of all visible defects, such as laminations, surface defects caused by shearing or flame-cutting operations. The edges and surfaces to be welded shall be free of rust, mill scale, grease, oil, paint or any other foreign matter.

5.5.2.2 Welding Qualifications

- i. For welding of principal stress carrying parts, the standard of welding procedures etc., shall conform to Standards equivalent to the requirements of the ASME Boiler and Pressure Vessel Code, Sections X and XI, or DIN 8560, DIN 8563, EN 287.
- ii. For welding of less important parts, the standards and qualifications shall conform either to the AWS Standard Qualification Procedure or equivalent .

5.5.2.3 Quality and Procedure Control

- i. Quality control methods (radiography, ultrasonic crack detection, etc.), shall be used as per appropriate manufacturing code.
- iii. All welded joints, which have to be tight, shall be inspected or tested by dye-penetration tests.
- iii. All major welds carried out on parts under hydraulic pressure shall be at least 10 % radio-graphically and 100% ultrasonic examined. All welds on the skin-plates shall be additional dye penetration tested as Directed.
- iv. The Contractor shall indicate in the corresponding drawings the type of non-destructive testing to be carried out during manufacture and at Site.

5.5.2.4 Defects and Repairs

- i. Plates with laminations discovered after cutting shall be rejected unless the laminated portion is only local, easily repairable but only if Approved.
- ii. Defects in welds to be repaired shall be chipped out to sound metal and the areas tested by DP (Dye-penetration) or ultrasonically to ensure that the defective material has been completely removed before repair of welding is carried out. Repairs shall be carried out in accordance with the relevant Standards and to the approval of the Engineer.
- iii. The Work shall be 100% inspected again by the method used first to ensure to determine that there is no faulty work.

5.5.2.5 Heat Treatment

Heat treatment shall be performed:

- i. On all fabricated parts which are stressed during fabrication as per the approved heat treatment/weld procedure and are to be finish machined.
- ii. On field erection welding seams, performed according to the approved specifications for the welding procedure for the corresponding parts.

5.6 TECHNICAL WORKS AND STEEL STRUCTURE

5.6.1 Bolts, Screws, Nuts, etc.

- i. All bolts, studs, screws, nuts, and washers shall be to the ISO metric system Mild steel bolts and nuts shall be of the precision cold forged or hot forged type with machined faces parallel to one another.
- ii. The Contractor shall supply net quantities plus 5 % of all permanent bolts, screws and similar items / materials required for installation at the Site.

5.6.2 Seals

- i. Rubber Seals shall be mounted type and extruded ones, designed and mounted in a manner that these are adjustable, water tight and readily removable and replaceable.
- ii. All adjusting screws and bolts for securing the seals and seal assembly in place shall be of stainless steel.
- iii. Seals shall be made of synthetic rubber suitable for site conditions and of proven quality material. Joints shall be water/oil tight.

5.6.3 Drives

- i. Moving parts of machinery including shafts, couplings, collars, projecting key heads, rope/belt-drives shall be completely guarded for full protection.
- ii. All setscrews on revolving shafts shall be countersunk or suitably protected.
- iii. All guards shall be arranged for removal without disturbing the main parts. All bearings shall be mounted in dust-proof housings. Base of bearing supports shall be machined, and rest on machined-surfaces.

5.6.4 Oils and Lubricants

Efficient means of lubrication, suitable for use under Site conditions, shall be provided for all moving parts. Approved quality lubricates shall be used.

5.6.5 Piping, Fittings, Valves and Gates

i. Materials of Pipes & Fittings

- a. Water, air admission and drain piping less than 25mm nominal bore shall be of galvanized heavy grade as per IS-1239, Part-I or to schedule 'STD' conforming to ANSI B36.10 or equivalent Standards for steel pipe or copper.
- b. Water, air admission and drain piping equal to or greater than 25 mm nominal bore shall be galvanized heavy grade as per IS-1239, Part I/IS-3589 or to schedule 'STD' conforming to ANSI B36.10 or equivalent Standards.
- c. Oil piping of greater than 25 mm nominal bore shall be of seamless high quality steel pipe conforming to minimum API-5L GR.B or equivalent grade as per process requirement and the pipes of less than 25 mm bore of stainless steel.
- d. Steel pipes of diameter 100 mm and above for a pressure of not more than PN 10 may be used in Welded type.
- e. The minimum steel pipe wall thickness shall be the "normal" or "standard" wall thickness as per the applicable Standards.

ii. Fabrication of Pipe Work

- a. Steel pipe work for water, air admission and drains smaller than 65 NB shall be galvanized and joined by screwed fittings. After fitting, unprotected steel be wire brushed and painted with two coats of zinc-rich paint. Leak-free joint shall be ensured by the contractor.
- b. Steel pipe work for water, air admission and drains 65 NB and over shall be welded ends black pipe hot-dip galvanized after fabrication.

iii. Painting

Un-galvanized steel piping shall be painted on the exterior. The paint treatment shall be of the same system as used for the turbine exterior.

iv. Pressure Testing

- a. Hydraulic piping shall be pressure tested after erection at site. The pressure shall be maintained without loss for one hour.
- b. The lubricating oil piping shall be pressure tested, without loss for one hour, after erection at a pressure 50% greater than maximum pump pressure.

v. Valves & Gates

- a. Valves shall be leak-proof in either flow direction (except for non-return valves) when the nominal pressure is applied.
- b. Valves with design pressures higher than PN 10 and diameters larger than DN 100 shall be workshop-tested for tightness and soundness of materials.

vi. Pipe Supports and Hangers

All pipe work and accessories shall be mounted and supported in a safe and neat manner. All brackets, stays, frames, hangers and supports for carrying and staying the pipes, including their fasteners shall be included in the supply and completed by the Contractor at the Site. Pipes and fittings shall be supported at or near flanges wherever possible.

5.6.6 Mechanical Instruments

- i. Mechanical parts of instruments shall be suitably protected against shocks, vibrations, heat, humidity splash water, etc.
- ii. Pressures gauges shall be provided with a damping liquid, e.g., glycerine, to compensate vibrations, unless approved otherwise.

5.7 ELECTRICAL WORKS

5.7.1 General

- i. All components shall be of Approved design.
- ii. Works shall be pre-assembled to the extent possible in the Contractor's workshop complete with all devices and wired up to common terminal blocks.
- iii. Short-circuit calculations shall be evaluated giving full evidence that every electrical component can withstand the maximum stresses under fault conditions, for fault levels and durations under the worst conditions.
- iv. All Works shall be suitable for the prevailing climatic conditions.

5.7.2 Clearances

Clearances shall be provided as per the Indian Electricity Rules and Standards for ready access for O & M whilst the remaining sections of Equipment are alive.

5.7.3 Electrical Supplies for Auxiliary Equipment

The electricity supply for Auxiliary Equipment shall be:

- i. For power: 415 V, 3-phase, 50Hz, 4-wire or 230 V, 1-phase, 50 Hz, 2-wire.
- ii. For lighting, indication, and anti-condensation heaters: 220 V, 1- phase, 50 Hz
- iii. For essential indication, controls, protection, alarms and circuit breaker closing and tripping supplies: 24 V D.C

5.7.4 Alternating Current Supply Practice

- i. Switch -Fuse system shall be provided for all mains supplies.
- ii. Double-pole switches shall be used to break single-phase A.C. mains supplies.

5.7.5 Direct Current Supply

- i. It shall be possible to remove/replace cards from / to electronic equipment without damage and without interfering with the operation of the rest of the equipment or system; if necessary, otherwise, switching-off the supplies locally to a card to prevent inadvertent interference to the equipment or system during removing/replacing a card may be considered.
- ii. Power supply bus bars in cubicles shall be carefully routed and each bus bar shall be shrouded. Inadvertent short circuiting of bus bars either between themselves or to the earth, should not be possible.

5.7.6 Electric Motors

i. General

- a. All motors shall be of approved manufacture, high starting torque and comply with motor dimensions as per relevant IS.
- b. The general construction shall be stiff, rigid and corrosion proof. Light metal alloy casings shall not be accepted.
- c. AC motors shall have squirrel cage type rotors.

ii. Motor Ratings

The voltage and power rating of electric motors shall be as follows:

- a. A. C. Motors up to 0.75 kW :
 - Service voltage : Single-Phase 230 V A. C., 50 Hz
 - Mode of starting : Condenser
- b. D. C. Motors :
 - Service voltage : 24 V D.C.
 - Mode of starting : Resistor

- c. Motors of Higher Ratings : As approved
- d. A. C. motors shall be capable of operating continuously under rated output, 50 Hz \pm 3% frequency, \pm 10% voltage variation and transient over voltage of 130% of the nominal voltage.
- e. Motors shall be capable of maintaining stable operation when running at 70% nominal voltage for 10 seconds. The pullout torque for continuously loaded motors shall be at least 160% of the rated torque and for intermittently loaded motors 200% of the rated torque.
- f. D.C. motors shall be capable of operating continuously under rated output and \pm 10% voltage variation with a fixed brush setting for all loads. Unless otherwise approved, the speed drop between no-load and full-load shall not exceed 10% of no-load speed.

5.7.7 Starting

- i. A.C. motors shall be designed for direct on-line starting and capable of being switched on to an infinite bus-bar at 110% of the nominal voltage with an inherent residual voltage of 100% even in phase opposition. For starting the motors from the individual main and auxiliary bus-bars, a momentary voltage drop of 20% referred to nominal voltage should be taken into consideration. With 85% of the nominal voltage applied to the motor terminals, each motor shall be capable of accelerating its associated load to full speed with a minimum accelerating torque of 5% of full load torque.
- ii. Maximum starting current (without tolerance) in both the cases of A. C. and D.C. shall not exceed the values recommended in the Standards followed.
- ii. The motors shall be able to withstand number of cold starts per hour as per Standards followed.

5.7.8 Insulation Class

The insulation of all motors shall be of class 'F' but maintain in operation the temperature limits of class 'B' materials.

5.7.9 Ventilation and Type of Enclosure

Motors shall be totally enclosed fan-cooled type, protection class IP 54 as per IEC Recommendation 144. Cable termination points shall be of class IP 55 or as per Standards followed.

5.7.10 Bearings

As far as possible, the motors shall have sealed ball or roller bearings lubricated for life. All other motors with ratings of about 1 kW and above shall be equipped with lubricators permitting greasing while the motor is running and preventing over-lubrication. Additionally, the bearings shall be fitted with grease nipples permitting the use of a universal grease gun.

5.7.11 Terminal Boxes and Earthing

The terminal leads, terminals, terminal boxes and associated equipment shall be suitable for terminating the respective type of cables as specified in this Document and in the section of Technical Specifications. A permanently attached connection diagram shall be mounted inside the terminal box cover.

5.7.12 Noise-Level and Vibrations

- i. The noise level of motors shall not exceed 85 dB (A).
- ii. All motors shall be statically and dynamically balanced.

5.7.13 Tests

Each motor shall be factory tested for i. Measurement of winding resistances,

- ii. No-load and short-circuit measurements, iii. Measurement of starting current and torque, iv. Efficiency measurement (type test), v. Heat test run, vi. Dielectric test, vii. Measurement of insulating resistance

5.7.14 Starters And Contactors

- i. Motor starters and contactors shall have short circuit protection and local disconnecting devices.
- ii. Starters and contactors shall comply with relevant Standards. These shall be installed in ventilated enclosures for indoor installation and weatherproof enclosures for outdoor installation. The enclosures shall be complete with locks, cable sealing boxes, conduit entries, cable gland plates, bus bars, internal wiring, terminal boards, etc. as required by the duty of the starter or contactor.
- iii. Starters and contactors shall be capable of satisfactory operation for 5 minutes at a voltage 25 percent below nominal, at nominal frequency.

5.7.15 Moulded Case Circuit Breakers (MCCB)

MCCBs shall be of 2 or 3-pole type as required, having thermal time delay and instantaneous trips with "On-Trip-Off", indicating/operating mechanism. Circuit breakers used in combination type motor starters or contactors shall have the operating mechanisms interlocked with the starter or contactor cover so that the cover cannot be opened unless the circuit breaker is open. The breakers shall comply with applicable section of IEC 157/1 or equivalent Standards.

5.7.16 Control Relays

Relays used as auxiliary control devices in conjunction with motor starters and magnetic contactors shall be of the type designed for machine tool application featuring contact convertibility. All contacts shall have a minimum thermal current rating of 10A over a range of 6 to 600 V AC.

5.7.17 Terminal Blocks

- i. All terminal blocks shall be mounted in accessible position with the spacing between adjacent blocks not less than 100 mm and space between the bottom blocks and the cable gland plate being a minimum of 200 mm. Sufficient terminals shall be provided to allow for the connection of all incoming and outgoing cables, including spare conductors and drain wires. 20 (Twenty) % spare terminals shall be provided. In enclosed cubicles, the terminal blocks shall be inclined toward the door for facilitating terminations.
- ii. Terminal blocks shall be provided with shorting links and paralleling links where applicable and mounting identification numbers and/or letters. Terminal blocks shall conform to the applicable Standards. Terminal identification shall be provided as per wire number of connected leads.

Circuit terminals for 415 V AC shall be segregated from other terminals and equipped with non-flammable, transparent covers to prevent contact with live parts. Warning labels with red lettering shall be mounted thereon in a conspicuous position.

5.7.18 Equipment Wiring

- i. All wiring connections shall be readily accessible and removable for test etc. Wiring between terminals of the various devices shall be point to point.
- ii. Multi-conductor cables shall be connected to the terminal blocks in such a manner as to minimise crossovers. Approved claw washers of crimp type connector shall be used to terminate all small wiring. Each conductor shall be individually identified at both ends through a system providing ready and permanent identification, utilising approved slip-on ferrules.

- iii. Markers may be typed individually or made up from sets of numbers and letters firmly held in place. Open markers will not be accepted. These must withstand a tropical environment and high humidity and only fungus proof materials will be accepted. **Ferrules of adhesive type are not acceptable.**

5.7.19 Cubicles and Control Panels

- i. Cubicles / control panel enclosures shall be of sheet steel (minimum thickness: 2.5 mm), rigid, self-supporting construction and supplied with channel bases.
- ii. Fitted with close fitting, gasketed, hinged, lift-off doors capable of being opened through 180 deg. The doors shall have integral lock and master key.
- iii. Cubicles /panels shall be vermin proof. Removable gland plates shall be supplied and located to provide adequate working clearance for cable terminations. Cables and wiring shall enter from bottom or top as Approved.
- iv. Instruments, control knobs and indicating lamps shall be flush mounted. Relays and other devices sensitive to vibration shall not be installed on doors or hinged panels, and no equipment shall be installed on rear access doors.

5.7.20 Earthing

- i. Provision shall be made for earthing all equipment. All structural metal work and metal chassis shall be connected to earth..
- ii. Earthing conductors shall be at least equal in cross-sectional area to the supply conductors and capable of carrying the fault current.

5.7.21 Labels and Plates

- i. Labels of approved material, size, lettering and arrangements shall be provided for all instruments, relays, control switches, push buttons, indication lights, breakers, etc. No levels are required if function is indicated on the device.
- ii. Instruction plates in the Contract and selected local language, the sequence diagrams or instructions for maintenance shall be fitted on the inside of the front door of the electrical switchboards.

5.7.22 Warning Labels

- i. Warning labels shall be made of synthetic resin with letters engraved in the Contract and selected local language as Approved.
- ii. For indoor circuit breakers, starters, etc., transparent plastic material with suitably contrasting colours and engraved lettering would be acceptable.

5.7.23 Labels For Cables

Each cable shall have Approved non-corrosive labels detailing identification number of the cable, voltage, and conductor size permanently attached to each end.

5.7.24 Single-Line Diagrams

Switchgear room and the control room shall be furnished with a copy of the final as-built single-line diagram detailing all electrical data and denominations, separate for each individual switchgear / distribution board / MCC, placed under glass and frame/wall mounted at an Approved location.

5.7.25 Key System for Electric Boards

Key interlocked switches shall be provided with Approved locks for locking in the neutral position. Similar locks shall be provided for selector switches for locking the switches in any of the positions. The locks or padlocks shall be co-ordinated for different applications and supplied with three keys.

5.8 INSTRUMENTATION AND CONTROL EQUIPMENT

5.8.1 Design Criteria

i. General

- a. The Works shall be pre-assembled to the extent possible in the Contractor's workshop.
- b. All instrumentation and control functions shall be shown on the piping and instrumentation diagrams. Symbols to be used shall be as per ISO Standards and Identification system (tag numbers) as per the Approved Works identification system.
- c. Shielded cables shall be used for the control and supervisory equipment.

ii. Sizes of Indicators, Recorders, Etc.

Meters, instruments and recorders shall be of standard size. The front glasses shall be anti-glare type. The scales shall be 90 degrees type for local control panels but must be 240 degrees type for control room instrumentation.

iii. Tests

Single components and pre-erected assemblies shall undergo functional and routine tests in the Contractor's workshop. Ready mounted control and supervisory system shall undergo functional tests on Site. Calibration tests shall be made on all-important pressure gauges and other instruments.

iv. Measuring Systems

Measuring ranges of indicators, transducers, etc. shall be selected in such a way that the rated value of the measured magnitude covers approx. 75% of the range. All local instruments shall, as far as practicable, be mounted vibration free. Wherever required, damping elements shall be used.

5.8.2 Temperature Measurement

- i. Resistance thermometers and thermocouples shall be equipped with waterproof connection heads.
- ii. Use of dial-type contact thermometers shall be restricted to bearing metal and oil temperature measuring.

5.8.3 Pressure Measurements

- i. Pressure gauges shall be made of stainless steel, shock/ vibration-proof, and equipped with toothed wheels and toothed segments of the machined type.
- ii. If the pressure is pulsating, the devices concerned shall be connected via flexible tubes or other pulse-absorbing means.

5.8.4 Level Measurements

The liquid level measurements in reservoirs and tanks with atmospheric pressure shall be made by means of displacement-type transmitters, float-disc-transmitters or capacitance measurement type. The errors shall not exceed $\pm 1.0\%$ of the total measuring range.

5.8.5 Electrical Measurements

Electrical instruments shall be of flush mounted type, dust and moisture proof, have digital system and accuracy class not less than 1.5. D.C. measuring instruments shall have digital type systems of the same accuracy. Wattmeters shall be suitable for unbalanced systems and accuracy of energy meters should be of 0.2 % accuracy class.

5.8.6 Checking of Dimensions

Dimensions, especially clearances and fits (ISO 286) shall be carefully checked.

5.8.7 Workshop Assembly

- i. Works to be furnished shall be shop assembled to a status sufficient to prove that the design and workmanship have been executed in accordance with the Specifications, that the delivery is complete, and that no work remains to be done at Site, which reasonably can or should be done in the shop. .

- ii. During workshop assembly, all instruments, control devices and piping shall be fitted. If assembly shows defects in design or manufacture or difficulties in assembling and dismantling, these shall be eliminated.
- iii. If corrections cannot be carried out as per the above terms, the components concerned will be rejected. The assembled parts shall subsequently be subject to tests as per applicable Standards.

5.8.8 Pressure and Leakage Tests

- i. Parts subject to internal or external pressure or containing liquids or gases temporarily or permanently during operation shall be tested prior to painting.
- ii. Official regulations shall be observed. If any liquid is used for the test that may cause corrosion, all Works and piping shall be thoroughly cleaned immediately after the test.
- iii. Leaks and defects can be repaired if permitted by the applicable Standards or as Approved. If defects are found, the Engineer may reject the defective parts, or permit welding repairs with stress relieving, radiographic examination and additional pressure tests.

5.8.9 Parts Exposed to Hydraulic Pressure

Hydraulic pressure tests shall be carried out using the liquid to be used during operation or a liquid with less viscosity. The hydraulic test pressure shall be 1.5 times the maximum operating pressure maintained for 30 minutes and afterwards the test pressure shall be reduced to the operating pressure.

5.8.10 Functional Tests

Functional tests shall be defined as tests of the function of assemblies, sub-assemblies or parts of the Works under no load conditions. Functional tests shall be performed on all Works prior to the execution of operational tests.

5.8.11 Operational Tests

- i. As far as practicable, operational test shall be carried out on all Works, simulating operating conditions.
- ii. Parts to be delivered by sub-Contractors shall be tested either at the premises of the sub-Contractor or of the Contractor, as Approved.
- iii. Testing of electrical works shall be performed as per relevant Standards and include but not be limited to tests of heating, loading, overloading, and losses.
- iv. Operational tests of lifting equipment and other machinery shall include tests under nominal load and 125 % of nominal load unless otherwise specified.

5.9 ERECTION AND COMMISSIONING

5.9.1 Reference Points

The Contractor shall be responsible for true and proper staking-out of the works and levels of reference given by the Engineer in writing, for correctness of the positions, levels, dimensions and alignment of all parts of the works and for the provision of all necessary instruments, appliances and labour in connection with this.

5.9.2 General Notes on Installation Work

- i. All power tools are to be handed over, on completion, in good condition.
- ii. After erection, the works shall be finally painted, as per relevant I.S.

5.10 SITE INSPECTION AND TESTS

- i. During erection, commissioning and trial run, the Contractor shall perform, all inspections and tests in the presence of the Engineer.

- ii. Unless otherwise specified, all costs for testing at site and of the works and charges associated with it shall be borne by the Contractor. The Contractor shall delegate his experts to perform the tests at site.
- iii. The Engineer reserves the right to have checked at his own expenses the Contractor's instruments to be used or having been used for any tests by an independent, officially acknowledged institution.

5.11 COMMISSIONING TEST

Commissioning tests shall be carried out as per relevant Standards on all generating units and other equipment to verify their rating characteristics. Field acceptance test reports shall be prepared by the Contractor and submitted to Purchaser for approval.

5.12 TRIAL RUN

- i. The plant shall be kept on trial run for 72 (Seventy Two) hours continuous run during which period all necessary adjustments shall be made while operating over the full load-range enabling the plant to be made ready for performance and guarantee tests.
- ii. The trial run shall be considered successful, provided that each item of the equipment can operate continuously at the specified operating characteristics, for the period of trial run.
- iii. For the period of trial operation, the time of operation with any load shall be counted. Minor interruptions not exceeding 4 (Four) hours, at a time, caused during the continuous operation shall not affect the total duration of trial operation.
- iv. A report comprising observations and recordings of various parameters measured during the above trial run shall be prepared by the Contractor. This report shall be signed by both the parties. Based on the observations, necessary modifications, repairs to the plant shall be carried out by the Contractor to the full satisfaction of the purchaser.
- v. During the trial run the Contractor shall make familiar the Purchaser's personnel with the equipment, the O&M of the Works and its auxiliaries.
- vi. If any defects or irregularities affecting the safety or reliability of the Works should arise during the trial run, the trial run shall be interrupted and started again after such defects or irregularities have been corrected by the Contractor.

5.13 ACCEPTANCE

- i. The taking-over testing shall be performed as per the test procedure agreed upon between the Engineer and the Contractor.
- ii. Immediately upon termination of any such testing, a "Protocol of Acceptance", which shall be deemed to be the Test Certificate, shall be issued by the Engineer.
- iii. This document shall be signed by both the Parties and form an integral part of the subsequent "Taking-Over Certificate".
This "Protocol of Acceptance" shall state:
 - a. The date of testing.
 - b. The quantity and type of Works concerned.
 - c. Statement of all minor defects which have to be corrected by the Contractor.
 - d. Confirmation that the guaranteed data have been proven.
- iii. The plant shall continue to be operated till both the generating units have been tested and commissioned and trial run for a period of 15 days.

LIST OF APPLICABLE STANDARDS

A. ELECTRICAL AND INSTRUMENTATION

S. No.	Description	IEC	IS
1	2	3	4
1.	Rotating Electrical Machines	IEC 34	IS:4722-1968
2.	Direct Action Indicating Electrical Measuring Instruments	IEC 51	
3.	Paper-Insulated Metal-Sheathed Cables for Rated Voltages Up To 18/30 kV	IEC 55	
4.	Insulation Co-Ordination	IEC 71	
5.	Dimensions and Output Ratings for Rotating Electrical Machines	IEC 72	
6.	Colours for Indicator Lights and Push Buttons	IEC 73	
7.	Power Transformers	IEC 76	IS:2026-1977
8.	Classification of Materials for The Insulation of Electrical Machinery	IEC 85	
9.	Primary Batteries	IEC 86	
10.	Lead Acid Starter Batteries	IEC 95	
11.	Lightning Arrestors Recommended Graphic Symbols	IEC 99	
12.	Alternating Current Disconnectors (Isolator) and Earthing Switches	IEC 129	
13.	Bushings for Alternating Voltages Above 1000 V.	IEC 137	
14.	Degrees of Protection for Low Voltage Switch Gear and Control Gear	IEC 144	
15.	Low Voltage Switchgear and Control Gear	IEC 157	
16.	Low Voltage Control Gear Tests on Indoor and Outdoor Post Insulators for Voltages Greater Than 1000 V.	IEC 168	
17.	Current Transformers	IEC 185	IS:2705-1977
18.	Voltage Transformers	IEC 186	IS:3156-1978
19.	Low Frequency Cables and Wires with P.V.C. Insulation and PVC Sheath	IEC 189	
20.	Polyvinyl Chloride Insulated Cables of Rated Voltages Up To And Including 450/750 V.	IEC 227	
21.	Conductors for Insulated Cables	IEC 228	

S. No.	Description	IEC	IS
1	2	3	4
22.	Impulse Tests on Cables and Their Accessories	IEC 230	
23.	Electrical Relays	IEC 255	IS:3231-1965
24.	Low Voltage Fuses Calculation of The Continuous Current Rating of Cables (100% Load Factor)	IEC 287	
25.	Low Voltage Motor Starter	IEC 292	
26.	Specification for New Insulating Oil for Transformers and Switchgear	IEC 296	
27.	AC Metal-Enclosed Switchgear and Control Gear For Rated Voltages above 1 kV Up To and Including 72.5 kV	IEC 298	
28.	Standard Colours for Insulation for Low Frequency Cables and Wires	IEC 304	
29.	Guide to the Calculation of Resistance of Plain and Coated Copper Conductors of Low-Frequency Cables and Wires.	IEC 344	
30.	Loading Guide for Oil Immersed Transformers	IEC 354	
31.	Marking of Insulated Conductors	IEC 391	
32.	Report on Synthetic Testing of High Voltage Alternating Current Breakers.	IEC 427	
33.	Factory-Build Assemblies of Low Voltage Switchgear and Control Gear	IEC 439	
34.	Identification of Insulated and Bare Conductors by Colours	IEC 446	
35.	Standard Directions of Movement for Actuators Which Control the Operation of Electrical Apparatus	IEC 447	
36.	Extruded Solid Dielectric Insulated Power Cables for Rated Voltages from 1 kV Up to 30 kV	IEC 502	
37.	Class 0.5, 1 and 2 Alternating Current Watt-Hour Meter	IEC 521	
38.	Test Methods for Insulations and Sheaths of Electric Cables and Cords	IEC 540	
39.	Electro Mechanical Equipment for Small Hydro	IEC-61116(1992)	
40.	Guide for Commissioning, Operation and Maintenance of Hydraulic Turbines	IEC-60545(1978)	

B. TURBINES, GENERATORS AND ANCILLARY PLANT

Sl. No.	Description	Publication
1	2	3
1.	International Code for Field Acceptance Test of Hydraulic Turbines.	IEC -41-1963
2.	International Code for Testing of Speed Governing Systems for Hydraulic Turbines' shall be an Integrated Document of the Governor Specification.	IEC - 308
3.	Test Code for Hydraulic Prime Movers, ASME Power Test Codes.	ASME-New York 1949
4.	Electromechanical Equipment Guide for Sal Hydroelectric Installations	IEC-1116-1992-10
5.	International Code for Model Acceptance Tests of Hydraulic Turbines.	193-1965-193A-1972

C. MISCELLANEOUS

Sl. No.	Description	Publication
1	2	3
1.	Bolt Calculation	VSM 14 332
2.	Vibrations	VDI 2 056
3.	Shaft Coupling	ANSI B 49.1
4.	Shaft Alignments	NEMA
5.	Rotating Electrical Machines; IEEE 30.4 to 34.11	
6.	Test Procedure for Synchronous Machine; IEEE 115	

D. INDIAN STANDARDS

S. No.	Description	IS
1	2	3
1.	Three Phase Induction Motors	IS:325-1978
2.	New Insulating Oils	IS:335-1983
3.	Code of Practice for Earthing	IS:3043-1966
4.	Stationary Cells and Batteries Lead-Acid Type (With Tubular Positive Plates)	IS:1651-1979
5.	Circuit-Breakers	IS:2516-1980
6.	Degree of Protection Provided by Enclosures for Low Voltage Switchgear and Control Gear	IS:2147-1980
7.	For Working Voltages Upto and Including 1100 V	IS:L1554(Pt.II)-1976
8.	Lines Upto and Including 11 kV, Section- 1: Design.	IS:5613(Pt.I/Sec.I) 1978

E. AMENDMENTS TO REC SPECIFICATIONS AND STANDARDS

i. Specifications

Sl. No.	REC Specification No.	Title
1	2	3
1.	1/1971 (R-1993): 2004	Hard-Drawn Stranded Alluminium and Steel Cored Alluminium Conductors for Over-head Power Lines.
2.	33/1984 (R-1993): 2004	Alluminium alloy Conductors for Overhead Power Lines
3.	3/1971 (R-1993): 2004	Porcelain Insulators and Insulator Fittings for 11 kV Overhead Power Lines.
4.	2/1971 (R-1997) :2004	Out-door type three phase, 11 kV/433-250 V Distribution Transformers upto and Including 100 kVA
5.	70/1993 (R-1997) :2004	Out-door type 3-phase 11 kV/433-250 V Conventional and Sealed Distribution Transformers with Amorphous Metal Core up to and Including 100 kVA.
6.	E-28 A	Universal Distribution Connectors

ii. Construction Standards

Sl. No.	Title
1	2
1.	REC Construction Standards: 2004

iii. New Specifications

Sl. No.	Title
1	2
1.	Technical Specification for 11 kV & 33 kV MS Cross –Arms
2.	Technical Specification for LT Switch Board for Distribution Transformer
3.	Technical Specification for Lead-Acid Battery & Charger
4.	Technical Specification for Control & Relay Panel
5.	Technical Specification for 3 Phase, 4 Wire AC, Static, CT Operated Energy Meter

F. FOR CIVIL WORKS

i. Materials

Sl. No.	Parts	Material	IS
1	2	3	4
1.	Structural steel parts	Structural steel	IS 2062
2.	Rollers and pins, brackets	Forged steel	IS 2004
3.	Seal seats	Stainless steel	IS 1570 (Pt V)
4.	Bush bearings	Aluminium bronze	IS 305
5.	Rubber seals	Rubber	IS 11855
6.	Bolts and nuts	MS	IS 3177 IS 1364

ii. Design & Installation

Sl. No. 1	IS 2	Title 3
1.	IS 5620	Recommendations for design of low head gates
2.	IS 4622	Recommendation for design of fixed wheel gates
3.	IS 807 IS 800	Recommendation for design of steel structures
4.	IS 11228	Recommendation for design of screw hoists
5.	IS 816	Metal arc welding in general construction in MS
6.	IS 822	Inspection of welds
7.	IS 823	Manual metal arc welding of mild steel
8.	IS 9595	Metal arc welding of carbon and carbon manganese steel
9.	IS 8987	Practice for air carbon arc gauging and cutting
10.	IS 14177	Guidelines for planning of hydraulic gates and hoists
11.	IS 1477(Pt II)	Inspection and testing of painted surfaces

G. OTHER STANDARDS

Standard publications issued by the following organisations of standardisation are considered being approved Standards for the works:

- AISI American Iron and Steel Institute
- ANSI American National Standards Institute
- ASME American Society of Mechanical Engineers
- ASTM American Society for Testing and Materials
- AWS American Welding Society
- BS British Standards
- CMAA Crane Manufacturers Association of America
- DIN Deutsche Institute für Normung
- IEC International Electro-technical Commission
- IEEE Institute of Electrical and Electronic Engineers
- IPCEA Insulated Power Cable Engineer's Association
- IS Indian Standards
- ISO International Standards Organisation
- JEC Standards of the Japanese Electro-technical Committee
- JIS Japan Industrial Standards
- NEMA National Electrical Manufacturers Association
- VDE Verein Deutscher Elektroingenieure
- VDI Verein Deutscher Ingenieure

Notwithstanding reference made to various standards, all equipment and works as per provisions and requirements of Relevant and latest Indian Standards shall be acceptable, unless Approved otherwise.

SECTION- VI

CIVIL WORKS

6.1 INTRODUCTION

The civil structures related to the Micro-Hydro projects generally comprise:

- i. Diversion structure.
- ii. Water conductor system including: a. Feeder channel / Power channel b. gate, c. De- silting Tank, d. Trash Racks, e. Gate / Valve, f. Fore-bay g. Penstock, Expansion joints, Anchor blocks, Saddle Supports etc. h. Arrangement for Water Spilling etc.
- iii. Power house Building.
- iv. Tail Race Channel.
- v. Discharge Measuring Device.

6.2 SCOPE

- i. Planning, Design, Construction, Testing & Commissioning of the scheme (including deciding its parameters) in consultation with the Purchaser.
- ii. Finalization of location of various components of the scheme keeping in view the topography, geology, land availability, location of the village to be electrified, accessibility of the area, slips, protection against flood, ease of construction, availability of construction material, over all economy etc.
- iii. The civil works shall include approach road, fencing, provision of gate, flood protection works, site board, retaining / breast wall, landslide protection works, site development etc.
- iv. Operation & Maintenance for 5 years w.e.f. the date of Taking Over.

6.3 COMPONENTS OF CIVIL WORKS

6.3.1 Diversion Structures

The diversion structure shall be Raised Gravity Type preferably with Kachcha (to reduce cost of construction) or Semi-permanent type and should be:

- i. Strong enough to withstand frequent floods of moderate intensity.
- ii. Capable of diverting major portion of discharge of the stream into the water conductor during the lean period.
- iii. Easy for operation and maintenance.
- iv. Have provision of trash racks and intake gates.
- v. Provided with G.I. wire crated boulders (gabions) on up and down streamside.

6.3.2 Water Conductor System

- i. Feeder channel/Power channel shall be in stone /Brick work or RCC (1: 1.5: 3) or unlined by using the existing water course with suitable polyester lining.
- ii. The channel should be plastered from inside with 1:3 cement –concrete ratio.
- iii. The channel shall be covered in slip zones.
- iv. If required, adequate cross drainage shall be provided.
- v. Flood protection works near the power channel shall be provided, if required.
- vi. Breast and retaining walls shall be provided as required.

6.3.3 De-silting Tank

- i. A de-silting tank, of suitable size to reduce the velocity of water (say, 0.3 m/s) to trap the pebbles and the suspended material to settle down in the bottom of

the chamber, shall be provided in the initial reaches of the water conductor system along with gated orifice / sluice valve,

- ii. De-silting of sediment of the size as per safety requirement of the turbine shall be ensured by proper design and construction,
- iii. The channel shall be suitable for proper flow transition,
- iv. Suitable silt flushing arrangements e.g. piping, valves/gate etc. shall be provided to ensure free flow of deposited sediments,
- v. It shall be constructed of brick / stone masonry or RCC (1:1.5: 3),
- vi. Adequate breast and retaining wall shall be provided.

6.3.4 Fore-bay Tank

- i. To ensure a minimum head over the penstock intake to prevent entry of air in to the penstock, a fore bay having a 2 minutes storage capacity to a minimum depth of 2 m, shall be provided.
- ii. A flush pipe with gated orifice, similar to de-silting tank, shall be provided at the bottom of the fore bay to remove the silt,
- iii. The tank shall be made of brick, stone masonry or RCC,
- iv. In case of direct penstock from the de-silting tank, the capacity of the de-silting tank shall be increased so as to utilize it as fore bay also (in that case, fore-bay may be avoided).
- v. Trash rack is to be provided at the entry of penstock in the fore bay.

6.3.5 Spilling Arrangement

- i. Spilling arrangement shall be provided at the intake of the penstock to spill out the water in case of sudden load rejection or at partial load. An opening, with its bottom at the maximum water level, shall be provided at a suitable location on the fore-bay and connected to a natural drain,
- ii. Proper protection work shall be provided to prevent any damage to the structure by over-flowing water and energy dissipation from the spilled water.

6.3.6 Penstock Intake and Penstock

- i. Penstock entry shall be bell-mouth type.
- ii. The invert of the penstock intake shall be kept 0.3 m above the bed of the fore bay to allow suspended matter to settle and flush out occasionally through a pipe controlled by a sluice valve.
- iii. One penstock may be used generally from intake to a suitable point up stream of the P.H. where multi-fold may be provided to feed individual turbines.
- iv. The pipe may be joined by welding or flanges / dress couplings.
- v. The penstock pipe shall be of proper material (mild steel- not less than 5 mm thickness or PVC/ HDPE of specified thickness).
- vi. The pipe shall be supported on saddle blocks on straight reach and on anchor blocks at the bends.
- vii. Adequate number of expansion joints shall be provided as required.
- viii. Design of water conductor system shall take care of water hammer conditions.
- ix. Last reach of penstock shall have sluice valve to isolate turbine in case of emergency.
- ix. Proper arrangement shall be provided to drain the penstock in the tail race.
- x. Two coats of red oxide/ bituminous/epoxy paint shall be provided for penstock..

6.3.7 Power House Building

- i. It shall be constructed using stone/brick.
- ii. The roof may be of tubular truss and C.G.I. sheets.
- iii. The design shall take care of maximum wind speed, snow load, seismicity etc.

- iv. The height shall take care of erection, and O & M requirements.
- v. All trenches and inside tailrace shall be covered with checkered plates.
- vi. Doors and windows made of termite proof material.
- vii. Inside walls shall be plastered and white wash distempered.
- viii. Windows/ventilators shall be fixed to ensure natural lighting in side the P.H.
- ix. Proper equipment- lifting facility shall be provided.
- x. Proper lighting arrangement shall be made both inside and outside of the P. H.
- xi. Breast walls and retaining walls shall be provided as required.
- xii. Flood protection shall be ensured.
- xiii. Any other arrangement required as per the site conditions shall be made to ensure proper functioning of the plant.

6.3.8 Tail Race Channel

- i. Tailrace channel shall have sufficient capacity and proper slope to swiftly clear the discharge from the machines,
- ii. Individual tailrace channels may be connected to a common channel out side the P.H. building and finally joined suitably to a natural drain with proper arrangement for energy dissipation and flood protection.
- iii. Tailrace channel may be constructed of brick, stone masonry or RCC up to a point where the turbulence subsides,

6.3.9 Discharge Measuring Device

Discharge measuring device in the form of sharp-crested weir shall be provided.

6.3.10 Any Other Works

Any other works as may be required for proper running and safety of the P.H. and the whole scheme shall be provided in consultation of the Purchaser.

6.3.11 Civil Works for Electrical Services

Any civil works required for the electrical services of the powerhouse shall be carried out as may be necessary.

6.4 MATERIALS, CONSTRUCTION, FINISHING, TESTING AND COMMISSIONING

These shall be as per the relevant Indian Standards. Where such Standards do not exist approval from the Engineer shall be taken. The construction etc. shall be carried out in accordance with approved drawings.

6.5 MILD STEEL OR IRON WORK IN SMALL SIZES AND SECTIONS

6.5.1 General

The materials to be used and fabrication and construction method shall be as per relevant Indian Standards. This item shall cover supplying and fixing mild steel or iron work in small sizes and sections such as holding down bolts, holdfasts, tie rods, gratings etc.

6.5.2 Painting

Steel work shall be thoroughly cleaned of rust, loose scales, dust etc. as per latest edition of IS: 1477-part-I and given one coat of red oxide paint conforming to IS: 2074 applied as per IS: 1477-part-II. Over surface inaccessible after placing in position, two coats of red oxide paint as directed by the Engineer, shall be applied.

SECTION-VII

POWER GENERATION EQUIPMENT

7.1 HYDRO-MECHANICAL EQUIPMENT

7.1.1 Type of Turbine

The types of turbines for MHP having unit of 5 to 25 kW generator out put are:

i. Axial flow, ii. Cross flow, iii. Francis, iv. Pelton, v. Turgo impulse. vi. Any other turbine which may suit the technical requirement.

7.1.2 Minimum Weighted Average Efficiency (η_{wav})

The weighted average efficiency of the turbine –generator unit, calculated by the following expression should not be less than 60% :

$$\eta_{wav} = 0.5 \{ \eta_{t100} \times \eta_{g100} + \eta_{t50} \times \eta_{g50} \}, \quad \text{where:}$$

$\eta_{t100}, \eta_{g100}, \eta_{t50}, \eta_{g50}$ are the efficiencies of turbine and generator at 100% and 50% rated outputs, respectively at rated head.

For efficiency of turbine, the performance curves of similar offered turbine manufactured by the manufacturer of which turbines are being quoted by the bidder, (tested by independent institution), be provided, OR the value obtained as per the field tests on the turbine carried out as specified in IEC or equivalent international or national code shall be taken.

For efficiencies of generator the value obtained as per field tests as specified in above codes shall be taken.

7.1.3 Bid Evaluation Equalization for Short Fall in η_{wav}

For each 1 (one)% or part thereof by which η_{wav} (Sub –Clause 7.1.2.i) is lower than the highest offered η_{wav} in any of the bids received, 3(Three)% of total price of turbine –generator unit offered in the bid under evaluation shall be added to the offered price of each turbine-generator unit.

7.1.4 Cavitation Guarantee

The bidder shall guarantee the runner against excessive pitting/ cavitation for Eighteen (18) months from the date of commissioning or 8000 (Eight thousand) hours of operation, which is earlier.

7.1.5 Technical Specifications

7.1.5.1 Turbine (Including Auxiliaries)

i. Rating

Category – ‘A’ : 1 No. rated for 10 kW generator output.

Category – ‘B’ : 2 Nos. each rated for 25 kW generator output.

ii. Access

Inspection and dismantling of turbine in-situ should be easy. It must also be possible to remove the runner in- situ. Access must be allowed to all sides of the turbine and also the space to dismantle it, for lubrication and O&M work.

iii. Air Access

In case the turbine needs good amount of air (e.g. for Pelton type), then unrestricted airflow should be ensured.

iv. Water Seals

Non- contact type seals shall be provided. Labyrinth seals or stuffing boxes can be used.

v. Balancing

Turbine runner shall be statically balanced before commissioning. Large Cross-flow runners shall be dynamically balanced.

vi. Bolts

Bolts securing the turbine / generator base frame to the floor must be removable so also the runner inspection bolts. The design must ensure that water is drained away to avoid corrosion seizure of bolts.

vii. Exhaust water

Design must ensure efficient departure of exhaust water from runner.

7.1.5.2 Turbine Casing

- i. The steel casing should have sufficient thickness. Webs or ribs shall be provided as stiffeners so as to reduce noise and vibration.
- ii. The turbine should have low vibrations and noise.
- iii. Where the bearing alignment and jet accuracy depends on adequate tolerances, the casing shall be checked for squareness as a rule.

7.1.5.3 Turbine /Generator Base Frame

- i. Turbine and the generator shall be mounted on a single steel base frame fabricated from angle iron or channel, which shall be set into or fixed to the P.H. floor (separate fixing shall be avoided in order to avoid tension stresses occurring in the concrete floor). If the turbine and the generator are closely coupled (i.e. their own frames are rigidly connected to each other), then the base frame may be omitted.
- ii. The turbine and the generator shall be fixed securely to the base frame in a workshop before installation so that correct positioning may be achieved. This shall avoid problems of bearing alignment and belt tensions during operations.
- iii. The runner must be easily removable on site.

7.1.5.4 Bearings

i. Position

Pelton and propeller turbines can be either centrally mounted or overhung. Cross-flow turbines must be mounted centrally between bearings.

iii. Service Life

A 5 years' service life is acceptable for small machines but on larger machines, bearings must be selected to provide 10 years' service life.

iii. Alignment

Bearings must be properly aligned. There should not be more than 2 bearings on one shaft.

iv. Housing

With the bearing housing open, the housing shall be 1/3rd full of clean grease.

v. Commissioning test

- a. The bearing must turn freely and should not rattle. It should be possible to check with a feeler gauge that the rolling element clearance is within the tolerances recommended by the manufacturer.
- b. There should be no heating of the bearing housing when the turbine has run for some minutes.
- c. The temperature of the bearing should not be over 60 °C when the turbine has run for 2 hours.

7.1.5.5 Pressure Gauge

A pressure gauge shall be provided in the P.H. to read the pressure of water just before it enters the turbine. It shall have scale to read approximately half- scale at gross head.

7.1.5.6 Manifold

The manifold to carry water from penstock to the turbine inlet and runner shall be designed so as not to introduce large additional head losses. This can be verified by

following thumb- rules:

- i. Do not allow the velocity of water in the penstock to increase as it passes through the penstock.
- ii. Velocity in the manifold should not exceed: a. 3 m/s in straight pipes, b. 2.5 m/s in bends up to 45 degrees, c. 2.0 m/s in bends up to 90 degrees.

7.1.5.7 Manifold Valve / Isolating Valve

i Provision of Manifold Valve

A manifold valve (a valve at the foot of penstock) shall be provided unless:

- a. It is possible to quickly, safely and in a routine manner divert water away from the turbine or the mouth of the penstock in order to shut down the turbine (e.g. on some low head sites it may be possible to divert water at the mouth of the penstock as to close a valve).
- b. If a jet deflection system is fitted to a Pelton turbine.
- c. If a multi- jet Pelton turbine has valves on every branch of the manifold,
- d. If the guide vane of a Cross flow or a propeller turbine closes off the flow sufficiently.

ii. Location

The manifold valve shall be located in the P.H. and be easily accessible. It shall be rated at maximum penstock pressure.

iii. Operational Speed

The valve must be slow closing type (gate rather than a butterfly valve) or should have an apparatus which shall prohibit fast closing e.g.: a. Fitting of a much smaller second valve in parallel to the manifold valve, which shall be pad-locked in the open position and kept open when the main valve is closed.
b. A gearing mechanism to ensure very slow closing operation.

7.1.5.8 Safety Guards

All moving parts shall be shielded by a strong and durable wire mesh. The size of the mesh shall be small enough to prevent the entry of hands and arms of the children. The guards shall be electrically earthed and kept permanently secured by locks.

7.1.5.9 Tools

i .A set of tools shall be provided as per operator's manual. It shall also include the tools to test alignment and runner & case tolerances e.g. string, steel rule, measuring tape, square, feeler gauge, dial gauge, spirit level etc.

ii. Tool Display Board

Tool locations shall be silhouetted on a tool display board so as to immediately make it apparent if a tool is in use or missing.

iii. Lifting hoist

A suitable lifting hoist shall be provided in the power house.

iv. Re-chargeable Lantern

A re-chargeable battery-powered lantern shall be provided.

7.1.6 Field Tests

The field tests shall be performed as per the IEC- 1992 specifications. The equipment offered should stand these tests successfully.

7.2 ELECTRO-MECHANICAL EQUIPMENT

7.2.1 Type of Generator

3 phase, A.C. Synchronous generator shall be provided.

7.2.2 Technical Specification

7.2.2.1 Generator (Including Auxiliaries)

i. Nos. and Rating

Category – 'A' : 1 No. rated at 10 kW generator output.

Category – ‘B’ : 2 Nos. each rated at 25 kW generator output.

- ii. **Nominal Voltage of Generation, Frequency, and Power factor**
 - a. The nominal voltage of generation with no load on the generator terminals shall be between 100% and 110% of 415 volts.
 - b. The operating frequency shall be between 48.5 and 51.5 Hz.
 - c. The power factor rating shall be 0.8 when an ELC is in use except where all loads and the ELC present unity power factor.
- iii. **Excitation System**

Brush-less excitation system shall be provided.
- iv. **Run-away Speed With-Stand Capability of Generator**

The generator shall be capable to continuously with-stand the run- away speed of turbine.

7.2.2.2 Protection System

- i. **Over Current and Earth Fault Protection**
 - a. **Over Current Protection**

Miniature Circuit Breaker (MCB) or Molded Case Circuit Breaker (MCCB) of suitable rating shall be used for the purpose. These shall be placed as close to the generator terminals as possible.
 - b. **Earth Fault Protection**

An earth leakage circuit breaker (ELCB), also known as Residual current device (RCD), of suitable rating shall be provided as close to the generator terminals as possible.
 - c. **Ratings of Above Protection**

The maximum rating of the above protections shall not be more than 10 % of the current rating of the generator.
 - d. **Location**

The over current and the earth fault protection can be placed in the same box with each one clearly labeled but the mounting should not be on the generator body so as to avoid vibration damage. These shall be placed at least 1m above the floor level and as close to the generator as possible with properly fixed and sealed conduit protecting the cable to the generator.
The ELCB should be connected to the generator and then the over current trip should be connected to the ELCB.
- ii. **Voltage and Frequency Trips**

These shall be provided to protect consumer loads from un-acceptable voltages and frequency conditions. Over Voltage, Under Voltage, Over Frequency and Under Frequency Trips shall be provided:

7.2.2.3 Lightning Protection

To protect the power house and the consumers, lightning arrestors shall be provided on each phase as below:

- i. 1 arrestor on the first pole out side the P.H. and 1 arrestor per km of distribution line,
- ii. An additional arrestor if a consumer is more than 500 m away from the arrestor.

7.2.2.4 Instrumentation

- i. Placement
These, except the kWh meter, may be included on the controller box. The height should be at the eye level or 1.5 m above the floor level.
- ii. Meters
Volt meter, Ammeter, Frequency meter, Watt meter, Ballast meter (in ELC

system, 3 ballast meters- 1 per phase) shall be provided.

7.2.2.5 Controllers, Governors and Flow Regulators

An Electronic Load Controller (ELC) or a combined electronic and flow governor shall be provided. The controller must be located in the P.H. together with the ballast to ensure that the ballast is never disconnected.

7.2.2.6 Ballast

i. Location

Ballast shall be located in the P.H. so that it is never disconnected.

ii. Disconnection-proof

Cables to the ballast shall be short to be secure and temper-proof and there should be no method of disconnection.

iii. The Design

The design shall ensure that water flow is not impeded so that the ballast may not over-heat and fail and must include reliable protection against the effects of water flow blockage e.g. :

- a. Alarms for high water temperature and low level of water shall be provided for automatic disconnection of the generator field.
- b. Ballast tanks shall be made from corrosion-proof materials.
- c. Arrangement for easy flushing out of silt deposits.
- d. Provision of over flow channel to direct spill water away from electrical apparatus in case of out flow blockage.

7.2.2.7 Consumer Isolation Switch

A switch, rated at current equal to or higher than that of O/C trip, shall be provided in the P.H. to isolate the distribution system from the generator.

7.2.2.8 Earthing

i. The following shall be effectively earthed:

- a. The neutral of the generator.
- b. All the metal casings of the electrical equipment etc.

ii. Precaution shall be taken to prevent corrosion due to electrochemical effects, which can be done by using copper conductor/ electrode for earthing, avoiding bi-metal joints, or by maintaining air and water exclusion from bi-metal joints.

iii. ELCB (RCD) shall be used for electrical safety.

iv. The earth conductor (connection from the earth terminal to the earth electrode) should have a minimum cross-sectional area of not less than 25 sq. mm. A permanent level "Safety Electrical Connection – DO NOT REMOVE" shall be provided.

7.2.2.9 Lighting

- i. The P.H. shall be provided with adequate safe illumination: minimum 10 watts / sq. m. of floor area, if incandescent, or 3 watts / sq. m., if fluorescent.
- ii. A battery-charged type lantern (emergency light) shall be provided on display board.
- iii. A weather proof HPSV flood light shall be provided out side, above the door, on suitable fixtures providing 20 Lux illumination.
- iv. Street lighting/Road shall be provided with 20 Lux illumination using Approved type lighting equipment & fixture (s).

7.2.2.10 Conduits and Cables

- i. Strong conduits, physically secured to all enclosures by means of threaded connectors, shall be used to protect all cables.

- ii. The conduits shall be sealed to the enclosure entrances.
- iii. Since the cable inside the conduit from generator to over current- trip / ELCB box is not protected from over currents and earth faults, adequate physical strength of conduit shall be ensured,
- iv. The current carrying capacities of the cables, after taking in to account the de-rating required for use of conduit and multiple cables, shall not be less than 140% of the rating of the over current protection device(s),
- v. If the cables are felt over- warm on touching, it is an indication of these being under-sized. The cables shall be doubled or replaced in such cases.

7.2.2.11 Sockets

Two or more sockets (outlets) shall be provided for use of electrical appliances. The sockets shall be placed at least 1 m above the floor.

7.2.2.12 Shielding

- i. Cables and their connections to Units shall be shielded both by conduit and by their insulation. The connections shall be with in the closed casings.
- ii. All live surfaces and points shall be fully and reliably shielded from human contact.
- iii. Door interlock isolators shall be provided on control gear with voltages above 50 V so as to ensure safe working.

7.2.2.13 Fire Protection

Suitable, adequate and Approved fire protection equipment / system shall be provided for the plant / equipment.

5.2.2.14 Safety Guards

Appropriate and approved safety guards shall be provided.

5.2.2.15 Tools

- i. Required number and type of tools shall be provided as per Operator's Manual.
- ii. The tools shall be suitably located on tool display board.

7.3 MAINTENANCE MANUAL AND LOG BOOK

Three (3) copies of maintenance manual shall be provided. A logbook, in the format as per the Maintenance-Training Manual, shall be provided.

7.4 PROPOSED SPARES

- i. Instruments (Voltmeter, Ammeter, Pressure gauge,etc.), AVR, Digital Multi-meter, Emergency rechargeable lights. etc.
- ii. Lubricants like multipurpose grease and oils in dust free containers.
- iii. Bearings, Bolts and nuts.
- iv. Fuses, MCBs and ELCBs.
- v. Cable connectors.
- vi. Lightning arrestors.
- vii. Ballast heaters.
- viii. Rubber washers for the flange joints.
- ix. Two lengths of penstock.
- x. V-belts and couplings.
- xi. A set of open-ended spanners, Flat and cross-head screwdrivers, Grease gun, Bearing puller.
- xii. Tool rack to neatly place the tools
- xiii. Special tools like chain-pulleys, etc.

SECTION - VIII

POWER EVACUATION AND DISTRIBUTION SYSTEM

8.1 CONSUMER VOLTAGE VARIATION AND POWER FACTOR

The consumer voltage shall be within $\pm 10\%$ of the voltage of use and the P.F. shall not go below 0.8 lag.

8.2 GENERATOR NEUTRAL EARTHING

The neutral of the generator and all the exposed bodies of the system shall be earthed.

8.3 PROVISION OF ELCBs AND LOAD LIMITORS

ELCBs (also known as RCDs) shall be provided as required. MCBs of proper size (0.5A for 100 W and 1.0 A for 200 W) are recommended to be installed at the load points.

8.4 LIGHTNING PROTECTION

Suitable L. As. shall be provided. The earth electrode resistance is recommended to be less than 1Ω .

8.5 EARTHING

- i. Earthing in the powerhouse shall be as per the specifications of the Earth Leakage Circuit Breaker (ELCB).
- ii. It is not compulsory to draw an earth line in the distribution circuit.
- iii. Earthing shall be done as per the REC (Rural Electrification Corporation) standard and in line with Indian Electricity Rules.
- iv. No earthing is required other than the powerhouse earthing where consumer loads are simple appliances e.g. lights, double insulated non-metal items like radios but where the consumer loads may include metal appliances irons, water heaters etc and earth connection must be installed for each consumer likely to use such loads.

8.6 DISTRIBUTION PLAN

- i. Two nos. (for category 'A'/'B/'), 0.415/11kV power transformers, if required
- ii. 11/0.415 kV distribution transformers (if required)
- iii. A distribution diagram shall be provided showing key line distribution information:
 - a. Position of lightning arresters.
 - b. Voltage at powerhouse.
 - c. Positions of isolation switches and ELCBs.
 - d. Cross-sectional areas and the materials of the conductors.
 - e. Number of phases for each section.
 - f. Cable lengths.

- g. Maximum load demands at the load centers (in Amp.).
- h. Minimum expected voltages at all nodes and load centers.
- iv. Load distribution design in case of 3 - phase systems so as to enable proper balancing of the 3 - phases at all hours of the day.

8.7 ISOLATORS / FUSES / ELCBs

- i. All the consumer circuits shall be provided with isolation switches and fuses or MCBs and labeled in local language. A well-illustrated electrical book-let shall be provided for each house hold.
- ii. If the number of consumers is large, isolation switches shall be provided to cluster of consumers.
- iii. Where the number of consumers is large and spurious triggering of a single ELCB in the power house poses a problem, it is recommended that clusters are protected by ELCBs. These can be located in side the power house or out side in water proof housing. In the later case, it is recommended that the power house is also fitted with an ELCB having reduced sensitivity and response time.
- iv. The earth faults are required to be located with out undue delay. This can be provided by an ELCB. If the P.H. ELCB trips, the first step is to isolate the P.H. and then restart the generator. If the P.H. ELCB stays un-tripped, the fault is in the distribution system. Then isolate clusters of consumers or all individual consumers. Progressive switching in of consumers will reveal the location of fault.
- v. It is recommended to install a single ELCB of 150 m A rating or less at the P.H. to protect each circuit. A single 30 m A ELCB is recommended for the load points using loads more than 1 kW.

8.8 LOAD LIMITERS

MCBs of appropriate size (0.5 A for 100W and 1 A for 200 W) are recommended to be at load points and PVC insulated cables of 1mm sq. for house wiring for maximum load of less than 200 W.

8.9 CABLES

- i. Aluminium, copper, ACSR and high strength aluminium alloy overhead cables are recommended for use (under ground cables, being costly, may not be used).
- ii. Minimum ground clearances for overhead lines are 5.8m across motorable roads, 5.5m by the side of motorable roads and 3 m over open ground. The minimum horizontal top clearance is 1.5 m.
- v. In heavily vegetated or forested areas, insulated cables are recommended for use.
- vi. Sags and tensions of cables, size of poles, types of insulators etc. are to be used as per the REC construction Standards.
- vii. Selection of conductors shall be as per the REC construction standards.
- viii. The spacing shall be 300mm between conductors for a vertical arrangement of overhead lines and the neutral conductor shall be at the lowest.

- ix. The joints must be durable, strong, adequate for their purpose and visible. Bi-metallic clamps should be used for joints, which connect dissimilar metals.

8.10 TYPE OF POLES

8.10.1 Materials

This could be hard wood, reinforced or pre-stressed concrete or galvanized pipe. The wooden poles should be treated / painted and the steel poles painted for longer life. If care for safety can be ensured, the trees may be used for laying the cables.

8.10.2 Height of Poles

- i. 7m high poles for insulated cable network, up to 10 sq. mm cable size.
- ii. For cable size of 10 sq. mm and up to 35 sq. mm, 9 poles are to be used.
- iii. For un-insulated cables and bundled cables, the height of poles should be 9 m and 13 m respectively.

8.10.3 Span of Poles

Following span is recommended for distribution system for houses. The span length for the distribution line running cross-country may be taken as 60 to 90 m as per the site requirement. The span length may be higher for the line running through hilly areas.

- i. For single phase system:
 - a. Up to 16 sq. mm insulated wire : 2 core, maximum span should be of 30 m.
 - b. Above 16 sq. mm and up to 35 sq. mm: maximum span should be 25 m.
- ii. For three phase system:

REC national Standards shall be followed for span and length for AAC or ACSR bare conductors.

8.10.4 Insulators

- i. For bare cables, LT insulators are recommended for use.
- ii. For insulated cables, nylon bobbins or telecom insulators may be used as partial insulators.
- iii. The connections are to be carried out as per REC Standards.

8.10.5 Stays

Stays must be used at the first and the last poles of the straight lines and also at any turns.

8.10.6 Span and Sag

Span and sag shall be provided as the REC Standards.

8.11 HOUSE WIRING

- i. MCBs shall be used as load limiters as incoming protection device (0.5A for 100 W and 1 A for 200 W). Appropriate MCBs are to be installed as the main incomers for other loads.
- ii. One circuit with 1 sq. mm cable can be used for installations up to 1kW. The wire shall be of 600 V grade insulation.
- iii. Standard switches designed for 230 V AC shall be used.
- v. Conduits shall be used wherever mechanical protection is needed and the wires can be clipped onto the wooden parts for running on the roof section.

8.12 TEMPER PROOFING

Individual units, e.g. controller box, shall be provided with temper proofing or be sealed to ensure access by the specialist service technicians only.

8.13 MAINTENANCE MANUAL

Maintenance manual shall be provided and kept in place for use during O & M of PH.

8.14 LABELS AND NOTICES

- i. All electrical components; particularly switches, protection trips, circuit breakers, fuses etc.; shall carry labels describing their functions.
- ii. H.V. winding labels shall be placed on all cabinet doors, terminal covers etc.
- iii. A circuit diagram shall be provided in each individual unit such as the controller.
- iv. A block diagram showing overall electrical lay out shall be provided in the P.H. and it shall be durable and accessible.
- v. An illustrated notice, in local language, shall be provided to warn the people of the danger of electrocution. It shall be durable, within easy view and contain practical information on preventing and coping with electrocution and electric shock.

8.15 LINE DISTRIBUTION SYSTEM

- i. Generator neutral earthing and all the exposed metal bodies of the installation shall be earthed at the installation.
- ii. Use of ELCBs: residual current devices (RCD) shall be provided.
- iii. Size and class of wire: the wire shall be 600 V grade. Appropriate size of the cable shall be provided taking into consideration voltage drop requirement and length of the circuit – 1 sq. mm cable can be used for circuit length of 30 m (with voltage drop provision of 4 % from the origin of the installation)

8.16 SELECTION OF CABLE

Selection of cables shall be made as per latest edition of relevant I.S. keeping in view the basic requirements, cost effectiveness, safety considerations and the environmental etc.

SECTION- IX

TESTING AND COMMISSIONING

9.1 TESTING

Testing of equipment and works shall be carried out as may be required as per the relevant I.S./ I.E.C. Standards.

9.2 COMMISSIONING

After the erection and testing of the equipment/works as per above, commissioning of the plant and works shall be carried out and here the term “Commissioning” shall mean the activities of functional testing of the complete system after erection and testing, including tuning or adjustment of the equipment for optimum performance and demonstrating to the Purchaser that the equipment performance meets the requirements of the specifications.

9.3 ACCEPTANCE TESTS AT SITE

The contractor shall carry out tests to obtain the guaranteed out put and efficiency at the site as per the plan prepared by him and submitted to the Purchaser before hand.

SECTION – X
SCHEDULE OF GUARANTEED PERFORMANCE,
ANNEXURES AND COMMERCIAL & TECHNICAL
FROMS & SCHEDULES

SCHEDULE – GP
SCHEDULE OF GUARANTEED PERFORMANCE
(To be completed & submitted by Bidder with the Bid Part-I)

S. No	Item	Values (to be Filled in by Bidder)
1	2	3
1.	CIVIL WORKS	
1.1	Guaranteed discharge/design discharge for power generation at Turbine intake / at the end of penstock inside power house when water is available in the stream	.....cumec
1.2	Size of silt removal from the water before penstock intake	.....mm
1.3	Guaranteed head at Turbine intake/ at the end of penstock inside power house	.....m
1.4	<i>Head Race Channel</i>	
1.4.1	Type	.....
1.4.2	Section	.....
1.4.3	Length	..... m
1.5	<i>Penstock</i>	
1.5.1	Length	..... m
1.5.2	Outer Diameter	..... mm
1.5.3	Internal Diameter	..... mm
1.5.4	Thickness	..... mm
1.5.5	Material	
1.5.6	Design Head Loss	... .. m
2	ELECTRO MECHANICAL WORKS	
2.1	<i>Turbine:</i>	
2.1.1	Type	
2.1.2	Make	
2.1.3	Flow variation capability %
2.1.4	Design efficiency at rated flow %
2.1.5	Efficiency at 50% flow %
2.1.6	Shaft power at rated Flow	..... kW
2.1.7	Shaft power at 50% flow	.....kW

2.2	Drive:	
2.2.1	Type	
2.2.2	Make	
2.2.3	Ratios/.....
2.3	Generator:	
2.3.1	Type	
2.3.2	Make	
2.3.3	Efficiency at rated Flow %
2.3.4	Efficiency at 50%. Flow %
2.3.5	Output at rated Flow	..... kW
2.3.6	Output at 50% Flow	..... kW
2.4	Overall efficiency of Electro Mechanical Works	
2.5	Controller: Type of Ballast Load	
2.6	Switchgear and Metering: Meters Switchboard Components	
3.0	POWER EVACUATION AND DISTRIBUTION SYSTEM	
3.1	0.415/11 kV, 50Hz, 0.8 PF Transformer (If used): Rating	.....kVA,.....V,
3.2	Type of Pole & length	
3.3	Type of Cable & Rating	
3.4	Type of Conductor	

Seal of Company

Signature

Name

Designation

Date

FORM OF BANK GUARANTEE AS EARNEST MONEY

To,

.....
.....

Sir,

WHEREAS, Messersa Company incorporated under the Indian Companies Act having its registered office at a firm registered under the Indian Partnership Act and having its business office at.....Sri.....son of R/o..... Sri.....son of.....R/o..... Sri.....son of.....R/o..... and partners carrying on business under the firm’s name and style of Messers..... atwhich is registered partnership firm (hereinafter called the ‘Bidder’) has/have in response to your Bid Notice against specification No.....for, offered to supply and/ or execute the works as contained in the bidder’s letter No..... dated

AND WHEREAS the Bidder is required to furnish to you a Bank Guarantee for the sum of Rs. as Earnest Money against the Bidder’s offer as aforesaid.

AND WHEREAS We (Name of the Bank), have, at request of the Bidder, agree to give you this guarantee as hereinafter contained.

NOW THEREFORE, in consideration of the promises we, the undersigned, hereby covenant that the aforesaid bid of the bidder shall remain open for acceptance by you during the period of validity as mentioned in the bid or any extension thereof as you and the bidder may subsequently agree and if the Bidder shall, for any reason back out, whether expressly or impliedly, from his said bid during the period of its validity or any extension thereof as aforesaid we hereby guarantee to you the payment of the sum of Rs..... on demand notwithstanding the existence of any dispute between the.....and the Bidder in this regard and we hereby further agree as follows :-

- i. That you may without affecting this guarantee grant time or other indulgence to or negotiate further with the bidder in regard to the conditions contained in the said tender and thereby modify these conditions or add these to any further conditions as may be mutually agreed upon between you and the bidder.
- ii. That the guarantee herein before contained shall not be affected by any change in the constitution of the bidder.
- iii. That this guarantee commences from the date thereof and shall remain in force till the bidder, if his bid is accepted by you, furnishes the security as required under the said specifications and executes a formal agreement as therein provided or till four months after the period of validity or the extended period of validity, as the case may be, of the bid, whichever is earlier.
- iv. That the expressions ‘The Bidder’ and ‘The Bank’ and ‘The’(insert the name of organization & address of Purchaser) herein used shall, unless such an interpretation is repugnant to the subject or context include their respective Successors and Assigns.
- v. That any account settled between you and the bidder shall be conclusive evidence against us of the amount due hereunder and shall not be questioned by us.

Yours faithfully,

BID FORM

(To be completed and submitted by Bidder with the Bid Part – I)

Bid Specification No.

From:

(Insert Name and address of Bidders:)

To

(Insert Designation and address of Purchaser/Purchaser’s Representative)

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

Dear Sir,

We have examined the Conditions of Contract, Purchaser's Requirements, Schedules, etc. and the matters set out there –in. We have understood and checked these documents and have not found any errors in them. We accordingly offer to design, execute and complete the said Works and remedy any defects fit for purpose in conformity with these documents and the enclosed Proposal, for the fixed lump sum of Rs.

.....
We accept your suggestions for the appointment of the Arbitrator(s), as set out under Sub-Clause 3.20.4 (Section – III).

We agree to abide by this Bid until and it shall remain binding upon us and may be accepted at anytime before that date.

If our Bid is accepted, we will provide the specified performance security, commence the Works as soon as reasonably possible after receiving the Purchaser's Representative's notice to commence, and complete the Works in accordance with the above-named documents within time.

Unless and until a formal Agreement is prepared and executed this Bid, together with your written acceptance thereof, shall constitute a binding contract between us.

We understand that you are not bound to accept the lowest or any bid you may receive.

Yours faithfully,

Signaturein the capacity ofduly authorized to sign bids for and on behalf of

Address

.....
.....

Date

Place.....

FORM OF COMMITMENT

Name.....of.....Contract:

To:(Insert name of Purchaser)
..... (Insert address of Purchaser)

Gentlemen:

We have examined the Conditions of Contract, various sections of this specification No.We have understood and checked these documents and have not found any errors in them. We, accordingly offer to design, supply, execute test and commission and complete the said Works and remedy any defects, etc. fit for purpose in conformity with these documents and the enclosed Proposal for the fixed lump sum payment equal to that quoted in the Price Schedules or other such sums as may be determined in accordance with the terms and conditions of the Contract.

We confirm our agreement with the appointment of *(The arbitrator(s) as set out in Clause 3.20.4 (Arbitration) and procedural rules set out in Section- III.*

We agree to abide by this Bid until and it shall remain binding upon us and maybe accepted at any time before that date.

If our bid is accepted, we will provide the specified performance security, commence the Works as soon as reasonably possible after receiving the Purchaser's Representative's notice to commence, and complete the Works in accordance with the above-named documents within the time stated.

Unless and until a formal Agreement is prepared and executed this Bid, together with your written acceptance thereof, shall constitute a binding contract between us.

We understand that you are not bound to accept the lowest or any bid you may receive.

Yours faithfully,

Signaturein the capacity ofduly authorized to sign bids for and on behalf of

Address:
.....
.....

Date.....

FORM OF CONTRACT AGREEMENT

THIS AGREEMENT made on theday of20.....
BETWEEN.....
(hereinafter referred to as “the Contractor”) of the one part AND the
..... (insert name of the organization and address) (hereinafter
called “the Purchaser”) of the other part;

WHEREAS the purchaser is about to erect and maintain
the..... (hereinafter called “the works”) and for the purpose
requires the plants and machinery mentioned and specified in certain general conditions,
specifications, schedules, drawings, bid forms, covering letter and schedule of prices
which, for the purpose of identification, have been signed by
... on behalf of the Contractor and
..... (the Engineer of the Purchaser) on behalf of the Purchaser all of which are
deemed to form part of this Contract as though separately set out herein and are included
in the expression “Contract” whenever herein used.

AND WHEREAS the Purchaser has accepted the bid of the Contractor for the
supply and delivery of the said plant and machinery for the sum of
.....
upon the terms and subject to the conditions hereinafter mentioned.

NOW THESE PRESENT WITNESSES and the parties hereto hereby agree and
declare as follows, that is to say, in consideration of the payment to be made to the
Contractor by the Purchaser as hereinafter mentioned the Contractor shall and will fully
provide the said plant and machinery for the said works on the terms and conditions
mentioned in the Contract.

AND in consideration of the due provisions of the said plant and machinery by
the Contractor and due performance of his part of contract, the Purchaser does hereby for
himself, his successors or assigns covenant with the Contractor that he, the Purchaser,
his successors or assigns will pay to the Contractor the said sum of
.....

or such other sum as may be become payable to the Contractor under the
provision of the Contract, such payments to be made at such time and in such manner as
is provided by this contract.

IN WITNESS WHEREOF the parties hereto have signed this Deed hereunder on
the dates respectively mentioned against the signatures of each.

Signed
(for and on behalf of the Purchaser)
(date)
in the presence of

1.
2.

Signed
(Contractor)
(date)
in the presence of

1.
2.

FORM OF BANK GUARANTEE FOR SECURITY

(For depositing security in case the amount for deposit exceeds Rs. 5000. Bank guarantee should be on a Non-Judicial Stamp Paper of Rs. 100.00 at present.)

To,

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

(Insert name, designation and address of Purchaser etc.)

In consideration of the (insert detail of Purchase) (hereinafter called 'The') having agreed to exempt
.....(hereinafter called 'The Contractor') from the demand under the terms and conditions of agreement dated made between
.....and (insert detail of Purchaser) for hereinafter called the said 'Agreement' of security deposit for the due fulfillment by the said contractor(s) of the terms any conditions contained in the said agreement on production of bank guarantee for Rs. (Rupees only) we
.....Bank (Ltd.) (hereinafter referred to as 'The Bank') do hereby undertake to pay the an amount not exceeding Rs. against any loss or damage caused to or suffered or would be caused to or suffered by the by reason of any breach by said contractor(s) of any of the terms and conditions contained in the said agreement.

2. We Bank (Ltd.) do hereby undertake to pay the amounts due and payable under this guarantee without any demur merely on demand from the stating that the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by the by reason of any breach by the said contractor of any of the terms and conditions contained in the said agreement or by reason of the contractor(s) failure to perform the said Agreement. Any such demand made on bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding of Rs.....

3. We Bank (Ltd.) further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said agreement and that it shall continue to be enforceable till all the dues of the under or by virtue of the said agreement have been fully paid and its claims satisfied or discharged or till the or their only authorised officer certifies that the terms and conditions of the said agreement have fully and properly carried out by the said contractor (s) and accordingly discharges the guarantee.

4. We Bank (Ltd.) further agree with the that the shall have the fullest liberty without our consent and without affecting in any manner of obligations hereunder to vary any of terms and conditions of the said agreement or to extend time of performance by the said contractor (s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the against the said contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation or extension (s) being granted to the said contractor or for any forbearance, act or omission on the part of the or any indulgence by the to the said contractor(s) or any such matter or thing whatsoever which under the Law relating to sureties would, but for this provision, have effect of so relieving us.

5. We Bank (Ltd.) lastly undertake not to revoke this guarantee during its currency except with the previous consent of the in writing.

6. Notwithstanding any thing contained above, the liability of the guarantor hereunder is restricted to said sum of Rs. and this guarantee shall expire on the day of 20 (Rupees.....)Unless a claim under the guarantee is filed with the guarantor within six months of such date, all claims shall lapse and the guarantor shall be discharged from the guarantee.

7. We (Name of Bank) lastly **undertake** to pay to the any money so demanded notwithstanding any dispute or disputes raised by the contractor (s)/supplier(s) in any suit or proceeding, pending before any Court or Tribunal relating to arbitration thereto or liability under this present being absolute and unequivocal. The payment so made by us under this Bond shall be a valid discharge of our liability for payment there under and the contractor (s)/supplier(s) shall have no claim against us for making such payment.

Date day of20

forBank (Ltd.).

Seal of the company

FORM OF PERFORMANCE BANK GUARANTEE

To,
.....
.....
(Insert name, designation and address of Purchaser etc.)

THIS DEED OF GUARANTEE MADE ON THE day of20.
..... By the (hereinafter called ‘the Guarantor’) of the one
PART IN FAVOUR OF the (insert detail of purchase’s) (hereinafter
called the Purchaser of the other part

WHEREAS in accordance with the contract agreement dated the day of
.....20.....(hereinafter called ‘the said Contract) entered in to between the
purchaser and Messers a company within the meaning of the
companies act and having its registered office at
(hereinafter called ‘the Contractor’) the Contractor agrees to supply, erect, test &
commission (strike off which is not applicable) to the Purchaser the as
provided in the said Contract.

AND WHEREAS the payment terms under the Contract provide that in order to take
100% payment of the Contract value the contractor shall furnish to the purchaser a Bank
Guarantee in the sum of 10% value of each consignment despatched valid for
.....

AND WHEREAS instead of furnishing separate guarantees as aforesaid the Contractor
wishes to furnish one guarantee as sum of 10% value of the Contract valid for
..... and reckoned from the date.....

Now This Deed Witnesses As Follows:

1. In consideration of the promises the Guarantor hereby undertakes that the Contractor shall duly supply, erect, test and commission (strike off which is not applicable) the aforesaid material of the correct quality and strictly in accordance with the said contract failing which the guarantor shall pay to the Purchaser on demand such amount or amounts as the Guarantor may be called upon to pay to the maximum aggregate of Rs. (Rupees.....) being 10% of the Contract value.
2. The Guarantor shall pay to the Purchaser on demand the sum under clause 1 above without demur and without requiring the Purchaser to invoke any legal remedy that may be available to it to compel the guarantor to pay the same or to compel such performance by the Contractor. Provided that where the Guarantor considers the demand of the Purchaser unjustified, it shall nevertheless pay the same though under protest to the Purchaser and shall not with-hold payment on that account.

3. This guarantee shall come into force the date hereof and shall remain valid for 12 (Twelve) calendar months from the date of the Commissioning.... of the last consignment of goods despatched which date despatch according to the Contract is the day of if however, the period of the Contract is for any reason extended thereby extending the said date and upon such extension, if the Contractor fails to furnish a fresh or renewed bank guarantee for the extended period, the Guarantor shall pay to the Purchaser the said sum of Rs..... or such lesser sum as the Purchaser may demand.

4. The guarantee herein contained shall not be effected by any change in constitution of the Guarantor or of the Contractor.

5. Any account settled between the Contractor and the Purchaser shall be conclusive evidence against the Guarantor of the amount due and shall not be questioned by the Guarantor.

6. The neglect or forbearance of the Purchaser in enforcement of payment of any moneys the payment whereof is intended to be hereby secured or the giving of time by the Purchaser for the payment thereof shall in no way relieve the Guarantor of its liability under this deed.

7. The Purchaser and the Contractor will be at liberty to carry out any modifications in the said Contract during the time of the said contract and any extension thereof, notice of which modifications to the guarantor is hereby waived.

8. The expressions 'The Purchaser' and 'The Guarantor' and 'The Contractor' shall unless there be any thing repugnant to the subject or context include their respective successors and assigns.

9. Notwithstanding anything contained above, the liability of the Guarantor hereunder is restricted to the said sum of Rs..... and this guarantee shall expire on the day of 200unless a claim under the guarantee is filled with the Guarantor within six months of such date, all claims shall lapse and the Guarantor shall be discharged from the guarantee.

IN WITNESS WHEREOF

For and on behalf of the Guarantor has signed this deed on the day and year first above written.

Witness :

1. Signed by
(For and on behalf of Guarantor)

2.

Seal of the company

**SCHEDULE- 10.7
DECLARATION**

(To be executed on a non-judicial stamp paper of Rs.(Insert the value) with a revenue stamp of Rs. 1/- affixed and be submitted by Bidder with the Bid Part – I)

Name of Bidder.....
Specification No. and date of opening :-

To
(Insert Designation and address of Purchaser/Purchaser's Representative)

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

Dear Sir,

In consideration of the.....(Insert Designation and address of Purchaser/Purchaser's Representative). having treated the Bidder to be an eligible person whose Bid may be considered, the Bidder agrees to the condition that the proposal in response to the above invitation shall not be withdrawn within 120 days (or any extension thereof) from the date of opening of the Bid, also to the condition that if thereafter the Bidder does withdraw his proposal within the said period, the Earnest Money deposited by him shall be forfeited to.....(Insert Designation and address of Purchaser/Purchaser's Representative) and at the discretion the Purchaser, the Purchaser may debar the Bidder from Bidding for a minimum period of one year reckoned form the date of opening of the Bid.

Signed this day of.....20.....

Place	Signed by
	State title (whether)
	(Proprietor/Partner)
Witness	Name of the firm
Signature	Address of the firm
Name	
Address	Seal of the firm

SCHEDULE -10.8 GENERAL PARTICULARS

(To be Completed and Submitted by Bidder with the Bid Part – I)

Bid Specification No. -----

1. Name of sole Bidder/Consortium leader/ members of the consortium/associates

Sl No.	Name & Type of Firm	Regd. Office		Head office		Local Representative		Authorized Representative	
		Address	Phone No. Fax No.	Address	Phone No./ Fax No.	Address	Phone No./ Fax No.	Address	Phone No./ Fax No.
1	2	3	4	5	6	7	8	9	10

2. Other Details

Sl. No.	Items	Details
1	2	3
1 1.1 1.2	Total annual turnover of the firm during last 2 (Two) financial years	2004-2005 2005-2006
2.	State name and designation of your relative (s), if any, working in the State of	
3.	Whether certificate of satisfactory performance of offered equipment enclosed or not. If yes, give details of the officer issuing certificate. If no, give location of plant, name & address of Owner, Plant-in-Charge address, telephone number etc.	Enclosed/ not enclosed
4.	(i) Give Trade Tax/ Sales Tax Registration No.: i. Central ii. State	
5.	Income Tax clearance certificate of current and preceding year enclosed or not.	Yes/ No.
6.	Give two references (Name, Designation and complete postal address) who can certify financial status and capability to under-take such Turn-key project orders. References should be from authorized officials of any scheduled nationalized bank/ financial institutions/ credit rating agency in India.	
7.	Have you offered any discount? If yes, then details of rebate / discount	

Full Signature, Name, Designation....., Date....., Seal of the company

SCHEDULE –10.9

**LIST OF DRAWINGS AND LITERATURE ENCLOSED
WITH THE BID**

(To be Completed and Submitted by Bidder with the Bid Part – I)

Bid Specification No.-----

SI No.	Drawing/ Literature No.	Title
1.	2	3
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Seal of the company

Full Signature

Name

Designation

Date

SCHEDULE – 10.10

DEVIATION FROM “TECHNICAL SPECIFICATION”

(To be Completed and Submitted by Bidder with the Bid Part – I)

Bid Specification No. -----

(All deviations from the “Technical Specification” shall be filled in clause by clause, in this schedule. Compliance with the Specification will be taken as granted, if the deviations are not specifically mentioned in this schedule. In case the Bidder is required to agree to the standard clause, then he may indicate the amount in Bid Part-II by which the Bid price will thereby be increased or decreased.)

Sl. No.	Page No.	Clause No. & Stipulation in Specification	Deviation, if any
1.	2	3	4
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			

The Bidder hereby certifies that the above mentioned are the only deviations from the “Technical Specification”

Seal of the company

Signature

Name

Designation

Date

Note:

- I. IN CASE THERE IS NO DEVIATION (S) THE “NIL” INFORMATION SHOULD BE FURNISHED.**
- II. IN CASE THIS SCHEDULE IS NOT FILLED IN OR NOT SUBMITTED WITH THE BID IT WILL BE TAKEN FOR GRANTED THAT THE BIDDER SEEKS NO DEVIATIONS.**

SCHEDULE – 10.11

DEVIATION FROM “SPECIAL CONDITIONS OF CONTRACT” (To be Completed and Submitted by Bidder with the Bid Part - I)

Bid Specification No. -----

(All deviations from the “Special Conditions of Contract” shall be filled in clause by clause, in this schedule. Compliance with the Specification will be taken as granted if the deviations are not specifically mentioned in this schedule. In case the Bidder is required to agree to the standard clause then he may indicate the amount in Bid Part-II by which the Bid price will thereby be increased or decreased.)

Sl. No.	Page No.	Clause No. & Stipulation in Specification	Deviation, if any
1	2	3	4
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			

The Bidder hereby certifies that the above mentioned are the only deviations from the “Special Conditions of Contract”.

Seal of the company

Signature

Name

Date

Designation

Note:

- I. IN CASE THERE IS NO DEVIATION (S) THE “NIL” INFORMATION SHOULD BE FURNISHED.**
- II. IN CASE THIS SCHEDULE IS NOT FILLED IN OR NOT SUBMITTED WITH THE BID IT WILL BE TAKEN FOR GRANTED THAT THE BIDDER SEEKS NO DEVIATIONS.**

SCHEDULE – 10.12

LIST OF RECOMMENDED SPARE PARTS

(To be Completed and Submitted by Bidder with the Bid Part – I)

Bid Specification No. -----

(Bidder shall give below a list of recommended spares other than mandatory spares for generating and distribution works for 5 years trouble free operation of equipment offered by them).

SI No.	Catalogue No.	Name of the Component	Recommended Qty. in Nos.
1	2	3	4
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			

Seal of the company

Signature

Name

Designation

Date

NOTE: PLEASE WRITE “NOT APPLICABLE” WHERE THIS SCHEDULE IS NOT RELEVANT.

SCHEDULE – 10.13

LIST OF RECOMMENDED SPECIAL TOOLS AND TACKLES

(To be Completed and Submitted by Bidder with the Bid Part – I)

Bid Specification No. -----

(Bidder shall give below a list of recommended special tools and tackles required for erection, commissioning, operation and maintenance of generating and distribution works offered by them).

SI No.	Particulars	Recommended Qty. in Nos. Per/Unit
1	2	3
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		

The Bidder hereby certifies that above are the only special tools and tackles for required erection, commissioning, operation and maintenance of the equipment's offered by him.

Seal of the company

Signature

Name

Designation

Date

NOTE: PLEASE WRITE “NOT APPLICABLE” WHERE THIS SCHEDULE IS NOT RELEVANT.

SCHEDULE ‘- 10.14

LIST OF RECOMMENDED TEST

(To be Completed and Submitted by Bidder with the Bid Part – I)

Bid Specification No. -----

(Bidder shall give below a list of recommended test required for commissioning, operation and maintenance).

SI No.	Particulars	Quantity	Purpose
1	2	3	4
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			

The Bidder hereby certifies that above are the only test sets and testing instruments required for required erection, commissioning, operation and maintenance of the equipment offered by him. The instruments required for erection & commissioning shall be brought by the Contractor on returnable basis (after commissioning) without extra cost whereas instruments required for operation & maintenance shall remain with the purchaser.

Seal of the company

Signature

Name

Designation

Date

NOTE: PLEASE WRITE “NOT APPLICABLE” WHERE THIS SCHEDULE IS NOT RELEVANT

SCHEDULE – 10.15

SCHEDULE OF QUOTED GUARANTEED DELIVERY / PROJECT COMPLETION SCHEDULE

(To be Completed and Submitted by Bidder with the Bid Part - I)

Bid Specification No. -----

(GUARANTEED DELIVERY/PROJECT COMPLETION SCHEDULE will be reckoned from the date of issue of letter of intent)

(“Please indicate activity wise bar chart with date of start & finish of each activity of the project with submission/approval of drawings/ data, delivery, erection & commissioning, preliminary acceptance tests and final acceptance test/ handing over of the complete project in operating conditions” etc.).

Seal of the company

Signature

Name

Designation

SECTION-XI
SCHEDULES OF PRICES

SCHEDULE –11.1

Surveys, Investigations, Design, Drawings and Documentation for Project
(To be completed and submitted by Bidder with Bid Part-II)

Bid Specification No.....

Sr. No.	Description	Quantity	Price (Rs.)	Taxes (Rs.)	Total Price (Rs.)
1	2	3	4	5	6
1.	Surveys, investigations, Design, Drawings and Documentation for the project.	1 lot			

Seal of the company

Signature

Name

Designation

Date

SCHEDULES –11.2

CIVIL WORKS

(To be completed and submitted by Bidder with Bid Part-II)

Bid Specification No.....

Sl. No.	Description	Quantity	Price (Rs.)	Taxes * (Rs.)	Total Price at site (Rs.)
1	2	3	4	5	6
1.	Diversion Weir	1 Lot			
2.	Feeder Channel	1 Lot			
3.	Head Race Channel	1 Lot			
4.	De-silting Tank	1 Lot			
5.	Forebay Tank	1 Lot			
6.	Spillway Channel	1 Lot			
7.	Penstock, Intake, Anchor & Saddle Blocks including testing of penstock	1 Lot			
8.	Power House Building	1 Lot			
9.	Tail Race	1 Lot			
10.	Discharge Measuring Device	1 Lot			
11.	Development Works	1 Lot			
12.	Others works such as access, fencing etc.**	Lot			
	Total Rs.				
	Total Price in Words				

* Details are to be provided by the bidder

** Details to provided by the bidder

NOTE:

1. Description of items in price schedule is only indicative. Price shall be given for complete scope as described in Technical Specifications excluding the civil works for the distribution works (which shall be the part of Distribution works).
2. The price, Taxes (VAT) & Duties, other cost, shall be given for those items only on which these are applicable. **The detailing of such items is to be given at appropriate place (s), wherever necessary.**

Seal of the company

Signature

Name

Designation

Date

SCHEDULES –11.3

Electro Mechanical Works

(To be completed and submitted by Bidder with Bid Part-II)

Bid Specification No.....

Sl. no.	Description of (As per Purchaser, requirement)	Quantity	Ex- works/ Unit Price (Rs.)	Excise duty per unit (Rs.)	VAT	Transport & Insurance (Rs.)	Total Price at site (Rs.)
1	2	3	4	5	6	7	8
1.	Turbine and Its Auxiliaries	1/2 Sets for category 'A'/'B'					
2.	Generator, Excitation System & Its Auxiliaries	1/2 Sets for category 'A'/'B'					
3.	1. Step-up Transformer complete with fittings and Accessories, if required.	1/2 Sets for category 'A'/'B'					
	2. 11 kV Switch gear, if required.	Lot					
4.	Control, Metering, Protection Panels	Lot					
5.	Electrical Auxiliaries including switchgear /DC distribution board etc.	Lot					
6.	Mandatory Spares**	Lot					
7.	Mandatory tools**	Lot					
8.	Erection, testing and commissioning	Lot					
	Total						

* Details are to be provided by the bidder

** Details to provided by the bidder

Note: Items at Serial 3 i. & ii. will be used only in case the length of line is large enough to necessitate 11 kV system.

Seal of the company

Signature

Name

Designation

Date

SCHEDULE – 11.4 DISTRIBUTION SYSTEM

(To be completed and submitted by Bidder with Bid Part-II)

Bid Specification No.....

Sl. No.	Description	Qty.	Ex-work unit price (Rs.)	Excise duty per unit (Rs.)	VAT (Rs.)	Transport & insurance (Rs.)	Total Price at site (Rs.)
1	2	3	4	5	6	7	8
1.	11 kV Line						
	i. Pole						
	ii. Conductor						
	iii. Insulator						
	iv. Miscellaneous						
2.	11/0.415 V transformer						
3.	Distribution Line						
	i. Pole						
	ii. Conductor						
	iii. Insulator						
	iv. Any other item(s)						
4.	Civil Works for distribution system						
5.	Meters for Consumer end						
6.	Mandatory Spares						
7.	Mandatory tools						
8.	Erection testing and commissioning						
	Total						

* Details are to be provided by the bidder

** Details to provided by the bidder

Note: Items at serial 1&2 will be needed only in case the distribution system requires power evacuation at 11 kV.

Seal of the company

Signature

Name

Designation

Date

SCHEDULE –11.5
GRAND SUMMARY OF PRICES
 (To be completed and submitted by Bidder with Bid Part-II)

Bid Specification No.....

Sl. No.	Description of Works	Price (Rs.)
1	2	4
1.	Schedule – 11.1 Surveys, Investigations, Design, Drawing & Documentation for the Project	
2.	Schedule – 11.2 Civil works	
3.	Schedule – 11.3 Electro Mechanical Works	
4.	Schedule –11.4 Distribution system	
	Total	
5.	O&M of the plant and the distribution system after commissioning	
	1 st year including warranty period	
	2 nd year	
	3 rd year	
	4 th year	
	5 th year	
6.	Total Rs. Total Price in Words	

Note : 1. Purchaser's Work- Force for the O&M period of 5 years (which shall work with the Work- Force of the Contractor) shall be provided and paid by the Purchaser directly. The Contractor shall submit his recommendation for the Nos. and qualifications required for the Purchaser's Work-Force consideration of the purchaser.

2. For evaluation of Bid, the prices quoted shall also be taken in to consideration.

Seal of the company

Signature

Name

Designation

Date

SCHEDULE – 11.6
SCHEDULE OF PAYMENT

(To be completed and submitted by Bidder with Bid Part-II)

Bid Specification No.....

Sl. No.	Description of Works	% of payment of the total cost	Amount	Comulative payment %	Remarks
1	2	3	4	5	6
1.	On submission Surveys, Investigations, Design, Drawing & Documentation for the Project (Schedule – 11.1)	10%		10%	
2.	On completion of Civil works (Schedule –11.2)	40%		50%	
3.	On commissioning of electro mechanical works (Schedule – 11.3)	40%		90%	
4.	On commissioning Distribution system (Schedule –11.4)	10%		100%	
	Total	100%			
5.	O&M of the plant and the distribution system after commissioning				
	1 st year including warranty period	(on yearly completion)		(on yearly completion)	
	2 nd year	(on yearly completion)		(on yearly completion)	
	3 rd year	(on yearly completion)		(on yearly completion)	
	4 th year	(on yearly completion)		(on yearly completion)	
	5 th year	(on yearly completion)		(on yearly completion)	
6.	Total Rs. Total Price in Words				

Note: Payment of O&M charges shall be made subject to achieving the Guaranteed Performance by the Bidder

Seal of the company

Signature

Name

Designation

Date