TENDER SPECIFICATION

No. BHE/PW/PUR/PIPVG-ELE/738

FOR

Handling at Storage Yard/ Stores, Transportation to Site, Calibration, Erection, Testing, Commissioning, Final Painting and Handing Over of Electrical Works of 2x351.43 MW Combined Cycle Power Plant comprising of HRSG, Frame 9 FA Gas Turbine, Steam Turbine and their Auxiliaries, Piping etc.

AT

GSPC PIPAVAV POWER COMPANY LIMITED

VILL-KOVAYA (NEAR PIPAVAV), TALUKA: RAJULA,

DIST- AMRELI (GUJARAT)

PART I - TECHNICAL BID

BHARAT HEAVY ELECTRICALS LIMITED

(*A GOVERNMENT OF INDIA UNDERTAKING*)

POWER SECTOR: WESTERN REGION

345, KINGSWAY

NAGPUR 440 001

Contents			
SN	Description	Section/ Appendix No.	No. of Pages
1.	Tender Specification issue details	--	1
2.	Procedure for Submission of Sealed Tender	--	1
3.	Project Information	--	2
4.	Check List	--	2
5.	Declaration by Bidder's Authorized Signatory	--	1
6.	Certificate of No Deviation	--	1
7.	General Conditions Of Contract #	Sections-1 & 2 $	$
8.	Offer of Contractor	Section-3	1
Special Conditions of Contract			
9.	Scope of Work	Section-4	26
10.	Obligations of the Contractor (Tools, Tackles & Consumables)	Section-5	07
11.	Contractor's Obligation with Regard to Employment of Supervisory Staff and Workmen	Section-6	02
12.	Obligations of BHEL	Section-7	01
13.	Inspection/ Quality Assurance/ Quality Control/ Statutory Inspection	Section-8	03
14.	Safety Measures	Section-9	17
15.	Drawings and Documents	Section-10	01
16.	Time Schedule/Mobilization/ Progress Monitoring/ Overrun.	Section-11	04
17.	Terms of Payment	Section-12	06
18.	Extra Charges for Modification/ Rectification	Section-13	02
19.	Insurance	Section-14	02
20.	Earnest Money Deposit and Security Deposit	Section-15	02
21.	Technical Details, Bill of Quantities & Drawings	Section-16	08
Appendices			
22.	Details of Items listed in Rate schedule	Appendix-I	09

LEGEND:

$: Attached at the end of hard copy of Tender Specifications Part-I.

@: Issued as separate hard copy booklet 'Tender Specifications Part-II (Price Bid-738)

BHARAT HEAVY ELECTRICALS LIMITED
(A GOVERNMENT OF INDIA UNDERTAKING)
POWER SECTOR - WESTERN REGION
SHREEMOHINI COMPLEX
345, KINGS WAY - NAGPUR 440 001

T E N D E R S P E C I F I C A T I O N

No. BHE/PW/PUR/PIPVG-ELE/738

FOR

Handling at Storage Yard/ Stores, Transportation to Site, Calibration, Erection, Testing, Commissioning, Final Painting and Handing Over of Electrical Works of 2x351.43 MW Combined Cycle Power Plant comprising of HRSG, Frame 9FA Gas Turbine, Steam Turbine and their Auxiliaries, Piping etc.

AT

GSPC PIPAVAV POWER COMPANY LIMITED

VILL-KOVAYA (NEAR PIPAVAV), TALUKA: RAJULA,

DIST- AMRELI (GUJARAT)

THESE TENDER SPECIFICATION DOCUMENTS CONTAINING **PART-I** AND **PART- II** ARE ISSUED TO:

M/s. ……

……

PLEASE NOTE:
THESE TENDER SPECS DOCUMENTS ARE NOT TRANSFERABLE.

For Bharat Heavy Electricals Limited

Dy. General Manager (Purchase)
Place: Nagpur
Date:

BHARAT HEAVY ELECTRICALS LIMITED
(A Government of India Undertaking)
POWER SECTOR - WESTERN REGION
345, KINGS WAY - NAGPUR 440 001

PROCEDURE FOR SUBMISSION OF SEALED TENDERS

THE TENDERER MUST SUBMIT THEIR TENDERS AS REQUIRED IN TWO PARTS IN SEPARATE SEALED COVERS PROMINENTLY SUPERSCRIBED AS PART-I TECHNICAL BID AND PART-II PRICE BID AND ALSO INDICATING ON EACH OF THE COVERS THE TENDER SPECIFICATION NUMBER AND DUE DATE AND TIME AS MENTIONED IN THE TENDER NOTICE.

PART-I (TECHNICAL BID) COVER-I

EXCEPTING RATE SCHEDULE, ALL OTHER SCHEDULES, DATA SHEETS AND DETAILS CALLED FOR IN THE SPECIFICATION SHALL BE ENCLOSED IN PART-I "TECHNICAL BID" ONLY.

PART-II (PRICE BID) COVER-II

ALL INDICATIONS OF PRICE SHALL BE GIVEN IN THIS PART-II "PRICE BID". **EMD SHALL NOT BE INCLUDED IN THIS COVER.**

THESE TWO SEPARATE COVERS-I AND II (PART-I AND PART-II) SHALL TOGETHER BE ENCLOSED IN A THIRD ENVELOPE (COVER-III) ALONGWITH REQUISITE EMD AS INDICATED EARLIER AND THIS SEALED COVER SHALL BE SUPERSCRIBED AND SUBMITTED TO ADDL. GEN MANAGER (PURCHASE) AT THE ABOVE MENTIONED ADDRESS ON OR BEFORE THE DUE DATE AS INDICATED.

THE QUALIFIED TENDERER WILL BE INTIMATED SEPARATELY ABOUT THE STATUS OF THEIR OFFER.

TENDERER ARE REQUESTED TO MAKE SPECIFIC NOTE OF THE FOLLOWING CONDITIONS:

- CONTRACTOR SHOULD HAVE ADEQUATE RESOURCES INCLUDING MAJOR T&PS AT HIS DISPOSAL FOR THIS JOB.
- CONTRACTOR SHOULD HAVE SOUND FINANCIAL STABILITY.
- TENDERER SHOULD MEET QUALITY REQUIREMENT REGARDING WORKMANSHIP, DEPLOYMENT OF PERSONNEL, ERECTION TOOLS AND NECESSARY INSPECTION, MEASUREMENT & TESTING INSTRUMENTS.
- ALL INFORMATION AS CALLED FOR IN VARIOUS APPENDICES AND CLAUSES OF TENDER SPECIFICATION SHOULD BE FURNISHED IN COMPLETENESS. PLEASE REFER THE CHECKLIST.
- CLARIFICATION ON TENDER IF ANY, SHALL BE OBTAINED BY THE TENDERER BEFORE SUBMITTING THEIR OFFER.
- OFFERS MUST BE SUBMITTED WITHOUT ANY DEVIATION.
- OFFERS RECEIVED WITH ANY DEVIATION OR WITHOUT RELEVANT INFORMATION AS DESCRIBED ABOVE ARE LIABLE TO BE REJECTED. PRICE BIDS RECEIVED IN THE FORM OTHER THAN SPECIFIED IN PART-II (PRICE BID) ARE LIABLE TO BE REJECTED.
- In case customer approval is required for this package, bidder's offer will be accepted subject to approval of bidder by customer.

NOTICE INVITING TENDER

Sealed tenders are invited in two bid system (viz. Part-I: Technical cum Commercial Bid and Part-II : Price Bid) from bidders meeting Qualifying Requirements (QR) as specified later in this NIT. Brief details of job and Tender Specification (T.S.) No. are as under.

T. S. No. – BHE/PW/PUR/PIPVG-ELE/738

Handling at Storage Yard/ Stores, Transportation to Site, Calibration, Erection, Testing, Commissioning, Final Painting and Handing Over of Electrical Works of 2x351.43 MW Combined Cycle Power Plant comprising of HRSG, Frame 9FA Gas Turbine, Steam Turbine and their Auxiliaries, Piping etcat GSPC PIPAVAV POWER COMPANY LIMITED VILL-KOVAYA (NEAR PIPAVAV), TALUKA: RAJULA,

DIST- AMRELI (GUJARAT)

- **Issue of T. S. Documents: from 28/05/2010 to 17/06/2010 16.00 Hrs ***
- **Last Date for Tender Submission: 18/06/2010 15.00 ***
- **Date of Opening Technical Bid: 18/06/2010 16.00 HRS ***

Earnest Money Deposit (EMD) : Rs 2.00 LAKHS

* : Prospective bidders to obtain latest update of these dates from our web page www.bhel.com → Tender Notifications → View Corrigendum

---

- Tender Specification documents with complete details are hosted in web page (www.bhel.com). Bidders can directly download the same and use for submission of offer. Tender Document charges shall be paid to BHEL along with or before submission of Offer.
- Interested bidders may alternately collect hard copy of T.S. documents from this office on all working days within the sale period on payment of Tender Document charges.
- Tender Specification Document Charges: Rs. 2,000/- by DD (in favour of BHEL payable at Nagpur) or cash. Courier charges will be Rs. 500/- extra if T.S. documents are requested through courier.
- BHEL takes no responsibility for any delay/loss of documents or correspondences sent by courier/post.
- Bidders who have deposited One Time EMD of Rs. 2.00 Lakhs with BHEL:PSWR:Nagpur will be exempted from submission of EMD with these tenders.
- BHEL reserves the right to accept or reject any or all tenders without assigning any reasons whatsoever.
- BHEL will operate Purchase Preference Policy of the Government of India as applicable.
- Tenderers whose bids are found techno commercially qualified shall be informed the date and time of opening of the Price Bids.
- All corrigenda, addenda, amendments and clarifications to Tender Specifications will be hosted in this web page (www.bhel.com → Tender Notifications → View Corrigendum) and not in the newspaper. Bidders shall keep themselves updated with all such amendments.
- BHEL reserves the right to reject any tender on the basis of unsatisfactory performance of the bidder in any ongoing job or any similar job in the last seven years or for furnishing false information/declaration in the offer

NOTICE INVITING TENDER

Qualifying Requirements (QR)

Bidder must fulfill the Qualifying Requirements as under in order to be considered as technically qualified for this Tendering process

a) Bidder must have achieved any one of the following

a1) Executed in the last seven (7) years as on 30/04/2010, any one of the following listed work of Erection, Testing and Commissioning of Main plant Electrical System consisting of HT Panels, HV Transformers (11kV or above) work in any Power Plant or any Industry:

a1.1) One similar job of at least Rs. 316 lakhs value in a single order.

OR,

a1.2) Two similar jobs of at least Rs.198 lakhs value per job.

OR,

a1.3) Three similar jobs of at least Rs. 158 lakhs value per job.

OR,

a2) Executed in the last seven (7) years as on 30/04/2010 , E, T, C of Electrical works (up to synchronization of the unit or beyond) consisting of HT Panels, HV Transformers (11kV or above) in 1 unit of 190MW or higher in a Thermal Power Plant.

OR

a3) Bidder should have been Techno Commercially Qualified for Main Plant Electrical Package for one unit of 350 MW or higher CCPP, by any Power Sector Region of BHEL, in the last 3(Three) years as on 30/04/2010.

OR

a.4) Bidder should be empanelled with BHEL-PSWR for E-EE-3 (Electrical works of Value between 300 Lakhs to 500 LAkhs) category.

AND

b) Bidder must have achieved average financial turnover (Audited) of Rs 119 Lakhs per year over last three financial years i.e. 2007-08, 2008-09, & 2009-10 **OR** 2006-07, 2007-08 & 2008-09 if Accounts for FY 09-10 has not been audited.

AND

c) Net worth of the Bidder based on the latest Audited Accounts as furnished for 'b' above should be higher than 50% of the Paid-up Capital in case of companies

AND

d) Bidder must have earned cash profit in any one of the three Financial Years as applicable in case of 'b' above based on latest Audited Accounts.

==========

Explanatory Notes for QR 'a'

1. The word 'executed' means the bidder should have achieved the criteria specified in the QR even if the total contract has not been completed or closed
2. The word 'similar job' means the work of HT Panels, HV Transformers (11kV or above) work in any Power Plant or any Industry:

GENERAL

1) **Timing of sale of Documents:** Tender Specification documents will be issued from BHEL PSWR Nagpur office from 10:00 AM to 4:00 PM on all working days within the period specified in the NIT.

2) **Holidays:**
Sale of Tender Documents shall not take place on National Holidays, holidays declared by the Central or State Governments, Sundays, second and last Saturdays and holidays of BHEL PSWR Nagpur HQ.

3) **Seeking Clarifications on Tender Specification:**
Clarifications on the Tender Specifications, if any, may be sought by the bidders so as to reach this office at least **seven days before the Due Date** for submission.

4) **Fulfillment of Qualifying Requirements:**
A bidder must satisfy **all the Qualifying Requirements** stipulated under 'a', 'b' etc of this tender concurrently in order to get qualified.

5) **Customer Approval**: In case customer approval is required for this package, bidder's offer will be accepted subject to approval of bidder by customer.

6) **Supporting Documents:**
Bidders shall submit documents in support of possessing "Qualifying Requirements" as under duly self-certified and stamped by the authorized signatory.
   - List of jobs done with Name of the Project, Owner of Project, Name of Customer, Work Order Ref. No. & Date, Brief Details of Job, Executed Value, Date of Start, Date of Completion.
   - Photocopies of Work Orders issued by the Customer containing details of Bill of Quantities/Schedule of Rates.
   - Empanelment certificate issued by BHEL-PSWR
   - Photocopies of Completion Certificate issued by Customer or Owner of Project.
   - Photocopies of audited Profit and Loss accounts accompanied by relevant schedules for turnover figures.

7) **Earnest Money Deposit (EMD):** Refundable, Non-interest bearing EMD for each tender is indicated against each job earlier here. Bidders may also opt to deposit "One Time EMD" of Rs. 2.0 lacs and thus be exempted henceforth from payment of EMD with each Erection and Commissioning tender of BHEL-PSWR Nagpur. EMD shall be paid ONLY by **Account Payee Demand Draft** in favour of "Bharat Heavy Electricals Limited" payable at Nagpur.

   Those bidders who have already deposited 'One Time EMD' earlier need not submit EMD with the present tenders. Please indicate the payment details of the 'One Time EMD' in each tender.

8) **Tender Document Cost and Courier Charges:**
Tender document charges @ Rs 2000/- per set and courier charges @ Rs 500/- per set shall be made by Account Payee Demand draft in favour of "Bharat Heavy Electricals limited" payable at Nagpur or in cash payable at cash counter of this Office. Courier charges shall be paid in case bidders requests for dispatch of Tender specifications by courier. In case bidder downloads the Tender specifications etc from web page, they

shall remit the Tender document charges (Rs 2000/-) positively along with or before submission of offer.

9) **Liquidated Damages/Penalty:** BHEL will impose Liquidated Damages and Penalty as per suitable clauses in the respective Tender Specifications on account of delay, violation of contract conditions and non-performance attributable to the contractor.

10) LATE TENDER: Tender received after the specified time of submission shall not be considered in any circumstances.

11) **BHEL may resort to the process of REVERSE AUCTION (on Line bidding) among the bidders who are found to be qualified on the basis of Technical Bid and approval of customer. Details of Reverse Auction process are furnished in Section 18 of SCC under title "Reverse Auction Procedure". Date of Reverse Auction/On-line bidding shall be intimated to all techno-Commercially qualified bidders later. In case the option of Reverse Auction/On-line bidding is not exercised by BHEL, the sealed price bid of technically qualified bidders shall be considered for further processing of the offer and evaluation**.

12. Tenders Submitted By Hand

Tenders being Submitted through representative shall be handed over to any of the following BHEL offcials after making entry/registration at the reception:

1. SM Borkar/ Sr Manager (Purchase)
2. RK Ranade/ Manager (Purchase)
3. Vivek Kamal/ Engineer(Purchase)
4. Pratish Gee Varghese/Engineer(Purchase)

Sr. Dy. General Manager (Purchase)

BHEL:PSWR:Nagpur

PROJECT INFORMATION

INTRODUCTION

GSPC PIPAVAV POWER CO. Ltd. is going to install 2x351.43 MW Gas Based Combined Cycle Power Plant (CCPP). The entire work of this project have been awarded to BHEL on total turn-key basis (EPC Contract) comprising of Design, Engineering, Manufacturing, Supply, transportation, Unloading, Storage, erection, testing, Commissioning with Auxiliaries and ancillaries including civil & structural works and handing over as per contract.

Contractor is advised to visit the site and appraise himself about the conditions of the site and infrastructure available in the area for fulfilling their commitment under the contract.

APPROACH TO SITE

Location:

In Amreli District of Gujarat State, Latitude 71º 16' N / Longitude 20º 54' E
The site is a PIPAVAV Plant of GSPCL in Amreli District of State of Gujarat.

Access by Road:
PIPAVAV is connected by road from State Highway NH 34 running between Rajula and Jafrabad.

Nearest Railway Station: Rajula

Nearest Airport: Diu (80 kms) / Ahmadabad (375kms by road)

Nearest Seaport: Pipavav (35 kms)

1. **Owner** GSPC PIPAVAV POWER COMPANY Ltd (GPPC)
2. **Project Title** 2X351.43 MW PIPAVAV CCPP
3. **Location** Village: Kovaya Near Pipavav Taluka: Rajula, Distt: Amreli, Gujarat, India
4. **Nearest Railway Stn.** Rajula

METEOROLOGICAL DATA

5. Ambient Air Temperature

a. Highest ever temperature recorded (Dry Bulb) 43 Deg.C

b. Lowest ever temperature recorded (Dry Bulb) 10 Deg.C

c. Maximum Daily Average (Dry Bulb) 33 Deg C

d. Average Mean temperature

(Dry Bulb) : 33 deg C (For CCPP Performance)

e. Average Mean temperature

(Wet Bulb) : 28 deg C (For CCPP Performance)

f. Average Mean temperature

(Wet Bulb) : 28.5 deg C (For Cooling Tower Performance)

g. Design Ambient for Electrical Equipment 50 deg C

6. Relative Humidity

a. Maximum 89%

b. Minimum 10%

c. Average 70%

7. Rainfall

a. Annual Average – 1050 mm in the period June to October. Maximum intensity of rainfall; 150 mm/hr continuously maximum rainfall in a day – 400mm.

8. Wind Data

a. 16.5 km/hr (Normal)

9. Seismic Zone - Zone III as per IS: 1893-2005 (Part – IV)

10. Fuel - Degasified Liquefied Natural Gas(RNLG)

11. Ambient Air Quality - The site is located close to Kovaya village and is bordering Birla group Cement plant and colony .This area is classified under semi-urban area.

The bidder is advised to visit and examine the site of WORKS and its surroundings and obtain for himself on his own responsibility all information that may be necessary for preparing the bid and entering into the CONTRACT. All costs for and associated with site visits shall be borne by the bidder.

CHECK LIST

(VIDE PARA 1.3 OF SECTION-I OF GENERAL CONDITIONS OF CONTRACT)

1	NAME OF THE TENDERER WITH ADDRESS		
2	NATURE OF THE FIRM	LIMITED / PARTNERSHIP / PROPRIETARY	
3	EMD DETAILS (Rs. 2.0 LACS BY DD ONLY OR ONE TIME EMD)		
4	VALIDITY OF OFFER (REQUIRED 6 MONTHS FROM TENDER OPENING DATE)		
5	MOBILIZATION TIME (NOT EXCEEDING 30 DAYS FROM FAX LOI)		
6	WHETHER NO DEVIATION CERTIFICATE FURNISHED	YES	NO
7	TENDERER HAS VISITED THE PROJECT SITE AND ACQUAINTED WITH THE SITE CONDITIONS	YES	NO
8	DETAILS OF CONCURRENT JOBS ARE FURNISHED (AS PER RELEVANT APPENDIX)	YES	NO
9	HEAD QUARTER'S ORGANISATION IS FURNISHED	YES	NO
10	PROPOSED SITE ORGANISATION IS FURNISHED	YES	NO
11	FINANCIAL STATUS OF THE COMPANY (ANNEXURE 'A' OF GCC) IS FURNISHED	YES	NO
12	MANPOWER DEPLOYMENT PLAN (AS PER RELEVANT APPENDIX) IS FURNISHED	YES	NO
13	MONTHWISE DEPLOYMENT PLAN FOR MAJOR T&P (AS PER RELEVANT APPENDIX) IS FURNISHED	YES	NO
14	ANALYSIS OF UNIT RATES QUOTED (AS PER RELEVANT APPENDIX) IS FURNISHED	YES	NO
15	POWER OF ATTORNEY ENCLOSED IN FAVOUR OF PERSON MAKING OFFER.	YES	NO
16	PROGRAMME FOR THE SUBJECT WORK FURNISHED	YES	NO
17	BIDDER HAS FMILIARIZED HIMSELF WITH ALL RELEVANT LOCAL LAWS & CONDITIONS.	YES	NO

18	WHETHER ALL THE PAGES OF THE TENDER DOCUMENTS ARE READ, UNDERSTOOD AND SIGNED	YES	NO
19	WHETHER THE FOLLOWING DETAILS PERTAINING TO YOUR BANK ACCOUNT DULY ENDORSED BY THE BANK HAVE BEEN FURNISHED {TO ENABLE BHEL RELEASE PAYMENTS THROUGH ELECTRONIC FUND TRANSFER (EFT/RTGS) AS SPECIFIED IN SECTION 12 } 1. Name of the Company 2. Name of Bank 3. Name of Bank Branch 4. City/Place 5. Account Number 6. Account type 7. IFSC code of the Bank Branch 8. MICR Code of the Bank Branch NOTE: In case Bank endorsed certificate regarding above has already been submitted earlier, Kindly submit photocopy of the same	YES	NO

NOTE : STRIKE OFF YES OR NO, AS APPLICABLE

DATE : SIGNATURE OF TENDERER

DECLARATION BY BIDDER

I, ... hereby certify that all the information and data furnished by me with regard to the Tender Specification No. BHE/PW/PUR/PIPVG-ELE/738 is true and complete to the best of my knowledge. I have gone through the specifications, conditions and stipulations in detail and agree to comply with the requirements and intent of the specification. **I further certify that I am duly authorized representative of the under-mentioned bidder and a valid power of attorney to this effect is also enclosed**.

Authorized representative's signature with
Name and address

Date:

Bidder's Name and Address

CERTIFICATE OF NO DEVIATION

Tender Specification No. BHE/PW/PUR/PIPVG-ELE/738

I/WE, M/s .....

HEREBY CERTIFY THAT NOTWITHSTANDING ANY CONTRARY INDICATIONS/ CONDITIONS ELSEWHERE IN OUR OFFER DOCUMENTS, I/WE HAVE NEITHER SET ANY TERMS AND CONDITIONS NOR THERE IS ANY DEVIATION TAKEN FROM THE CONDITIONS OF BHEL'S TENDER SPECIFICATIONS, EITHER TECHNICAL OR COMMERCIAL, AND I/WE AGREE TO ALL THE TERMS AND CONDITIONS MENTIONED IN BHEL'S TENDER SPECIFICATION WITH ASSOCIATED AMENDMENTS AND CLARIFICATIONS.

Date:

Signature and Official Seal of Bidder

SECTION – 3
OFFER OF THE CONTRACTOR

To,
DGM (Purchase)
Bharat Heavy Electricals Limited
Power Sector - Western Region
Shreemohini Complex
345, Kingsway
Nagpur - 440 001

Dear Sir,

I/we hereby offer to carry out the work detailed in tender specification no. BHE/PW/PUR/PIPVG-ELE/738 issued by Bharat Heavy Electricals Limited, Power Sector-Western Region, Nagpur, in accordance with the terms and conditions thereof.

I/we have carefully perused the following documents connected with the above work and agree to abide by the same.

1. Instructions to bidders
2. General conditions of contract
3. Special conditions of contract
4. Other sections, appendices, schedules and drawings.

I/WE HAVE DEPOSITED / FORWARDED HEREWITH THE EARNEST MONEY DEPOSIT FOR A SUM OF RS. 2,00,000/- (RUPEES TWO LAKH ONLY) DETAILS OF EMD PAYMENT ARE FURNISHED IN THE CHECK LIST.

EMD shall be refunded should our offer not be accepted / EMD **need not be refunded and the amount may be treated as "one time EMD" for erection and commissioning tenders of BHEL-PSWR, Nagpur**. Should our offer be accepted, i/we further agree to deposit security deposit for the work as provided for in the tender specification within the stipulated time as may be indicated by BHEL, Power Sector-Western Region, Nagpur.

I/we further agree to execute all the works referred to in the said documents upon the terms and conditions contained or referred to therein and as detailed in the appendices annexed thereto.

Place: Signature of Bidder:
Date: Address:

Witnesses with their Address

Signature	Name	Address
1.		
2.		

SECTION – 4

SPECIAL CONDITIONS OF CONTRACT

4.0 SCOPE OF WORK:

4.0.1

The Scope of Work Under These Specifications Covers The Complete Work of Handling of Storage Yard/Stores, Transporting to site, Calibration, Pre-Assembly, Erection, Pre-Commissioning Checks & Tests, Commissioning and Handing Over of Electrical Works of 2X 351.43 MW Combined Cycle Power Station having:

- 2 x Frame 9 FA Gas Turbine and its Auxiliaries
- HRSG and It's Auxiliaries
- Steam Turbine and its Auxiliaries
- Piping
- Electrical items

The Scope of Work, in general, covers Electrical System of Gas Turbine, HRSG, Steam Turbine, Generator Transformers, Bus Duct, Auxiliary Systems like Lube Oil and Jacking Oil System, Regenerative and Feed Cycle, EHTC and AVR and HRSG, Turbine & Generator Supervisory Controls, Electrical Systems, Lighting Etc.

The Work Shall Conform to dimensions, Limits, and Tolerances specified in various Drawings/ Documents that will be provided during the Erection/ Commissioning including final Painting of all equipments included in this work.

The work under this scope being quite sophisticated and also quite extensive, for proper planning, monitoring, reporting, etc of ongoing works, the contractor shall establish his own computer(s) and printer(s) at his site office, along with suitable operator(s), consumables, etc.

The scope of work is further detailed in the specifications hereinafter.

4.0.2

The work covered under this specification is of highly sophisticated nature, requiring the best quality of workmanship, engineering and construction management. The contractor should ensure timely completion of work. The contractor must have adequate quantity of tools, measuring instruments, calibrating equipment etc. in his possession. He must also have on his rolls adequately trained qualified and experienced engineers, supervisory staff and skilled personnel. The manpower deployment identified by contractor should match requirement of sophistication involving microprocessor-based systems.

4.0.3

The intent of specification is to provide erection services according to the most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for proper and efficient erection and commissioning of the plant shall not relieve the contractor of the responsibility of providing such facilities to complete the work without any extra compensation.

4.0.4
The terminal points decided by BHEL shall be final and binding on the contractor for deciding the scope of work and effecting payment for the work done.

4.0.5
The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The contractor and his personnel shall cooperate with personnel of customer's, contractor's, coordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

4.0.6
Contractor shall erect and commission all the equipments and auxiliaries as per the sequence & methodology prescribed by BHEL. The BHEL engineer depending upon the technical requirements, availability of materials and fronts will decide this. No claims for extra payment from the contractor will be entertained on the ground of deviation from the methods adopted in erection of similar sets elsewhere.

4.0.7
All necessary certificates and licenses, permits & clearances required to carry out this work are to be arranged by the contractor expeditiously at his cost.

4.0.8
All tools, tackles, fixtures, equipments, materials handling and transportation except those specifically to be provided by BHEL, manpower, supervisors/ engineers, consumables etc., required for this scope of work shall be provided by the contractor. These tools & plant, equipments, men & material shall remain at site throughout the duration of contract and extension thereof, if any. Diversion/removal of these shall be done only on the approval of BHEL. for further details refer sections-5, 6 & 7.

4.0.9
During the course of erection, testing and commissioning certain rework/ modification/ rectification/ repair/ fabrication etc., will be necessary on various accounts. Contractor shall carry out such rework/ modification/ rectification/ fabrication/ repair etc., promptly and expeditiously. The contractor shall maintain daily log sheets signed by BHEL engineer and indicating the details of work carried out, man-hours. Claim of contractor if any, for such works will be governed by clauses 13.1 to 13.8.

4.0.10
All works such as cleaning, levelling, aligning, trial assembly, dismantling of certain equipments/ components for checking and cleaning, surface preparation, fabrication of sheets, tubes and pipes as per general engineering practice and as per BHEL engineer's instructions at site, cutting, weld depositing, grinding, straightening, chamfering, filing, chipping, drilling, fitting up etc., as may be applicable in such erection works and which are treated incidental to the erection works and necessary to complete the work satisfactorily, shall be carried out by the contractor as part of the work.

4.0.11

The contractor shall take delivery of the components, equipments, chemicals, and lubricants from the BHEL stores/ storage yard. Complete and detailed account of these shall be submitted to the BHEL.

4.0.12

Contractor shall plan and transport equipments, components from storage to erection site so as to avoid material accumulation at site. Contractor shall stack materials neatly at site and his stores. Where necessary, materials at site may have to be shifted and re-stacked for various reasons as incidental to work.

4.1 WELDING, NON-DESTRUCTIVE TESTING ETC.

A) Installation of equipment involves good quality welding, NDE checks etc.

B)

1) Welding of high pressure joints shall be done by IBR certified high pressure welders who have been permitted by CIB of concerned state for deployment at site of work.

2) Welding of all attachments to pressure parts, piping shall be done only by the qualified and approved welders.

C) All the welders (structural and high pressure) shall be tested and approved by BHEL engineer before they are actually engaged on work though they may possess the IBR/Other certificate. BHEL reserves the right to reject any welder without assigning any reason.

D) The welded surface shall be cleaned of slag and painted with primer paint to prevent corrosion. For this, paint will be supplied by the contractor.

F) Welding electrodes have to be stored in enclosures having temperature and humidity control arrangement. This enclosure shall meet BHEL specifications. Certain types of coated welding electrodes, prior to their use, call for baking for specified period and will have to be held at specified temperature for specified period. Also, during execution, the coated welding electrodes have to be carried in portable ovens.

4.2 TESTING, PRE-COMMISSIONING, AND COMMISSIONING:

4.2.1
Testing, pre-commissioning, & commissioning will involve, though not limited to these: setting/adjusting, Testing, proving, trial runs, etc. of various equipments and systems installed. All the activities for commissioning of the set, as informed by BHEL from time to time shall be completed.

4.2.2
All the above tests should be repeated till all the equipments satisfy the requirement/ obligations of BHEL to their client and also the relevant statutory authorities.

4.2.3
The contractor shall immediately attend to defects noticed during tests, trial runs, pre-commissioning, commissioning such as loose components, undue noise or vibration, strain on connected equipment etc. Readjustment and realignment as called for shall be done as per BHEL's instructions. Claim, if any, for these works from the contractor shall be governed by clauses 13.1 to 13.8.

4.2.4
i) Contractor shall cut/open work, if needed, as per BHEL engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over.

ii) Similarly, during the course of erection, if certain portion of equipment's erected by the contractor has to be undone for enabling other contractors/agencies of BHEL/customer to carry out their work, contractor shall carry out such jobs expeditiously and promptly and make good the job after completion of work by other contractor's/ agencies of BHEL/customer as per BHEL engineer's/agencies of BHEL/customers instructions. Claims, if any, in this regard shall be governed as per clauses 13.1 to 13.8.

Iii) Certain instruments may have to be installed temporarily/ in temporary installations for specific requirements. Contractor shall install, after due calibration if required, such instruments for which payment shall be regulated as per respective item rates. Contractor shall remove these instruments and return to BHEL/Client's stores after the use. No separate payment will be made for removal and returning of such instruments.

4.2.5
The testing/calibration / commissioning activities shall start prior to synchronization of GTG and STG sets. The contractor shall provide adequate manpower, including supervision, of required skill level in various area of work with necessary consumables, tools and tackles etc., as part of commissioning till handing over of the unit to BHEL's customer.

4.2.6
It shall be specifically noted that the contractor may have to work round the clock during the pre-commissioning and commissioning period alongwith or without BHEL engineers and

hence considerable overtime payment is involved. The contractor's quoted rates shall be inclusive of all these factors. Also please refer 4.12.

4.2.7
The contractor shall carry out any other tests as desired by BHEL engineer on erected equipment covered under the scope of this contract during testing, pre-commissioning and commissioning, to demonstrate the completion of any part or whole of work performed by the contractor.

4.3 GENERAL RESPONSIBILITY OF THE CONTRACTOR

4.3.1 **Preservation & protection of components**
Contractor shall at all stages of work preserve equipments/materials in his custody, including those erected. Necessary preservation agents, except the primer & paint, for the above work shall be provided by BHEL.

4.3.2
The contractor shall make suitable security arrangements including employment of security personnel and ensure protection of all materials/equipment in their custody and installed equipments from theft/fire/pilferage and any other damages and losses.

4.3.3
Contractor shall maintain good house keeping & collect all scraps/unused materials/packing etc periodically from various areas of work site, dispose the same at one place earmarked at site or shift the same to a place earmarked in BHEL / client's store. ***1% value of each RA bill will be earmarked against compliance of the above, to be released only on satisfactory collection and deposit of scrap as stated above. In case of failure of contractor to comply with this requirement, BHEL will make suitable arrangement at contractor's risk and cost. In such case, any expenditure over and above the withheld 1% amount will also be recovered suitably from the RA bills of vendor.***

4.3.4
The contractor shall not waste any materials issued to him. In case it is observed at any stage that the wastage/excess utilization of materials is not within the permissible limits, recovery for the excess quantity used or wasted will be effected with departmental charges from the contractor. Decision of BHEL on this will be final and binding on the contractor.

4.3.5 Wastage allowance

Power and control/ instrument signal cables:

The erection contractor shall make every effort to minimize wastage during erection work. In any case, the wastage shall not exceed the following limits;

Power Cables **1.5%**

Control & Instrumentation Cables	**2.0%**
Fabrication steel	**2.0%**

If however, the bidder quotes for more wastage than specified above, the excess portion will be considered for adjustment during the tender evaluation at the quoted supply rate of material.

If the actual wastage be more than the specified figure, then equivalent price of the excess portion will be deducted from the contractor's bill.

Cable cut-pieces in lengths 10 m & above in both the above categories will be considered as useable and shall be taken in to account for computing net issued quantity when returned to BHEL stores/storage yard.

4.3.6

For any items or class of work not specified herein but required for total completion of work, the same shall be carried out as per BHEL requirement. However, payment of these items/class of work shall be regulated on the basis of rate arrived at by either of the following methods:

a) Based on rate of identical/similar items in the rate schedule.

b) Based on the rate arrived from nearby items in the rate schedule.

Wherever any item rate for similar type of work or nearby item rate does not exist in the rate schedule, rate will be worked out on the basis of work element or from fundamentals of estimation.

Contractor shall provide necessary resources for completion of such work within the stipulated time schedule. Value of such work shall be included while computing the total value of work finally executed for all contractual purposes, particularly for contract variation purpose.

4.4 FINAL PAINTING

4.4.1

The contractor shall provide all the primer, paint, and other consumables like brush, cleaning agents etc. All T&P, manpower, supervision is in contractor’s scope. Painting shall be carried out as per colour scheme approved by BHEL/ BHEL customer.

4.4.2

All equipment including piping, supports, structures, etc., as applicable shall be painted after thoroughly cleaning the surface from dust, rust, grease, oils, scales, swarf etc, by wire brush, scrapping, emulsion cleaning etc as specified in ANNEXUREII. The above parts shall then be painted with two coats of synthetic enamel paint over the shop primer/paint. Also, where the shop primer/paint has peeled off, the affected area shall be cleaned thoroughly by the specified method and then primed. Similarly, certain components may be supplied without any primer/paint coat from shop. The surface of such items shall be cleaned as per specifications in annexure II, primed with suitable primer and then coated with final paint coats. The dry film

thickness after final coat should be as per specification. The colour, shade etc; shall be as per specification. Primer and paint shall be sourced only from the following manufacturers or any other manufacturers approved by BHEL.

1) Berger Paints (I) Ltd.
2) Asian Paints ltd.
3) Goodlass Nerolac Paint Ltd.
4) Jenson & Nicholson Ltd.
5) Shalimar paints Ltd.

In order to have consistency in painting system, it is preferable that all the supplies are sourced from one single manufacturer.

The primer shall be compatible with the final coat paint schedule.

All the fabricated frames, racks, supports, panel base frame etc. wherever applicable shall be painted primer and with two coats of paint as specified in annexure II.

Touch-up painting of switchgear panel, 415 Volt LT MCC, Control Panels or any other equipment /devices wherever necessary.

Full painting of transformers, bus ducts with two coats of paint as per specification.

Irrespective to scopes of painting & supply of paint mentioned elsewhere it is to be noted that supply of paint, primers, other consumables etc for all primer/painting works to be done by the contractor, shall be in Contractor's scope. No dispute shall be entertained on the above matter.

4.4.2.1 TRANSFORMERS & BUS DUCTS

Transformers and Bus Ducts erected by the contractor shall be painted with two coats of Finish Paint after thoroughly cleaning the surface from dust, rust, greases, oils, scales, by wire brush, scrapping, machine buffing, water washing and any other appropriate method as specified in relevant in annexure II. Bus Ducts shall first be coated with two coats of Primer before application of Finish Paint.

Colour Banding, Legend and Identification Marking, Direction Marking etc. shall be in scope of the contractor.

4.4.2.2 STRUCTURALS

Structural components may be supplied without any primer/paint coat from shop. The surface of such items shall be cleaned as per specifications in annexure II and then coated with two coats of Primer.

4.4.2.3 PANELS, JUNCTION BOXES

Panels and Junction Boxes shall be Touch-up painted as and where original shop paint is peeled off. Necessary surface cleaning and preparation shall be done by the contractor as per relevant painting codes followed by two coats of Primer and two coats of Finish Paint.

4.4.2.4 Primers, Paints etc.

The contractor shall provide the Primer (ROZC as per IS:2074) for the scope of painting work indicated in Section-4 as well as for protection of site weld joints and gas cut locations. Contractor shall also arrange to provide the required thinner and other consumables, T&P etc required for application of ROZC Primer. All paints and thinners shall be sourced only from BHEL approved manufacturers.

4.4.3
In addition, colour banding, legend and identification marking; direction of flow/rotation marking etc. is part of the work.

4.4.4
Contractor shall ensure that all steel structure used for electrical installation shall be painted with one coat of Red Oxide Zinc Chromate primer and two coats of Aluminium Alkyd paints of approved shade for indoor installations. However, for outdoor installations and corrosive areas like Battery room / DM plant etc, contractors shall carry out hot dip Galvanisation.

4.5 The contractor's scope of work is further described in the clauses hereafter:

The work will comprise of, *but not limited to the following:*

4.5.1 Installation of panels and HT/LT Switchgear

A. Electrical control panels, Electronic Control panels, Unit Supervisory Control DESK, HT/LT Switchgear, 415 Volt LT MCCS, Analyser Panels and Transmitter racks/enclosure are normally supplied in suit of either one/two/three or loose shipping sections with integral base frame or loose base frame. These panels may have to be installed as stand-alone or in-group consisting of number of panels in each row, depending upon the plant layout and foundation arrangement.

B. The panels shall be transported from stores to the place of installation in vertical position. Care shall be taken such that the Switches, Lamps, Instruments etc. mounted on the panel does not get damaged during transit.

C Installation of panel shall include fixing of base frame, levelling, alignment, fixing of anti-vibration pads, removal of side covers, fixing of cubicle interconnection hardware's, Bus bar jointing, wiring interconnection, Welding and Grouting of panels and base frames, mounting of panel Canopy wherever supplied as part of panel, drilling of gland plates, sealing of panels/ cable entries. Where the base frame is not supplied as part of panel supply, the contractor shall fabricate the base frame from structural items at site. Payment for such fabrication will be effected on measured quantity at the rate applicable for structural steel fabrication and installation. Special material required for fireproof sealing of the panels shall be

supplied by the contractor within the quoted rates. Proper sealing of all the holes and Cable entries (even if the cable has been laid by others) in the panel is in the contractor's scope.

D Panels have to be shifted to their locations through floor openings, temporary openings like floor grills, door etc. which shall be a part of work and no claim whatsoever will be entertained with regard to non-availability of opening as per shortest route etc. Panels have to be erected at different locations and elevation in HRSG, SGTG and STG Hall, LT & HT Switchgear room, Unit Control Room etc.

E Panel and instruments once erected in position should be properly protected using necessary care to prevent ingress of dust/moisture. This will have to be periodically cleaned and surroundings have to be kept tidy.

F Whenever the panels to be mounted on cable trenches, channel supports have to be provided across the cable trench over which the base frame of panel shall be mounted. For such work, Structural Steel fabrication & installation rate shall be applicable.

G **Normally the panels shall be supplied with meters, relays, electronic modules, contractors, pushbuttons etc mounted and pre-wired. However, if such devices are supplied loose/separately for safety in transit, contractor shall mount the same, as part of panel installation work and no extra payment shall be made for this.**

H Supplier's instruction manuals, packing slips, door keys etc. Received along with the panels will be handed over to Customer through BHEL's engineer on opening of the panels.

I Regular cleaning of the panels as per the instruction of BHEL engineer till handing over of the set to customer is to be carried out by the contractor free of cost.

J **Interposing Relays (24 / 48 Volt DC) along with mounting base shall be supplied separately for mounting in the various feeders of 11KV / 6.6 KV HT switchgear boards and 415 Volt MCC Board / Switchgear Panel Boards for uni-directional / bi-directional drives, solenoid valves. 2 Nos. interposing relay are required to be mounted in each feeder. Internal wiring for these relay shall be pre-wired in the feeders, wires to be terminated on relay terminals. Approximately quantity is 1700 Nos. Contractor shall mount the same and terminate the wire as part of panel installation work and no extra payment shall be made for this work.**

4.5.2 STRUCTURAL STEEL FABRICATION AND INSTALLATION

A Structural steel material like MS angles, channels, beams, flats, plates etc. shall be supplied in running meter and the same shall be used for fabrication of panel base frame, cable tray supports, Canopies for instruments/panels/ drives/JB's/Push Buttons etc., Instrument/Junction box frames, Impulse Pipe/Instrument Air Pipe supports and instruments etc.

B This shall include cutting to size, contouring of ends for connections if required, Welding, Grinding of excess weld deposits/burrs, drilling of holes for mounting of device/instrument, installation at location, levelling, alignment, providing bracings and painting etc. No gas cut holes will be permitted.

C All the fabricated supports/frames for instruments, trays, pipes, electrical equipments, etc., shall be epoxy painted after sand blasting and surface preparation as per painting specifications. Paints and other associated items are in the scope of the contractor.

D Frame installation at site may involve mounting either on concrete floor by grouting/using anchor fasteners or on steel structure by welding etc. All consumables including anchor fasteners shall be arranged by the contractor. Where required, as part of work, concrete floors may have to be chipped out to reinforcement depth for anchoring the frames. Wherever grouting is required, contractor shall arrange all the required material including cement/grout mix, shuttering, labour etc., and meet all other requirements as part of work.

E In certain packages, members of frames/rack for mounting of junction boxes/ instruments may be supplied readymade. These have to be assembled prior to installation. The installation rate as quoted shall include assembly of the frames.

F Gas cutting of tray/impulse pipe support and holes in frame is not permitted. Only hacksaw cutting/ drilled hole shall be permitted.

4.5.3 CABLE TRAYS/CABLE DUCTS

A Various types of sheet metal, Galvanised Cable Tray, i.e. Perforated, Ladder type, sheet metal duct, solid bottom trays, pre-fabricated structural trays etc., will be supplied in standard lengths along with accessories and hardware viz coupler plate, tray covers and tray clamps etc.

B Installation of cable tray/cable duct shall include cutting, laying, jointing, fixing tee/reducers/ bends/clamps, fixing of tray covers, hardware, welding of tray supports as per tray route layout etc.

C Fabrication of bends/tee/ reducers from straight length is within the scope of work and rate quoted shall be inclusive of this. All site welds of cable trays shall be painted with approved primer and cold galvanizing paint, which shall be arranged by the contractor.

D In case, structural cable trays, bends, tees, reducers etc., are required to be fabricated from structural steel and installed, unit rate applicable for fabrication and installation of structural steel shall be applicable in such instances.

E Cable trays/duct etc may have to be routed underground in cable trench, overhead on structure, along the walls, floors etc. for various applications.

4.5.4 Cable Laying (Power / Control / Instrumentation shielded cables / Triad Cable / plug-in cables / armoured / Un-Armoured, single / multi-core, PVC/HR PVC / FRLS / Teflon / XLP insulation)

A Cable laying (erection) will include:

1. Cutting to the required length, laying in overhead/underground cable trench/ through pipes/flexible conduits. Cable rollers have to be used as per requirement. The contractor shall prepare the drum schedule in order to minimize the wastage.
2. Dressing/Clamping in tray etc.
3. Drilling of holes in gland plates in panels and junction boxes for the entry of cable.
4. Cable glanding, splicing, dressing of spliced wire inside the panel and JBs
5. Providing printed ferrules. Wherever required ferrules shall be one-piece heat shrinkable type. **Contractor has to arrange for suitable ferrule printing machine(s).**
6. Termination by using crimp type lugs copper tinned/ aluminium (insulated/ un-insulated).
7. Providing identification cable tags, aluminium at both the ends and at appropriate interval (30m) throughout the route length. Tags to be arranged by the contractor.
8. Continuity checking, insulation resistance checking, High Voltage test on HT cables, as applicable.
9. LT Power cable trefoil clamps (Die cast Aluminium of good quality) are to be arranged by the contractor within the quoted rates.

B Entry to the panels, JB may be from top, side or bottom. All cable shall be supported and clamped near the panels/JB.

C Wherever cable glanding is not possible, either due to the gland plate size limitations or more number of cable entries, suitable alternative arrangement as specified by BHEL/consultant shall be done. Pre-Fabricated plug-in cables, for such cases, cables may have to be lifted inside the panel either making cut-out in gland plate and providing Rubber profile for sharp edge protection or alternatively, provide 4/6" PVC pipe coupling gland and these pipe coupling gland shall be supplied by contractor within the quoted rate of cable laying.

D Copper Tinned lugs of various type (pin, ring, fork, snap-on), PVC cable ties, PVC ferrules (printed), PVC buttons and tapes, cable identification tag of metallic, clamping and dressing material with hardware, PVC sleeves etc. shall be supplied by the contractor within the quoted rate for cable laying. The quality of material shall be got approved from BHEL engineer prior to their procurement.

E All care should be taken to avoid abrasion, tension, twisting, kinking, and stretching of cables during installation.

F Cable shielding – all signal cables are supplied with bare shielded copper wire/with braided wire shield, generally shield wire is kept isolated at instrument/field device end and continuity is maintained through JBs and getting earth at panel end only. While terminating the shield wire either in panel or JBs, PVC Sleeves is to be used to avoid two-point Earthing. Supply of PVC sleeves of appropriate colour is in contractor's scope.

G Wherever cable ducts/tray, conduits pass through fire barriers such as walls, floors etc., the openings/ passage shall be sealed using fireproof/ weatherproof sealing compound. Similarly cable entry in panels, MCC/HT/LT Breakers, Instruments, Electrical Actuators etc are also required to be sealed. These shall be done as per the specifications of BHEL. Required consumable shall be in contractor scope of supply within quoted rate for cabling Special material required for fireproof sealing shall be supplied by the contractor within the quoted rates.

H Normally, cables glands on junction boxes side are received mounted. While terminating the cables as per drawings, the cable glands to be removed and fixed. Wherever cable glands are not received along with junction boxes, no separate payment will be made for fixing the cable glands to the junction boxes including drilling of holes.

I For single core HT power cable, BHEL will provide the trefoil clamps.

J Many of the cables may have to be laid in the cable trenches. For this purpose, the cover of trenches has to be opened for working inside. All safety precautions have to be observed while laying the cables in the trench. After completing the work, the trench has to be cleaned and covers put back into position. The contractor, if required, shall do de-watering of trenches.

K Underground cabling for road / flood lighting fixtures on swaged pole will be necessary. Following works involved over & above normal cable laying works shall be included within the scope

1. Excavation of earth 300 mm width & 600 mm depth
2. Sand bedding around the cable 100 mm to 150 mm (including supply of sand).
3. Keeping protection bricks through out the cable length (including supply of bricks).
4. Back filling.

L Terminations:

The types of cable terminations are as detailed below:

1. Power cable: Crimping hydraulic / Manual
2. Control cable: Manual crimping
    a. Crimped/soldered plug-in-type Screwed type.

All console devices / computer peripherals shall be screwed, crimped, soldered plug in type.

The contractor shall arrange for special tools and skilled manpower required for any type of cable termination as mentioned above.

Additionally ferrule-printing machine(s) for printing of sleeved ferrules of various sizes will also be arranged by the Contractor, as mentioned above under 4.5.4, A 05.

4.6 Power Transformers

A Generator Transformer / Station Transformer / Service Transformer/ Unit Auxiliary transformer

4.6.1 Transformer tank will be supplied filled with oil upto the core end winding level or gas filled. Accessories like radiators, conservator tank, pipes, fittings, hardware, gaskets, BUCHHOLZ relay, Marshalling box, relief vent, valves, pumps, cooling fans, cabling between marshalling box, bushings, radiator headers/fans, LT/HT cable box, rollers, tap changer, electrical control unit, bushing turrets and oil in 200 Ltrs. Barrels shall be supplied loose. The erection and testing of transformer shall include the following work and activity: -

4.6.2 Transportation of generator transformer tank from store/unloading place to the transformer foundation. The transformer should be handled in such a manner so that no jerk is transferred to the core and winding and internals of the transformer. Transformer tank shall be made available within 100-meter radial distance from transformer foundation.

4.6.3 Placement on plinth, alignment with respect to the foundation and lay out drawings.

4.6.4 Internal inspection to verify the intactness of core end winding, tape changer leads, off-load switch, measurement of core and core bolt insulation.

4.6.5 After internal inspection, the transformer shall be kept under vacuum for a period to be decided by BHEL engineer, after which pre-treated oil is to be filled up to required level.

4.6.6 Contractor has to arrange storage tank of 20-Kiloliter capacity with internal surface sand blasted and painted with minimum one coat of oil resistant paint. Oil from drums is to be transferred to the storage tank and filtration to be carried out to achieve the required BDV value. This treated oil is to be filled in the transformers and auxiliaries. However, for low capacity transformer, a separate storage tank for mass filtration is not required.

4.6.7 All the accessories shall be assembled / mounted as per OGA drawings and these should be thoroughly cleaned prior to installation.

4.6.8 Drying out of transformer and filtration of oil in cooling bank, pipe line, diverter tank of tap changer etc. To be done with ultra vacuum filtering machine of adequate capacity (760 mmHg). Drying out process shall be carried out round-the-clock and contractor shall deploy trained manpower for this purpose.

4.6.9 During dry out process, contractor has to plot the curve for insulation resistance value/time/oil temperature. Hourly reading to be recorded till completion of the dry out.

4.6.10 The criteria for deciding completion of drying out shall be breakdown value of oil, ppm value of oil, resistivity of oil, transformer winding, insulation resistance value of winding and polarization index.

4.6.11 The filter machine capacity if found to be inadequate, or in case of failure of existing machine, an alternative arrangement shall be done to meet the required result and time schedule.

4.6.12 Due to unforeseen reasons the commissioning of transformer is delayed after first drying out and if required, the contractor shall carry out the oil filtration of assembled transformer. For full refiltration, payment will be made at 25 % of quoted price of Transformer.

4.6.13 Contractor shall arrange required testing equipments for carrying out electrical test like voltage ratio, turn ratio, vector group, magnetic balance, winding resistance measurements, BDV value of oil, insulation resistance, measurement of oil PPM and resistivity. The contractor shall arrange for testing of oil samples for PPM/ Resistivity etc. At BHEL approved testing laboratory at his own cost.

4.6.14 The contractor shall arrange for attending to the leakage noticed at any stage till handing over of the unit. Gasket/ packing blanks will be provided by BHEL, which, if required, shall be cut to, required profile and size.

4.6. 15 Generator Transformer tanks shall be made available to the contractor upto 100 meters away from the respective foundation; further transport and shifting to the foundation shall be in the scope of this work. The shifting operation may require dragging, fixing of wheels, rollers and turning of transformer to a suitable location enroute to suit the layout. The contractor shall arrange wooden sleepers, winches, jacks, rails, crane etc at his cost for this operation. However accessories shall have to be shifted from stores.

4.6. 16 Each drum of oil to be tested for BDV and if BDV is less, then each drum should be filtered separately. This treated oil to be filled in the transformers and auxiliaries. Contractor has to arrange storage tank of 20 kilo litre capacity with internally sand blasted and coated with one coat of oil resistance paint. Oil from drums to be transferred in storage tank and filtration to be carried out to achieve the required However, for low capacity of transformer, a separate storage tank for mass filtration may not be required

4.6.17 Tan delta test on all the bushings of GT, ST & UAT before their erection and Tan Delta testing on GT, ST & UAT with their bushings before charging of transformers.

B DRY TYPE TRANSFORMERS

Dry type transformers are supplied in sheet metal enclosure with natural/forced air-cooling. The contractor shall carry out all electrical tests, excepting oil test, as applicable for “generator transformer”.

Auxiliaries power transformer
Transformer tanks shall be supplied filled with oil upto the core and winding level or gas filled. Accessories like radiators, conservator tank, pipes, fittings, hardware, gaskets, BUCHHOLZ relay, marshalling box, relief vent, valves, cabling between marshalling box, bushings, LT/HT cable box, rollers, electrical control unit, and oil for topping-up in 200 Ltrs. Barrels shall be

supplied loose. The erection and testing requirements as specified for “generator transformer” shall be applicable except vacuum pulling.

4.7 HIGH VOLTAGE ISOLATED PHASE BUS DUCT FOR GTG & STG

Generator isolated bus duct is connected to low voltage side of power transformers and main bus duct shall have tee off connection for unit auxiliary transformer, LAVT Cubicles, Excitation transformer and air pressurisation equipment. Bus duct consist of round hollow aluminium alloy conductor and supported inside aluminium enclosure with post insulator. Flexible connections and expansion joints are provided at terminals and intermediate point to alleviate stresses. Ring type protection current transformer will be mounted inside the Bus Duct.
Isolated phased bus duct shall have tape connection for potential transformer, Surge protector etc. Housed in a metal clad cubicle, UAT and excitation transformer, NG Cubicle/resistor Cubicle. Various electrical tests have to be performed before and after erection.
Bus duct enclosure conductor is a continuous type. Conductor, enclosure, makeup pieces, shunt pieces etc. have to be welded at site.

Scope of work

1. Erection and testing of Bus Duct includes transportation of bus duct materials from BHEL stores to site, preparatory work, supporting structure installation, placement of bus duct sub-assemblies/equipment, alignment, edge preparation of conductor/ enclosure, welding of conductor/enclosure/shunt pieces/makeup pieces, seal off bushing, wall frame assembly, neutral and line side starting link, earthing, mounting of CTS/PTS, copper flexible, copper rubber bellows, weldable flexible, installation of Air Pressurising Unit and its associated piping work and cable etc.

2. The Scope Would Include Neutral and Phase Bus Duct IR Value Measurement, Bus Duct Mounted CT’s Testing, Loop Testing of CT Secondary Cabling By Secondary And Primary Injection Of Busduct, Contact Resistance Measurement For All Busduct Joints, HV Testing Of Phase And Neutral Busduct, Space Heater Circuit Testing And Charging, LAPT Cubicle IR Value Measurement, PTS Testing. Surge Capacitor Testing, LA Meggaring, PT Secondary Circuit Checking By Secondary And Primary Injection Testing, LAPT Cubicle Space Heater And Illumination Circuit Testing, Testing Of Neutral Grounding Transformer for Ratio, IR Value and Resistance; Testing Of Neutral Grounding Resistor for IR Value And Resistance, Space Heater And Illumination Circuit Charging For NGT/NGR Cubicle, Busduct Charging, LAPT Cubicle Charging.

3. Pre-fabricated GI Supporting members shall be supplied in loose and to be erected as per lay out drawing. Foundation pockets and embedded plate inserts shall be provided as per lay out drawing (on floor for bottom support and on bottom of concrete slabs). Contractor shall weld the supports on insert plate and shall carry out grouting including supply of grout materials after complete alignment/bolting of structural members. If any modification required in supporting structure due to site conditions, the same shall be carried out without any extra cost. All welded joints shall be applied cold galvanizing zinc paint within the quoted rates.

4. Required aluminium welding of conductor, enclosures, shunt, make up pieces, aluminium flexible etc as detailed in Drgs. Has to be carried out by contactor. Mig welding shall be applicable. Contactor shall arrange necessary welding equipment/ accessory in sufficient number, filler wire, argon gas and other required consumables at his cost.

5. During erection of bus duct/enclosure, makeup pieces and shunts, if any modifications needed to match the alignment shall be part of work and no extra payment shall be made.

6. All bolted joints and flanges shall be tightened with torque wrench to the approved torque. Wherever bolted joints, the same shall be cleaned and a layer of anti-oxidation paints shall be applied. Necessary paints etc to be arranged by contractor within the quoted rates.

7. Top chamber/adopter box for line and neutral side, hood assembly at UAT, hood assembly at excitation transformer and at LAVP cubicle end shall have drilled hole in flange. If any mis-match of the hole in above with respect to the counter flange/welded studs provided on UAT, LAVT and excitation cubicle, the contractor shall drill new holes if required.

8. Proper sequence shall be followed during erection to avoid any mis-match and alignment problem.

9. Prior to installation of bus duct assemblies in position, the various component like conductor, insulator shall be inspected and cleaned and insulation resistance to be measured and recorded. If any insulator found damaged, the same shall be replaced.
10. Electrical test on current transformers and potential transformers shall have to be carried out prior and after installation. The tests are insulation resistance measurement, winding resistance, polarity test, magnetisation characteristic, and ratio test etc.

11. Minor civil work as chipping, leveling of foundation, providing pockets, drilling/enlargement of holes in structure, bus bar etc. Which are incidental to the erection of bus duct shall not be treated as extra.

12. All miscellaneous items such as disconnecting links, flexible, shorting bars, hardware, conduit for wiring, marshalling box, CTs and PT wiring through conduit, earthing materials, bus bar fish plates etc. are part of bus duct installation. Hence separate break-up quantity is not given in BOM.

13. Round makeup pieces for main and tee off duct shall be supplied in two halves and it involves but circumferential and horizontal welding at parting plain.

14. Air tightness and water tightness test have to be carried out on completion of bus duct installation. In case of any leakages, contractor has to rectify and bring to the required level of air tightness/water tightness without any extra cost.

15. High voltage test of bus duct is to be carried out as per the instruction of BHEL engineer. Contractor shall arrange necessary test equipment/instrument for conducting various electric test at his own cost.

16. Contractor has to carry out final painting as per standard colour coat recommended by BHEL. Paints and consumables shall be in contractor's scope.

17. On welding joints, DPT test is required to be conducted.

18. Shunt pieces shall be supplied in two halves & to be welded between two phase bus duct at transformer end. The shunt pieces to be welded on both the side on matching plain and bus duct circumference and horizontal plain.

19. Contractor shall conduct 20 % radiography and 100% NDT test on welded joints.

20. Any enclosed drawings are for estimation and tendering purpose only. Contractor has to ascertain quantum of work involved. The BOQ as furnished in this tender specification for Isolated Phase Bus Duct & Segregated Phase Bus Duct are tentative / approximate. **Contractor has to ascertain the quantum of work involved and quote the lump-sum value, as called in the rate schedule, without any additional compensation for any variation in length or numbers of joints.**

21. One end of the enclosure to be earthed to the station earth at shunt location where all three-phase enclosure are shorted. Wherever shunts are not provided, each phase should be earthed separately.

22. In case of bolted busducts, phase split covers, rubber bellows, a clamping earth straps to be connected to maintained the electrical continuity and in turn enclosure gets earthed at one point.

23. All other equipment such as LAVT, NG transformer/ resistor cubicle, air pressurisation, CT chambers, junction boxes, etc to be earthed at two points to the earth grid.

4.8 11 KV / 6.6 KV SEGREGATED PHASE BUS DUCT

11 KV / 6.6 KV Segregated phase bus duct shall be supplied in loose shipping section along with hardware & other items. Each section shall be complete with AL alloy enclosure and conductor with epoxy bus support insulators arrangement. However, other items such as silica gel breathers, inspection windows, rubber bellows, flexible & solid copper / aluminium connector, bi-metallic strips, GI pre-fabricated supporting structure, wall frame assembly, set of hardware etc shall be supplied loose. Galvanised iron earth bus shall be provided for enclosure continuity. All bolted joints shall have cadmium plated high tensile steel hardware.

Each set of SP bus duct is meant for interconnection from low voltage side of Unit, Unit Auxiliary and Station Transformer to 11 KV/6.6 KV switchgear board and bridging bus duct between the switchgear boards.

The bus duct consists of rectangular conductor made of aluminium alloy supported on post insulator and housed in aluminium sheet metal rectangular enclosure. The bus bar / enclosures are having bolted joints.

The bus duct shall be supported either from bottom of the concrete slab with embedded insert plate/ TG building supporting structural members and pocket provided on foundations. The bus duct assemblies, supporting structures shall be pre-fabricated and to be assembled as per lay out drawing. **The erection and testing requirement shall be similar to the isolated phase bus duct, except the welding of bus bar and enclosures.**

Each set of bus duct shall be supported with supporting structure, which shall be fabricated from standard steel section and hot dip galvanised. All structure & bus duct assemble shall be erected as per drawings.

4.9 INTEGRATED TESTING OF CONTROLS AND PROTECTIONS & RELAY TESTING

Integrated testing of control and protection of generator, generator transformer, station transformer, unit aux. Transformer, bus duct, and HT breaker

Integrated electrical testing/commissioning of generator control and protection relay panels, LT MCC, HT Breakers, other electrical panels and associated equipment shall involve various activities like relay testing/setting, simulation checks, testing of energy meters, on/off line functional checks on integrated system.

The brief scope of work under the “integrated testing/ commissioning of generator controls and protections relay panel & associated equipments” is defined as below, but not limited to the following;

1. Relay testing in static condition for generator, transformers, and associated system by secondary current injection at different current and recording the time duration.

2. Testing and checking of control and protection interlock scheme in static condition and simulation of protection device contact from internal and external devices.

3. Measurement of Insulations, Winding Resistance, Polarization Index of winding of Generator & associated equipment/ system, DC resistance test & Impedance test on rotor, Brushless excitation system at the time of rotor insertion as well as during pre-commissioning stage / commissioning stage/ post commissioning stage.

4. Relay setting and checking the stability of protection relays in static and dynamic condition during the OCC (open circuit characteristic) & SCC (short circuit characteristic)

5. Functional checks / testing of synchronizing schemes during the static and dynamic by simulation / back charging of generator transformer conditions.

6. Monitoring & recording the various parameters during open circuit and short circuit conditions test on generator & associated field equipment like generator transformer, unit auxiliary transformer. Recording and monitoring measurement.

7. Testing of protection current transformer for ratio test by primary injection, magnetization characteristic, polarity test, and ir measurement. Functional checks of relays of protection system by primary injection.

8. Testing of potential transformer for ratio test by voltage ratio, polarity test, insulation resistance measurement etc, testing of surge capacitors, pt isolator in PTPS cubicle etc. (theses are housed in generator side line & neutral cubicle).

9. Measurement of Insulation resistance of individual equipment and connected together.
10. Tan delta test on generator & other equipments as required.
11. Calibration of energy meters, tri-vector meters, voltmeters, ammeters, current & power transducers etc.
12. Providing temporary shorting link on bus duct or any other location while testing & normalisation after the test.
13. Testing & commissioning generator circuit breaker.

14. High voltage test on inter connecting cable between generator and line/ neutral side cubicle.

15. Testing of relays, meters, internal devices, functional checks of electrical panels LT MCC, HT breakers and other panels/ equipments.

16. HT test on bus duct bus bar, resistance measurement etc.

17. Contractor shall discuss & finalize testing procedure with BHEL engineer in-charge for the test to be conducted on generator control & relay panel testing. Drawing & documents shall be provided by BHEL at the time of testing. BHEL decision in this regard shall be final and biding on the contractor.

18. Checking & testing of neutral grounding transformer & resistor.

19. Compilation of test records.

20. In case contractor has not done similar work, they are free to tie –up with experienced agency who has carried out similar nature of work and having adequate resources i.e. Experienced manpower, T&P / testing/ measuring instruments. Contractor shall submit documents in support of such tie –up arrangement of such parties along with the offer. Credential of such parties shall be submitted with technical bid along with tie-up MOU.

21. It is to be noted in general that for any testing of protection relays, MCC etc., where the contractor is not sufficiently experienced, they shall arrange for the services of suitable agencies for carrying out the work, within the quoted rates.

a) In case of party quoting for the work have their own resource or resourced capability to take up relay testing etc. At site, **the evidence of same is to be annexed to the technical bid**

OR ALTERNATIVELY

b) As indicated, contractor is free to tie up with experienced agency that has done similar work. The following parties are recommended by BHEL as agencies capable of carrying out these activities:

i. M/S ELCON ENGG
701, CENTRE POINT, ALKAPURI
R C DUTT ROAD, VADODARA 390007
CONTACT PERSON: SHRI ARVIND MEHTA
PH NO 0265-2359152

ii. PINNEL POWER SYSTEM
PILLAIYAR KOIL STREET
JAFFER KHAN PET
CHENNAI 600083
PH. NO. 044 - 24718925, 24891975.

iii. CONSULT INDIA, MUMBAI
CONTACT PERSON: SHRI JINGRE.
PH NO 022-25333727

iv. HI TECH ENGINEERING SERVICES
PLOT NO 127, 5TH CROSS STREET, AVM COLONY
VIRUGAMBAKKAM
CHENNAI 600092
CONTACT PERSON: SHRI S. SUBRAMANIEM
PH NO 044-23763520

v. VOLTECH ENGINEERS
ARUNODAYA APARTMENTS,
FLAT B-4, I FLOOR,
27, 2ND MADLEY ST,
T.NAGAR, CHENNAI
CONTACT PERSON: GEETHA
PH NO: 044-28341230

In such event where the relay testing facilities are outsourced by the bidder, the tie-up action taken in this regard by the bidder should be clearly mentioned in their offer (technical bid) and it should be made clear that from which of the above recommended parties such services shall be sourced.

In case, the tie-up for the above work is with some other party, other than those recommended by BHEL, then sufficient proof of the credentials and experience of the party in this field of work shall be annexed to the technical bid.

c) If by the time of offer submission, the contractor has not tied up with any agency for the above-mentioned work, the Contractor shall obtain approval of BHEL Construction Manager in writing before deploying any agencies on job.

4.9A Generator System Testing

The following major works also shall be in the scope of the Contractor

1. Generator stator winding resistance and PI value measurement / check
2. Generator rotor winding resistance, impedance, IR value measurement before and after rotor insertion.
3. Generator Bushing HV test
4. Main exciter winding resistance, IR value measurement / check
5. PMG winding resistance, IR value measurement / check
6. Testing and commissioning of generator and exciter accessories viz., heaters, blowers, stroboscope, diodes, enclosure lighting, potential measurement of bearings (TE &EE) etc
7. Meggering during drying out of generator.
8. Meggeriing of generator bushing and its accessories. This test has to be conducted many times during erection and commissioning stages

Other than the above, minor testing / checks will also be involved in the generator area, which are also in the scope of the contractor. *Any instruments / tools etc required for carrying out the above shall be arranged by the contractor within the quoted rates*.

4.10 Generator Circuit Breaker

GT generator circuit breaker is horizontal, floor/beam mounted, isolated phase, circuit breaker with isolators, circuit breakers, earth switches, link mechanisms for gang operation of all the three phases together. High precision alignment requirement of 0.00mm accuracy is required for aligning the frames and the breakers. Micro ohm meters for measuring contact resistance, event recorders for record of opening and closing timing of breakers with micro second accuracy will be required during commissioning.

4.11

415V MOTOR CONTROL CENTERS (MCC) & DC/AC DISTRIBUTION BOARDS

Motor control centres are double front draw –out/non-draw type consisting of circuit breakers units, contractor/starter, switch fuse units, MCC, Protection & metering relays/ instruments etc. arranged in multi tier construction. These PCC and MCC are mainly supplied to cater to the requirements of drives, valve actuators etc.

DC distribution Boards is single front non-draw out type consisting of circuit breakers, contactors, starters, fuse units, MCB etc arranged in multi-tier construction. Shall be located in LT switchgear room to cater the dc supply requirement.

The scope of work for the LT switch board and DCDB covers receipt of materials from stores, transportation to the respective location, erection, testing, commissioning and handing over.

Rubber mats shall be supplied by BHEL for HT/LT switchgear and the same shall be laid wherever required as part of work.

415 VOLT LT SWITCHGEAR / MCC & DC DISTRIBUTION BOARD ETC

1. Checking of installation for correctness.
2. Mechanical functional checking/ adjustment of individual breaker.
3. Measurement of Insulation resistance of individual breaker, complete switchgear board and combined insulation resistance of individual breaker with cable connected to drives.
4. Testing of Protection Relay, Thermal over relay, Power transducers, Energy/ Ammeters, Voltmeters, Power factor, frequency, tri-vector meters & metering etc. in static & dynamic condition relay
5. Conducting test such as Insulation Resistance measurement, Ratio, polarity, magnetisation characteristic, winding resistance on CT and PT.
6. Checking of electrical control & protection interlock of individual breaker and integration with other system.
7. Calibration of energy meters, tri-vector meters, voltmeters, ammeters, power current & voltage transducers etc.
8. Provide assistance for checking the electrical operation of individual breakers from remote panels / MMI package (maxDNA system).

4.12

MISC. OTHER INSTRUMENT/ EQUIPMENT CALIBRATION, ERECTION, TESTING, AND COMMISSIONING

A Contractor shall carry out testing & commissioning of panels, electrically operated valves, HT/LT motors including drying out, and any other integral devices forming part of various mechanical skids/equipments, & piping etc.

B The scope of commissioning of electrically operated actuators for valves, dampers, gates etc., will include meggering, adjustments of mechanical/ electrical or electronic position transmitters, setting of limit/torque switches, cable checking, internal wiring checking, cleaning / heating for increase in IR value, local/remote operation, replacement of limit/torque switches if required, etc.

C All batteries for various ac and dc systems are to be taken into service as per standard method of initial charging and discharging, recording specific gravity values, etc. Contractor has to make arrangement for suitable during charging / discharging cycle.

4.13 Battery/battery charger/UPS

4.13.1

HDP Tubular 550/600AH or NiCd (or similar type) or Lead acid Batteries will be supplied loose along with battery interconnection in the series/parallel links/bus bar, lugs, steel/wooden battery stand either assembled or knocked down condition, cables and associated charger and UPS system.

4.13.2

In case of Lead acid battery, the electrolyte shall be supplied in plastic cans. After installation, the electrolyte has to be filled in batteries and charging/discharging shall be carried out to achieve specific gravity of electrolyte and stability of battery/battery bank. If required, discharging of the charging cycle shall be repeated to achieve the desired results. However, BHEL engineer's decision shall be final. Any preparatory arrangement required to be done for charging and discharging of battery, the contractor shall arrange consumables, safety equipments etc., at his own cost.

4.13.3

In case of NiCd (or similar type) batteries are normally supplied in charged condition, due care shall be exercised while handling/installation of the same. If the battery charge is found to be less than the required level, the charging/discharging cycle shall be carried out as per instruction of BHEL engineer.

4.13.4

Battery charging/discharging is a continuous process and skilled manpower shall be deployed by the contractor round-the-clock.

4.13.5

Contractor shall arrange suitable load, cables, safety equipments and consumables for discharging the battery during charging and discharging cycle at his cost.

4.13.6

Contractor shall provide skilled manpower for periodic maintenance after the battery are fully charged for the activities such as checking of electrolyte level, specific gravity, topping up with distilled water and cleaning till the set is handed over to customer and record of the same shall be maintained and submitted before handing over of the system.

4.14 Earthing installations

4.14.1

All equipments shall be earthed by two separate and distinct connections. Earthing terminals will be available in all equipment supplied by BHEL.

4.14.2

The earthing conductors shall be of mild steel/GI strip/ wires. All connections from equipment to main earthing conductors shall be made as illustrated in earthing drawing / as per instruction of BHEL engineer.

4.14.3

A continuous earthing conductor shall be installed in all cable trays and securely clamped to each tray section by suitable connectors to form a continuous earthing system. When two or more trays supporting power cables run in parallel, a continuous earthing conductor shall be provided on trays only with tap offs to the control cable trays. All valve and damper motors and rapping motors will be earthed to this conductor.

4.14.4

All joints in the earthing system shall be welded type. Earthing connections to all equipments including motors shall be bolted type.

4.14.5

Earthing connections shall be free from tinning scale paint, enamel, grease, rust or dirt at the time of making joint.

4.14.6

Metallic sheaths, screens/shields and armour of all multicore cables shall be bonded and earthed.

4.14.7

Earthing conductors along their run on columns, beams, walls etc. shall be supported by suitable cleats at intervals of 750 mm.

4.14.8

Welded joints on GI earthing conductors shall be coated with one coat of bituminous paint in case of buried earth grid or earth flats to be laid in cable trench. For site welded GI strips/wires which are exposed these are required to be painted with one coat of cold galvanising zinc paint. Contractor to arrange the required paints and other items at his cost.

4.15

The work under this scope being quite sophisticated and also quite extensive, for proper planning, monitoring, reporting, etc of ongoing works, the contractor shall establish his own computer(s) and printer(s) at his site office, along with suitable operator(s), consumables, etc*. Non-establishment of above equipment will attract penalty @ Rs 10000 (Rs Ten thousand only) per month.*

BHEL uses its own software SOMS (Site Operation and Management System) for total project execution and billing. The contractor shall also provide adequate and suitable manpower for updating / entries into SOMS in BHEL computers at site.

4.16 TROUBLESHOOTING DURING PLANT OPERATION

During pre commissioning / commissioning stages when the plant will be under various stages of operation, it will be necessary to have continuous (day and night) presence of suitable manpower along with required tools to attend to any defects etc that may arise during such operation. The contractor will be required to put such personnel in shifts in electrical area. The bidder must also take this aspect into consideration.

4.17 EXCLUSIONS

The following are specific exclusions from this work.

1. Erection of dampers, valves, electrical actuators, pneumatic actuators.
2. Erection of HT/LT motors (except those specified herein)
3. Erection, testing and commissioning of elevators and DG sets.

Note:

The aforesaid exclusions should not be construed as exhaustive. They are meant for general guideline. BHEL reserves the right to include or exclude any item which is required for completing the job as per rates indicated in rate schedule. Contractor should carry out all such jobs as per the instructions of BHEL engineer.

SECTION-5

SPECIAL CONDITIONS OF CONTRACT

5.0 Obligations of the contractor (tools, tackles, consumables etc.)

5.1 ACCOMMODATION, DRINKING WATER & LOCAL TRANSPORTATION FOR THE LABOUR OTHER EMPLOYEES

BHEL/client is not providing any land / space for labour / workmen colony. Contractor shall make his own arrangements for accommodation of his labour and staff out side the project premise with necessary facilities including drinking water, Sanitation, Transport, Electricity, FIRST AID & Emergency transport facilities with all other Hygienic requirements etc at his own expenditure. BHEL/client shall not provide any facility in this regard.

5.2 Tools and tackles

5.2.1 The contractor shall provide all required tools and plants, inspection, measuring and test equipments and handling & transportation equipments for transportation of material / equipments from BHEL/ customer stores/ storage yard to erection site for the scope of work covered under these specifications.

Contractor shall arrange suitable capacity of crane for loading of material at BHEL storage yard / re-handling of material, unloading at work place and erection related works and suitable capacity of truck/trailer for transportation of material.

5.2.2 Where required the contractor's tools and tackles deployed for the work may have to have approval of BHEL.

5.2.3 Timely deployment of adequate quantity of T&P is the responsibility of the contractor. The contractor shall be prepared to augment the T&P at short notice to match the planned programme and to achieve the milestones.

5.2.4 Contractor shall maintain and operate his tools and plants in such a way that major breakdowns are avoided. In the event of major breakdown, contractor shall make alternate arrangements expeditiously so that the progress of work is not hampered.

5.2.5 In the event of contractor failing to arrange the required tools, plants, machinery, equipment, material or non-availability of the same owing to breakdown, BHEL will make the alternate arrangement at the risk and cost of the contractor.

5.2.6 The T&P to be arranged by the contractor shall be in proper working condition. The operation shall not lead to unsafe condition. The movements of cranes, and other equipment should be such that no damage/breaking occur to foundation, equipment, material and men. All arrangements for the movement of his T&P etc. shall be the contractor's responsibility.

5.2.7 Normally, for welding only the use of welding generators may be permitted. The use of welding transformers/rectifiers will be subject to the approval of BHEL engineer.

5.2.8 The contractor at his cost shall carry out periodical testing of his construction equipments and calibration of measuring instruments (MMD). Test/ calibration certificates shall be furnished to BHEL. IMTE shall be calibrated only at accredited

laboratory as per the list available with BHEL or any other laboratory approved by BHEL.

5.3 Consumables

5.3.1 The contractor shall provide all consumables required for carrying out the work covered under these specifications excepting those, which are specifically indicated as BHEL scope.

5.3.2 Prior approval of BHEL engineer with regard to certain consumables may be required. Test reports/certificates in respect of these consumables, wherever applicable, shall be submitted to BHEL engineer.

5.3.3 Primers, Paints etc.

The contractor shall provide Primer (ROZC as per IS:2074), Synthetic Enamel Paint (IS:2932) and Aluminum Paint – as necessary for respective painting area for the scope of painting work indicated in Section-4 as well as for protection of site weld joints and gas cut locations. Contractor shall also arrange to provide the required thinner and other consumables, T&P and implements etc. required for application of Primer and Paints. All primers, paints and thinners shall be sourced by contractor only from BHEL approved manufacturers. Some of them are as listed under.

1) M/s Asian Paints
2) M/s Berger paints
3) M/s Jenson & Nicholson
4) M/s Shalimar Paints
5) Any other BHEL approved manufacturer.

5.4 Welding Electrodes, Filler Wires for MIG/TIG Welding and Gases

5.4.1
All the required welding electrodes, as approved by BHEL shall be arranged by contractor at his cost. It shall be the responsibility of the contractor to obtain prior approval of BHEL, before procurement, regarding manufacturer, type of electrodes etc. On receipt of the electrodes at site, it shall be subject to inspection and approval by BHEL regarding type of electrodes, batch number, date of expiry etc. Batch test certificates shall be made available for verification & record before the actual use of the welding consumables.

BHEL reserves the right to reject the use of any electrodes, if found non-acceptable because of bad quality, deterioration in quality due to improper storage, shelf life expiry, unapproved type / brand etc.

5.4.2
All the Filler wires, for TIG welding of pressure parts, piping and systems of approved quality as per requirement shall be arranged by Contractor as scope of work at his cost. BHEL shall not provide any filler wires for the works under these specifications.

5.4.3
Gases like argon, oxygen, acetylene etc that are required for erection related activities shall be arranged by the contractor at his cost.

5.4.4
Nitrogen gas, if required, for preservation of boiler & related system and nitrogen capping during chemical cleaning process, will be provided by BHEL free of charge. Contractor shall arrange necessary connector, nipple, regulator, header and piping for usage of such gas from Cylinders.

5.4.5
If at any time during the execution of work, it is noticed that the work is suffering on account of non-availability of consumables from the contractor's side BHEL will make alternate arrangements at the risk and cost of contractor. The expenditure incurred with overheads will be recovered from the contractor.

5.4.6 TEST PIECES FOR WELDERS QUALIFICATION TEST.
The Contractor shall supply materials for Test Pieces for qualification of structural welders. Contractor shall also prepare the test coupons from such materials. All expenses in respect of welders' qualification test shall be to the contractors account.

5.5 Field Office

5.5.1
The contractor shall make his own arrangements for field office and stores for accommodating necessary equipments, tools room for execution of the work. Only open space will be provided by BHEL customer free of charges within the project premises as per the availability of space.

5.5.2
On completion of work, all the temporary buildings, structures, pipelines, cables, etc shall be dismantled and leveled and debris shall be removed as per instruction of BHEL by the contractor at his cost. In the event of his failure to do so, the same will be arranged to be removed and expenditure thereof will be recovered from the contractor. The decision of BHEL engineer in this regard shall be final. However, the scope of dismantling and leveling the area is limited only to the contractor's site office, yard and other spaces occupied by the contractor.

5.6 AREA LIGHTING

5.6.1
Contractor shall arrange adequate floodlights, hand lamps and area lighting. Contractor shall use his own materials like cables, fuses, switch-boards etc. BHEL/client will not provide anything in this regard.

5.7 Construction Power & Water

5.7.1 **Construction Power**
Construction power (3 phase, 50 Hz, 415 V)will be provided free of charge at one point at a distance of 500 mtrs approx from work site. However, any taxes, duties, levices etc shall be borne by the contractor. Required energy meter, all cable, fuses, distribution boards, switches, switchboards, busbars, earthing arrangements, protection devices e.g ELCB, if any, and other installation as specified by statutory authority, Client in this regard, for drawl of construction power shall be arranged by the contractor. Obtaining approvals, payment of

necessary fees, duties etc towards the clearance of such installation, prior to these being put to use or as may be specified, shall be the responsibility of the contractor.
The contractor has to bear cess and duties, power factor surcharges (if applicable) and any other taxes/duties on the power consumed.

5.7.2
It shall be the responsibility of the contractor to provide, maintain the complete installation on the load side of the supply with due regard to the safety requirements at site. All cabling and installation shall comply in all respects with appropriate statuary requirements. The installation and maintenance shall be done by licensed and experienced electrician.

5.7.3 **Construction Water**

Construction Water will be provided free of cost by Client through BHEL at single point in the work site. Contractor shall make all necessary arrangements for further distribution up to respective work spots at their own cost.

5.7.4
Contrcator shall make his own arrangement of drinking water.

5.7.5
Contractor shall be well equipped with back-up power supply arrangement like DG set and diesel operated wielding machine etc. to tackle situation arising due to failure of customer supplied power, so as to ensure continuity and completion of critical process that are underway at the time of power failure or important activities planned in immediate future.

5.7.6 BHEL shall not be responsible for any loss or damage to the contractor's equipment as s result of variations in voltage or frequency or interruption in power supply.

5.8 RESPONSIBILITIES WITH REGARD TO LABOUR EMPLOYMENT ETC.

Refer general conditions of contract

5.8.1
Contractor shall also comply with the requirements of local authorities/ project authorities calling for police verification of antecedents of the workmen, staff etc.

5.8.2
BHEL / customer may insist for witnessing the regular payment to the labour. They may also like to verify the relevant records for compliance with statutory requirements. Contractor shall enable such facilities to BHEL / customer.

5.8.3

It is the responsibility of the contractor to arrange gate pass for all his employees, T&P etc for entering the project premises. Necessary coordination with customer officials is the responsibility of the contractor. Contractor to follow all the procedures laid down by the customer for making gate passes. Where permitted, by customer / BHEL, to work beyond normal working hours, the contractor shall arrange necessary work permits for working beyond normal working hours.

5.8.4.
Contractor shall provide at different elevation suitable arrangement for urinal and drinking water facility with necessary plumbing & disposal arrangement including construction of septic tank. These installations shall be maintained in hygienic condition at all times.

5.8.5
If at any time during the execution of work, it is noticed that the work is suffering on account of non-availability/shortfall in provision of resources from the contractor's side, BHEL will make suitable alternate arrangements at the risk and cost of contractor. The expenditure incurred with overheads thereon shall be recovered from the contractor.

5.8.6
The contractor in the event of engaging 10 or more workmen will obtain Independent licence under the contract labour (regulation and abolition) act 1970 from the concerned authorities based on the certificate (form-V) issued by the principal employer/customer. In order to issue the certificate (form-V) by customer, contractor shall fulfill all statutory requirements like Insurance Policy, PF code/PF account number etc. as per requirement of Customer.

5.8.7
Contractor will deduct the necessary amount from his employees towards provident fund and contribute the equal amount as per government of india labour laws. This amount will be deposited regularly to the provident fund commissioner and get the account code. Contractor shall submit the above account code duly certified by pf commissioner to bhel project incharge.

5.8.8
It is the responsibility of the contractor to arrange gate pass for all his employees, T&P etc. Necessary coordination with Coustomer/BHEL officials is the responsibility of the contractor. Contractor to follow all the procedures laid down by Coustomer/BHEL for making gate passes.

5.8.9
BHEL/Coustomer may insist upon witnessing the regular payment to the labour. They may also like to verify the relevent records for compliance with statutory requirements. Contractor shall enable such facilities to BHEL/Coustomer.

5.8.10
Contractor shall also comply with the provisions of ESI act in vogue and submit evidence thereof to BHEL site incharge. Also all other employees benefits to be borne by the contractor as per the labour laws. Contractor shall produce necessary certificates towards their compliance with such statutes and payment of all statutory dues.

5.8.11
Contractor shall also comply with the requirements of local authorities / project authorities calling for police verification of antecedents of the workmen, staff etc.

5.8.12
Where permitted, by Costomer/BHEL, to work beyond normal working hours, the contractor shall arrange necessary gate passes.

5.9.0 TAXES, DUTIES, LEVIES
Refer to General Conditions of Contract. Notwithstanding anything contained therein, the following provisions shall be applicable for this contract.

5.9.1
The contractor shall pay all (save the specific exclusions as enumerated in this contract) taxes, fees, license charges, deposits, duties, tools, royalty, commissions or other charges

which may be levied on the input goods & services consumed and output goods & services delivered in course of his operations in executing the contract. In case BHEL is forced to pay any of such taxes, BHEL shall have the right to recover the same from his bills or otherwise as deemed fit.

However, provisions regarding Service Tax and Value Added Tax (VAT) on output services and goods shall be as per following clauses.

5.9.2 Service Tax & Cess on Service Tax

Service Tax and Cess on Service Tax as applicable on output Services are excluded from contractor's scope; therefore contractor's price/rates shall be **exclusive** of Service Tax and Cess on Output Services. In case, it becomes mandatory for the contractor under provisions of relevant act/law to collect the Service Tax & Cess from BHEL and deposit the same with the concerned tax authorities, such applicable amount will be paid by BHEL.

Contractor shall submit to BHEL documentary evidence of Service Tax registration certificate specifying name of services covered under this contract. **Contractor shall submit serially numbered Service Tax and Cess Invoice, signed by him or a person authorized by him in respect of taxable service provided, and shall contain the following, namely,**

I. **The name, address and the registration number of the contractor,**
II. **The name and address of the party receiving taxable service,**
III. **Description, classification and value of taxable service provided and,**
IV. **The service tax payable thereon.**

All the four conditions shall be fulfilled in the invoice before release of service tax payment.

Contractor shall obtain prior written consent from BHEL before billing the amount towards such taxes.

With introduction of Cenvat Credit Rules 2004, which came into force w.e.f. 10.09.2004, Excise Duty paid on Input Goods including Capital Goods and Service Tax paid on Input Services that are used for providing the output services can be taken credit of against the Service Tax payable on output services. However BHEL may opt for availing the abatement provision in which case cenvat credit may not be available on input duty.

5.9.3 VAT (Sales Tax /WCT)

As regards Value Added Tax (VAT) on transfer of property in goods involved in Works Contract (previously known as Works Contract Tax) applicable as per local laws, the price quoted by the contractor shall be **exclusive** of the same. Where such taxes are required to be paid by the contractor, this will be reimbursed on production of proof of payment made to the authorities by the Contractor. In any case the Contractor shall register himself with the respective Sales Tax authorities of the state and submit proof of such registration to BHEL along with the first RA bill. The contractor has to take all necessary steps to **minimize tax on input goods** by purchasing the materials from any registered dealer of the concerned state only. In case contractor opts for composition, it will be with the prior express consent of BHEL. Deduction of tax at source shall be made as per the provisions of law unless otherwise found exempted. In case tax is deducted at source as per the provisions of law, this is to be construed as an advance tax paid by the contractor and no reimbursement thereof will be made unless specifically agreed to.

5.9.4 Modalities of Tax Incidence on BHEL

Wherever the relevant tax laws permit more than one option or methodology for discharging the liability of tax/levy/duty, BHEL will have the right to adopt the appropriate one considering the amount of tax liability on BHEL/Client as well as procedural simplicity with regard to assessment of the liability. The option chosen by BHEL shall be binding on the Contractor for discharging the obligation of BHEL in respect of the tax liability to the Contractor.

5.9.5 New Taxes/Levies

In case the Government imposes any new levy/tax on the output service/ goods/work after award of the contract, the same shall be reimbursed by BHEL at actual.

In case any new tax/levy/duty etc. becomes applicable after the date of Bidder's offer, the Bidder/Contractor must convey its impact on his price duly substantiated by documentary evidence in support of the same **before opening of Price Bid**. Claim for any such impact after opening the Price Bid will not be considered by BHEL for reimbursement of tax or reassessment of offer.

No reimbursement/recovery on account of increase/reduction in the rate of taxes, levies, duties etc. on input goods/services/work shall be made. Such impact shall be taken care of by the Price Variation/Adjustment Clause (PVC) if any. In case PVC is not applicable for the contract, Bidder has to make his own assessment of the impact of future variation if any, in rates of taxes/duties/ levies etc. in his price bid.

5.10 Submission of Periodical Reports

Contractor shall submit periodical reports in respect of following aspects of operation:

1) Consumption of welding electrodes and gases
2) Consumption of construction power
3) Manpower reports
4) Daily and Monthly Progress reports
5) Field calibration reports

BHEL at site will inform formats for these reports.

5.11 It is the responsibility of the contractor to arrange gate pass for all his employees, T&P etc. Necessary coordination with customer officials is the responsibility of the contractor. Contractor to follow all the procedures laid down by the customer for making gate passes. Where permitted, by customer/ BHEL, to work beyond normal working hours, the contractor shall arrange necessary work permit for working beyond normal working hours.

5.12 ELECTRICAL INSPECTORATE'S APPROVAL /STATUTORY INSPECTION

5.12.1
Contractor should have valid Electrical Contractor-ship License to carry out the Erection, Testing & Commissioning work on High / Low Voltage electrical equipments from the appropriate statutory authority of concern state or Central Electricity Authority, as the case may be.

5.12.2
Contractor shall arrange inspection of concerned Statutory Authority for the installation, testing & commissioning of High / Low voltage equipment covered under this tender specification and obtain their approval in appropriate format prior to charging of the equipments.

5.12.3
Contractor shall be responsible for all necessary liasioning work with Statutaory Authority towards the certification of installation / works. BHEL shall reimburse Statutory Fees as per actual on submission of original receipt, however all incidental expenses shall be borne by Contractor. BHEL/ BHEL's Customer shall be providing technical assistance, drawing & document for submission to Statutory Authority.

5.12.4
The installation of all electrical equipments shall be carried out only by persons holding valid certificates of Competency for the voltage classes as defined in this tender specification, issued by appropriate state or central Statutory Authority. Contractor shall submit the particulars of Licenses held by him.

SECTION-6

SPECIAL CONDITIONS OF CONTRACT

6.0 **Contractor's Obligation with Regard to Employment of Supervisory Staff and Workmen**

6.1 The contractor shall deploy all the skilled/semiskilled/ unskilled labour including highly skilled workmen etc. These workmen should have previous experience on similar job. They shall hold valid certificates wherever necessary. BHEL reserves the right to insist on removal of any employee of the contractor at any time if he is found to be unsuitable and the contractor shall forthwith remove him. Contractor should furnish a tentative deployment plan of his manpower as required vide Appendix-II. Also the actual deployment will be so as to satisfy the erection and commissioning targets set by BHEL.

6.2 It is the responsibility of the contractor to engage his workmen in shifts and or on overtime basis for achieving the targets set by BHEL. This target may be set to suit BHEL's commitments to its customer or to advance date of completion of events or due to other reasons. The decision of BHEL in regard to setting the erection and commissioning targets will be final and binding on the contractor.

6.3 Contractor shall deploy only qualified and experienced engineers/ supervisors. They shall have professional approach in executing the work.

6.4 The contractor's supervisory staff shall execute the work in the most professional manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract. They shall be responsible to ensure that the assembly and workmanship conform to dimensions and tolerances given in the drawings/instructions given by BHEL engineer from time to time.

6.5 The supervisory staff employed by the contractor shall ensure proper outturn of work and discipline on the part of the labour put on the job by the contractor. Also in general they should see that the works are carried out in a safe and proper manner and in coordination with other labour and staff employed directly by BHEL or other contractors of BHEL or BHEL's client.

6.6 If at any time, it is found that the contractor is not in a position to deploy the required engineers/supervisors/workmen due to any reason; BHEL shall have the option to make alternate arrangements at the contractor's risk and cost.

6.7 The contractor shall be held responsible for any violation of statutory regulations (local, state or central) and BHEL instructions that may endanger safety of men, equipment, material and environment in his scope of work or another contractors or agencies. Cost of damage, if any, to life and property arising out of such violation of statutory regulations shall be borne by the contractor.

6.8 WATCH AND WARD

Contractor shall arrange and provide watch & ward round the clock for the materials/equipments issued to him.

6.9

Contractor shall implement local labour laws and Safety & Insuranace requirements, maintain necessary records and co-ordinate with the local labour authorities on all matters of labour and industrial relations.

6.10

The contractor shall comply with the applicable law, rules and regulation etc; with regard to employment of labour. He shall obtain labour license.

The scope includes getting the licenses and approvals from the statutory authorities, arranging for inspection of electrical inspector periodically as per BHEL engineer's instructions, submitting documents etc. and following up the matter with them as and when necessary for the work involved in this scope. All expenses, fees, levies etc have to be borne by the contractor.

6.11 Industrial Relations and Labour Laws

6.11.1
An industrial relations supervisor shall coordinate for the implementation of local labour laws, maintenance of records as required by contract labour (regulation and abolition act) and also coordinate with the local labour authorities. Contractor has to ensure minimum wages payment to their labours as per the rule of the state and they have to produce documentary evidence to that effect to bhel.

6.11.2
Contractor shall provide the names and details of engineer/ supervisors at the time of mobilization to bhel as per the proposed organization chart.

6.11.3
In case at any time the contractor is not in a position to deploy the required engineers/supervisors due to any reason, BHEL shall have the option to deploy their engineers/supervisors. The expenditure incurred with overheads on this account will be recovered from the contractor's bills.

6.11.4
The contractor's supervisory staff shall execute the work in the most substantial and workmanlike manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract. They shall be responsible to ensure that the assembly and workmanship conform to dimensions and tolerances given in the drawings/ instructions given by bhel engineer from time to time.

6.11.5
The supervisory staff employed by the contractor shall ensure proper outturn of work and discipline on the part of the labour put on the job by the contractor and in general, see that the works are carried out in a safe and proper manner and in coordination with other labour and staff employed directly by bhel or other contractors of bhel or BHEL's client.

6.11.6
Contractor will deduct the necessary amount from his employees towards provident fund and contribute the equal amount as per government of India rules. This amount will be deposited regularly to the provident fund commissioner and an account code obtained. Contractor shall submit the above account code duly certified by pf commissioner to bhel project in-charge. Also all other employees' benefits are to be borne by the contractor as per statutory laws.

6.11.7
The contractor shall obtain independent labour license under the contract labour (regulation and abolition) act from the concerned authorities based on the certificate (form-v) issued by the principal employer/customer.

6.11.8
The contractor shall pay for all taxes, fees, license charges, local body clearance, duties, tools, royalty, commissions and other charges, gate passes which may be leviable on account of his operation in executing the contract. In case BHEL is forced to make any such payments, bhel shall have the right to recover the same from contractor's bills.

6.12 If at any time, it is found that the contractor is not in a position to deploy the required engineers/supervisors/workmen due to any reason, BHEL shall have the option to make alternate arrangements at the contractor's risk and cost.

6.13 Site Organization.

Contractor shall employ only qualified and experienced engineers/supervisors for this job. They shall have professional approach in executing the work having adequate knowledge and experience in the fields of erection, erection methodology, calibration, testing and commissioning, quality control and quality assurance procedures, planning, safety etc., required to undertake the type of work as per this tender.

The contractor's supervisory staff shall execute the work in the most substantial and workmanlike manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract. They shall be responsible to ensure that the assembly and workmanship conform to dimensions and tolerances given in the drawings/instructions given by BHEL engineer from time to time.

The supervisory staff employed by the contractor shall ensure proper outturn of work and discipline on the part of the labour put on the job by the contractor and in general, see that the works are carried out in a safe and proper manner in coordination with other labour and staff employed directly by BHEL or other contractors of BHEL or BHEL's client.

Contractor should provide a team of engineers with proven experience of erection, testing/ commissioning of electrical equipments as specified in tender specification. They shall be in a position to undertake specific assignments during the start up/ post start up/stabilization.

Contractor to provide necessary engineers and supervisors for the work and they shall have adequate experience in similar type of work. Adequate staffing shall be provided by contractor in the following areas:-

- Overall co-ordination planning & execution
- Equipments Erection
- Welding & NDT & Stress Relieving operators, induction.
- Testing & Commissioning
- Quality control
- Safety
- Planning, review, monitoring & reporting

- Industrial relations
- Material management, material identification, transport, storage & supervision.

Contractor shall furnish an organization chart indicating the staffing pattern for the above functions. Contractor shall provide the names and details of engineer/ supervisors at the time of mobilization to BHEL as per the proposed organization chart.

SECTION-7

SPECIAL CONDITIONS OF CONTRACT

7.0 OBLIGATIONS OF BHEL

7.1 FACILITIES TO BE PROVIDED BY BHEL

7.2 SPACES FOR FIELD OFFICE

Refer Section-5 in this regard.

7.3 CONSTRUCTION WATER

Refer Section-5 in this regard.

7.4 CONSTRUCTION POWER

Refer Section-5 in this regard.

7.5 OTHER MATERIALS AND CONSUMABLES:

BHEL shall not provide any material/consumables except those specifically mentioned in the footnote as indicated in relevant **Appendix** and tender specification.

7.6 TEST BLANKS (PLATES & PIPES)

Test pieces for qualification of structural welders shall be supplied by the contractor.

7.7 FILLER WIRE FOR TIG WELDING

Refer Section-5 in this regard.

7.8 Special tools which are supplied by BHEL Manufacturing Divisions under regular DU/DESS numbers in various product groups as part of maintenance tools which are to be handed over to customer may be issued to the contractor free of charges for specific activities, at the discretion of BHEL. Contractor shall return them after the completion of the specific activity, for which the tools were spared, in good working order.

7.9.1 **CRANES TO BE PROVIDED BY BHEL**

7.9.1.1
BHEL will make available EOT (as per relevant appendix) free of hire charges to the contractor on sharing basis subject to availability and accessibility. Contractor shall make all arrangements of all other arrangements, T & P, cranes and other suitable arrangements as required for satisfactory completion of work as scope of work of this tender specification.

SECTION-8 (Rev 01, 24/01/2009)
SPECIAL CONDITIONS OF CONTRACT

8.0 Inspection/Quality Assurance/Quality Control/ Statutory Inspection

8.1 Various inspection/quality control/quality assurance procedures/methods at various stages of erection and commissioning will be as per BHEL/customer quality control procedure/codes and other statutory provisions and as per BHEL engineer's instructions.

8.2 Preparation of quality assurance log sheets and protocols with customer/ consultants/statutory authority, welding logs, NDE records, testing & calibration records and other quality control and quality assurance documentation as per BHEL engineer's instructions, is within the scope of work/specification. These records shall be submitted to BHEL/customer for approval from time to time.

The protocols between contractor and customer/ BHEL shall be made prior to installation for correctness of foundations, materials, procedures, at each stage of installation, generally as per the requirement of customer/ BHEL. This is necessary to ensure elimination of errors or keeping them within tolerable limits and to avoid accumulation and multiplication of errors.

8.3 A daily log book should be maintained by every supervisor/engineer of contractor on the job in duplicate (one for BHEL and one for contractor) for detailing and incorporating alignment/clearance / centering / leveling readings and inspection details of various equipments etc.

High pressure welding details like serial number of weld joints, welders name, date of welding, details of repair, heat treatment etc. will be documented in welding log as per BHEL Engineer's instructions.

Record of radiography containing details like serial number of weld joints, date of radiography, repairs, if any, re-shots etc shall also be maintained as per BHEL Engineer's instructions.

Record of heat treatments performed shall be maintained as prescribed by BHEL.

8.4 The performance of welders will be reviewed from time to time as per the BHEL standards. Welders' performance record shall be furnished periodically furnished for scrutiny of BHEL's Engineer. Corrective action as informed by BHEL shall be taken in respect of those welders not conforming to these standards. This may include removal/ discontinuance of concerned welder(s). Contractor shall arrange for the alternate welders immediately.

8.5 All the welders shall carry identity cards as per the proforma prescribed by BHEL/Customer/Consultant. Only welders duly authorized by BHEL/customer/consultant shall be engaged on the work.

8.6 Contractor shall provide all the measuring monitoring devices (MMDs) required for completion of the work satisfactorily. These MMDs shall be of brand, quality and accuracy specified by BHEL Engineer and should have necessary calibration and other certificates as per the requirement of BHEL Engineer. Decision of BHEL Engineer regarding acceptance or otherwise of the measuring instruments/gauges/tools for the work under this specification, is final and binding on the contractor. The indicative list of MMDs required for this work and to be made available by the contractor is given in relevant appendix. The list will be reviewed by BHEL and the contractor shall meet any augmentation needed wherever required.

8.7 It is the responsibility of the contractor to prove the accuracy of the testing/measuring/calibrating equipments brought by him based on the periodicity of calibration as called for in the BHEL's quality assurance standards/BHEL Engineer's instructions.

8.8

Any re-laying or re-termination of cables/re-erection of instruments/ recalibration of instruments etc. required due to contractor's mistake or design requirement and found at any stage inspection, shall be carried out by the contractor at no extra cost.

8.9 BHEL, Power Sector – Western Region (PSWR) has already been accredited with ISO 9002 certification and as such this work is subject to various audits to meet ISO 9002 requirements. One particular aspect which needs special mention is about arrangement of calibration of instruments by the contractor. Contractor shall ensure deployment of reliable and calibrated MMDs (Instrument Measuring and Test Equipment). The MMDS shall have test / calibration certificates from authorised / Government approved / Accredited agencies traceable to National / International Standards. Re-testing / re-calibration shall also be arranged at regular intervals during the period of use as advised by BHEL Engineer within the contract price. The contractor will also have alternate arrangements for such MMDs so that work does not suffer when the particular equipment / instrument is sent for calibration. Also if any MMDs not found fit for use, BHEL shall have the right to stop the use of such item and instruct the contractor to deploy proper item and recall ie repeat the readings taken by that instrument, failing which BHEL may deploy MMD and retake the readings at Contractor's cost.

8.10 Re-work necessitated on account of use of invalid MMDs shall be entirely to the contractor's account. He shall be responsible to take all corrective actions, including resource augmentation if any, as specified by BHEL to make-up for the loss of time.

8.11 In the courses of erection, it may become necessary to carry repeated checks of the work with instruments recently calibrated, re-calibrated. BHEL may counter/ finally check the measurements with their own MMDs. Contractor shall render all assistance in conduct of such counter/final measurements.

8.12 Vibration indicators / vibration recorders / vibration analysers will be provided by BHEL for checking and analysing vibration levels of rotating equipments with necessary operators. Contractor shall provide necessary labour for carrying out such tests.

8.13 Total Quality is the watchword of the work and Contractor shall strive to achieve the Quality Standards, procedures laid down by BHEL. He shall follow all the instructions as per BHEL drawings and Quality Standards. Contractor shall provide the services of Quality Assurance Engineer.

8.14 Stage Inspection By FES/QA Engineers

Apart from day-to-day inspection by BHEL Engineers stationed at Site and Customer's Engineers, stage inspection of equipments under erection and commissioning at various stages shall also be conducted by teams of Engineers from Field Engineering Services of BHEL's Manufacturing Units, Quality Assurance teams from field Quality Assurance, Unit/Factory Quality Assurance and Commissioning Engineers from Technical Services etc. Contractor shall arrange all labour, tools and tackles etc for such stage inspections free of cost.

8.15 Any modifications suggested by BHEL FES and QA Engineers' team shall be carried out. Claims of contractor, if any, shall be dealt as per Section 13, and provided such modifications have not arisen for reasons attributable to the contractor.

Statutory Inspection of Work

8.16 The work to be executed under these specifications has to be offered for inspection, at appropriate stages of work completion, to various statutory authorities for compliance with applicable regulations.

The work related statutory inspections, though not limited to, are as under:

1) Inspectorate of steam boilers and smoke nuisance

2) Factory Inspector, Labour Commissioner, Electrical Inspector PF Commissioner and other authoritiy connected to this project work

The scope includes getting the approvals from the statutory authorities, which includes arranging for inspection visits of statutory authority periodically as per BHELl Engineer's instructions, arranging materials for ground inspection, taking rub outs for the pressure parts to be offered for inspection, submitting co-related inspection reports, documents, radiographs etc and following up the matter with them. Contractor shall also make all arrangements for offering the Products / Systems for inspection at location, as applicable, to the concerned authority.

8.17 Contractor should be qualified to execute pressure parts & piping work coming under the purview of IBR, for which he should register himself with CIB of state concerned. contractor also should be aware of the latest IBR regulations and Electricity Act, including the amendments thereof.

8.18 All fees connected with the contractors for testing his welders / men / workers and testing, inspection, calibrating of his instruments and equipments, shall be paid by the contractor. It shall be contractor's responsibility to obtain approval of Statutory Authorities, wherever applicable, for the conducting of any work which comes under the purview of these authorities.

8.19 Other fees like fees for periodic visits, hydraulic test fees, light up inspection fees etc. shall be borne by the contractor.

8.20 Payment of Registration fees for Boiler is excluded from the scope.

8.21 BHEL shall pay the ground inspection fees of Boiler Inspectorate. All other arrangements for site visits periodically by Boiler Inspector to site, for obtaining Inspection certificate etc, will have to be made by contractor.

8.22 The quality management system of BHEL, Power Sector – Western Region (PSWR) has already been certified and accredited under ISO 9002 standards in this regard. The basic philosophy of the quality management system is to define the organizational responsibility, work as per documented procedures, verify the output with respect to acceptance norms, identify the non-conforming product/ procedure and take corrective action for removal of non-conformance specifying the steps for avoiding recurrence of such non-conformities, & maintain the relevant quality records. The non-conformities are to be identified through the conduct of periodical audit of implementation of quality systems at various locations/stages of work. Suppliers/vendors of various products/services contributing in the work are also considered as part of the quality management system. .as such the contractor is expected not only to conform to the quality management system of BHEL but also it is desirable that they themselves are accredited under any quality management system standard.

Field Quality Assurance

8.23 Contractor shall carry out all activities conforming to the approved Field Quality Plan (FQP) as revised from time to time. Total quality shall be the watchword of the work and contractor shall strive to achieve the quality standards, procedures laid down by BHEL. He shall follow all the instructions as per BHEL drawings and quality standards. Contractor shall provide the services of quality assurance engineer as per the relevant clauses.

SECTION-9

SPECIAL CONDITIONS OF CONTRACT

Safety, Occupational Health and Environmental Management

BHEL PSWR has been certified for Environmental Management under ISO 14001:1996 standard and Occupational Health & Safety under OHSAS 18001 by DNV. In order to comply with the above standards, it shall be the endeavour of BHEL and all its subcontractors to meet and implement the requirements by following the guidelines issued under Environmental, Occupational Health and Safety Management (EHS) manual a copy of which will be available with the BHEL Site-in-charge.

Contractor shall also enter into a "Memorandum of Understanding" as given in clause 9.9 in case of award of contract.

9.0 Responsibility of the Contractor in Respect of Safety of Men, Equipment, Material and Environment.

9.1 The Contractor shall:

9.1.1

Abide by the Safety Regulations applicable for the Site/Project and in particular as mentioned in the booklet "Safe Work Practices" issued by BHEL. Contractors are also to ensure that their employees and workmen use safety equipments as stipulated in the Factories Act (Latest Revision) during the execution of the work. Failure to use safety equipment as required by BHEL Engineer will be a sufficient reason for issuance of memo, which shall become part of Safety evaluation of the contractor at the end of the Project. Also all site work may be suspended if it is found that the workmen are employing unsafe working practice and all the costs/losses incurred due to suspension of work shall be borne by contractor. A comprehensive list of National Standards from which the contractor can draw references for complying with various requirements under this section is given under 9.10

9.1.2

Hold BHEL harmless and indemnified from and against all claims, cost and charges under Workmen's Compensation Act 1923 and 1933 and any amendment thereof and the contractor shall be solely responsible for the same.

9.1.3

Abide by the Procedure governing entry/exit of the contractor's personnel within the Customer/Client premises. All the contractors employees shall be permitted to enter only on displaying of authorized Photo passes or any other documents as authorized by the Customer/Client.

9.1.4

Be fully responsible for the identity, conduct and integrity of the personnel/workers engaged by them for carrying out the contract work and ensure that none of them are ever engaged in any anti national activity

9.1.5

Prepare a signboard giving the following information and display it near work site:

i) Name of Contractor
ii) Name of Contractor Site-in-charge & Telephone number

iii) Job Description in short
iv) Date of start of job
v) Date of expected completion
vi) Name of BHEL Site-in-charge.

9.1.6
Abide by the rules and regulations existing during the contract period as applicable for the contractors at the Project premises.

9.1.7
Observe the timings of work as advised by BHEL Engineer-in-charge for carrying out the contract work.

9.2 SPECIAL CONDITIONS

9.2.1 Safety

9.2.1.1 Safety Plan

Before commencing the work, contractor shall submit a "safety plan" to the authorized BHEL official. The safety plan shall indicate in detail the measures that would be taken by the contractor to ensure safety to men, equipment, material and environment during execution of the work. The plan shall take care to satisfy all requirements specified hereunder.

The contractor shall submit "safety plan" before start of work. During negotiations, before placing of work order and during execution of the contract, BHEL shall have right to review and suggest modifications in the safety plan. Contractor shall abide by BHEL's decision in this respect.

9.2.1.2
The contractor shall take all necessary safety precautions and arrange for appropriate appliances and/or as per direction of BHEL or it's authorized person to prevent loss of human lives, injuries to men engaged and damage to property and environment.

9.2.1.3
The contractor shall provide to his work force and also ensure the use of Personnel Protection Equipment (PPE) as found necessary and/or as directed and advised by BHEL officials without which permission is liable to be denied.

- Safety helmets conforming to IS 2925/1984 (1990)
- Safety belts conforming to IS 3521/1989
- Safety shoes conforming to IS 1989 part-II /1986(1992)
- Eye and face protection devices conforming to IS 2573/1986(1991), IS 6994 (1973), part-I (1991), IS 8807/1978 (1991), IS 8519/1977(1991).
- Other job specific PPEs of standard ISI make as may be prescribed

9.2.1.4
All tools, tackles, lifting appliances, material handling equipment, scaffolds, cradles, cages, safety nets, ladders, equipment, etc used by the contractor shall be of safe design and construction. These shall be tested and certificate of fitness obtained before putting them to use and from time to time as instructed by authorized BHEL official who shall have the right to ban the use of any item found to be unsafe.

9.2.1.5
All electrical equipment, connections and wiring for construction power, its distribution and use shall conform to the requirements of Indian Electricity Act and Rules. Only electricians licensed by the appropriate statutory authority shall be employed by the contractor to carryout

all types of electrical works. All electrical appliances including portable electric tools used by the contractor shall have safe plugging system to source of power and be appropriately earthed.

9.2.1.6
The contractor shall not use any hand lamp energized by electric power with supply voltage of more than 24 volts. For work in confined spaces, lighting shall be arranged with power source of not more than 24 volts.

9.2.1.7
The contractor shall adopt all fire safety measures as per relevant Indian Standards

9.2.1.8
Where it becomes necessary to provide and/or store petroleum products, explosives, chemicals and liquid or gaseous fuel or any other substance that may cause fire or explosion, the contractor shall be responsible for carrying out such provisions and/or storage in accordance with the rules and regulations laid down by the relevant government acts, such as petroleum act, explosives act, petroleum and carbides of calcium manual of the chief controller of explosives, Government of India etc. The contractor in all such matters shall also take prior approval of the authorized BHEL official at the site.

9.2.1.9
Proper means of access must be used e.g. ladders, scaffolds, platforms etc. No makeshift access such as oil drums or pallets shall be used. Design of these will be in accordance with relevant standards and certified by competent persons before use.

9.2.1.10
Temporary arrangements made at Site for lifting , platforms, approach access etc should be properly designed and approved before being put to use.

9.2.1.11
All excavations and openings must be securely and adequately fenced/barricaded and warning signs erected when considered necessary as per relevant code of practice.

9.2.1.12
No persons shall remove guardrails, covers or protective devices unless authorized by a responsible supervisor and alternative precautions have been taken

9.2.1.13
Access ways, means of escape and fire exits shall be clearly marked, kept clear and unobstructed at all times

9.2.1.14
Only authorized persons holding relevant license will drive and operate site plant and equipments e.g. cranes, dumpers, excavators, transport vehicles etc

9.2.1.15
Only authorized personnel are allowed to repair, commission electrical equipments.

9.2.1.16
Gas Cylinders shall be handled and stored as per Gas Cylinders Rules and relevant safe working practices

9.2.1.17
All wastes generated at Site shall be segregated and collected in a designated place so as to prevent spillage/contamination/scattering at Site, until the waste is lifted for disposal to designated disposal area as advised by BHEL official.

9.2.1.18
The contractor shall arrange at his cost (wherever not specified) appropriate illumination at all work spots for safe working when natural day light is not adequate for clear visibility.

9.2.1.19
The contractor shall train adequate number of workers/supervisors for administering "FIRST AID". List of competent first aid administers should be prominently displayed.

9.2.1.20
The contractor shall display at strategic places and in adequate numbers the following in fluorescent markings

- Emergency telephone numbers
- Exit, Walkways
- Safe working load charts for wire ropes, slings, D shackles etc
- Warning signs

9.2.1.21
The contractor shall be held responsible for any violation of statutory regulations (local, state or central) and BHEL instructions that may endanger safety of men, equipment, material and environment in his scope of work or other contractors or agencies. Cost of damage, if any, to life and property arising out of such violation of statutory regulations and BHEL instructions shall be borne by the contractor.

9.2.1.22
In case of a fatal or disabling injury/accident to any person at construction sites due to lapses by the contractor, the victim and/or his/her dependents shall be compensated by the contractor as per statutory requirements. However, if considered necessary, BHEL shall have the right to impose appropriate financial penalty on the contractor and recover the same from payments due to the contractor for suitably compensating the victim and/or his/her dependents. Before imposing any such penalty, appropriate enquiry shall be held by BHEL giving opportunity to the contractor to present his case.

9.2.1.23
In case of any damage to property due to lapses by the contractor, BHEL shall have the right to recover cost of such damages from payments due to the contractor after holding an appropriate enquiry.

9.2.1.24
In case of any delay in the completion of a job due to mishaps attributable to lapses by the contractor, BHEL shall have the right to recover cost of such delay from payments due to the contractor after notifying the contractor suitably and giving him opportunity to present his case.

9.2.1.25
If the contractor fails to improve the standards of safety in its operation to the satisfaction of BHEL after being given a reasonable opportunity to do so, and/or if the contractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment

or to carry out instructions regarding safety issued by the authorized BHEL official, BHEL shall have the right to take corrective steps at the risk and cost of the contractor after giving a notice of not less than seven days indicating the steps that would be taken by BHEL.

9.2.1.26 **Emergency Response**

BHEL will have an Emergency Response Plan for each Project Site in consultation with the Owner as the case may be, detailing the procedure for mobilization of personnel and equipment, and defining the responsibilities of the personnel indicated, in order to prepare for any emergency that may arise in order to ensure the priorities of

- Safeguard of life
- Protect assets under construction or neighbouring
- Protect environment
- Resumption of normal operations as soon as the emergency condition is called off

All Contractors shall also be part of the Emergency response Plan and the personnel so nominated shall be aware of their duties and responsibilities in an emergency response situation.

9.2.1.27
At least 5% Contractors supervisors and workmen shall undergo training in administering 'First Aid'. The trained persons should represent for all categories of work and for all areas of work. Adequate number of trained persons should be available for each shift. These first aides shall be included in the emergency response team. Contractor employees and workmen are encouraged to participate in first aid training programmes whenever organized by BHEL.

9.2.2 OCCUPATIONAL HEALTH

9.2.2.1
Specific occupational health hazards will be identified through the hazard evaluation processes in consultation with BHEL engineers and the necessary prevention/reduction/elimination methods implemented.

9.2.2.2
All personnel working in an activity with a potential risk to health shall be made aware of all those risks and the actions they must take to reduce/control/eliminate the risk

9.2.2.3
Safety coordinator shall conduct periodic checks to ensure that every group of workers engaged in similar activities are aware of potential risks to health and the actions required to be taken to mitigate the risk

9.2.2.4
In order to protect personnel from associated health hazards, the following main areas will be focused

- Issue of approved Personnel Protective Equipment
- Verification that the PPE are adequate/maintained and worn by all staff involved in operations that are potentially hazardous to their health
- Ensure that the personnel deployed are physically fit for the operation/work concerned
- Provide hygienic and sanitary working conditions

9.2.2.5
Contractor workers employees engaged in noise risk areas shall be issued with hearing protection aids and the use of the same will be enforced. Further, these workers will be educated on the hazards of noise

9.2.2.6
Contractor workers engaged in dust environment shall be issued with necessary dust protection aids and the use of the same shall be enforced

9.2.2.7
Workers engaged in exposure to bright light/rays as in welding or radiation shall be issued with eye protection devices and the use of the same shall be enforced

9.2.2.8
Adequate arrangements shall be made to provide safe drinking water

9.2.2.9
Health monitoring records on at least sample basis for contractor employees & workmen shall be maintained for persons engaged in specified categories of work. These shall include

- Noise induced hearing loss
- Lung Function test
- Ergonomic Test
- Eye Test for Welders, Grinders, Drivers etc

9.2.3.0 HYGIENE and HOUSEKEEPING

9.2.3.1
Good house keeping and proper hygiene is one of the key requirements of Occupational Health Safety and Environment management. Towards this the contractor shall encourage his workers and supervisors to maintain cleanliness in their area of work.

9.2.3.2
The Contractor shall arrange to place waste bins/chutes at convenient locations for the collection of scrap and other wastes. The bins shall be clearly marked and segregated for metal, non-metal, hazardous and non hazardous wastes.

9.2.3.3
BHEL may take up appropriate remedial measures at the cost of the contractors if the contractors fail in good house keeping and if there is an imminent risk of pollution

9.2.4 ENVIRONMENT MANAGEMENT

9.2.4.1
BHEL has a sound environmental management system, which is to be maintained and implemented by all the contractors. The system allows for project specific objectives to be set and developed sensitive to client requirements, applicable environmental legislation and BHEL's own objectives and policy. BHEL engineers will assess and monitor the environmental impact of their work and lay out objectives for their minimization. The contractors shall implement the objectives for continual improvement of environmental performance. BHEL shall regularly audit environmental impacts and their improvements.

9.2.4.2 WASTE MANAGEMENT

9.2.4.2.1
The objective of waste management is to ensure the safe and responsible disposal of waste, ensuring that it is correctly disposed of and being able to audit the process to ensure compliance.

9.2.4.2.2
Chemical wastes if any shall be collected separately and disposed of to BHEL designated refuse yard as per BHEL advice.

9.2.4.2.3
No dangerous chemicals, noxious waste products or materials will be disposed off on or off site without approval obtained through BHEL.

9.2.4.2.4
All disposal of wastes generated during construction shall be in accordance with all relevant legislation.
Acid and alkali cleaning wastes shall be neutralized to acceptable norms before disposal to the designated area.

9.2.1.2.4
All necessary measures shall be taken to ensure safe collection and disposal of waste oils. In particular to ensure the prevention of their discharge into surface waters, ground waters, coastal waters or drainages

9.3 **SUPERVISION**

9.3.1

Contractor must provide at least one full time on site safety coordinator when the manpower engaged is in excess of 50 for the contract activities in the premises. If the manpower is less than 50, the on site safety coordination responsibilities shall be assumed by any one of the contractor's other supervisory staff; however in both the cases, the contractor must specify in writing the name of such persons to the BHEL Engineer in Charge.

9.3.2

Contractor's safety coordinator or his supervisor responsible for safety as the case may be shall conduct at his work site, and document formal safety inspection and audits at least once in a week. Such documents are to be submitted to BHEL Engineer in Charge for his review and record.

Contractor, supervisor must attend all schedule safety meetings as would be intimated to him by the BHEL Engineer in Charge.

9.3.3

Before starting work under any contract, the contractor must ensure that a job specific safety procedures/field practices as required over and above the safety permit conditions are prepared and followed .He should also ensure that all supervisors and workers involved understand and follow this procedures /field practices.

9.3.4
Contractor must ensure that in his work site appropriate display boards are put displaying signs for site safety, potential hazards and precautions required.

9.4.0 **TRAINING & AWARENESS**

9.4.1

Contractor shall deploy experienced supervisors and other manpower who are well conversant with the safety and environment regulations of the Project. The electricians to be deployed on the job should have wireman license.

9.4.2
All Supervisors & Workmen of the Contractor shall undergo Fire safety training/ demonstration whenever arranged by BHEL with the help of either Customer's Fire and Safety department or outside faculty so as to acquire knowledge of fire prevention and also to be able to make use of appropriate fire extinguishers.

9.4.3
Contractor must familiarize himself from BHEL Engineer in Charge about all known potential fire, explosion or toxic release hazards related to the contract. He in turn will ensure that same information has been passed to the supervisors and workmen

9.4.4
Contractor must ensure that all his supervisors are properly trained and each employee has received and understood from his supervisor necessary training and briefing about the safety requirement. Necessary document as a means to verify that employees have understood the training is to be maintained.

9.4.5
The contractor supervisors shall also give a small safety briefing to all the workmen under his charge before undertaking any new work and specially understand the safety requirements that are mandatory

9.5.0 **REPORTING**

9.5.1
The contractor shall submit report of all accidents, fires and property damage, dangerous occurrences to the authorized BHEL official immediately after such occurrence but in any case not later than twelve hours of the occurrence. Such report shall be furnished in the manner prescribed by BHEL and also to meet statutory requirement.

9.5.2
Any injury sustained by any of the contractor's employees within the Project premises must be reported to BHEL supervisor and FIRST AID should be immediately administered. The Contractor shall be responsible for keeping and maintaining proper records of Accidents to his personnel.

9.5.3
Contractor must arrange to immediately investigate, properly document and report any injury, accident or near miss involving any of his employees and take appropriate follow up action. He must furnish within 12 hours of the incident a written report to BHEL Engineer in charge and the Safety Section.

9.5.4
According to the Factory Act and the Employees state Insurance Act & regulation, any person sustaining any injury within the project premises and absenting himself from work for more than 46 hours, his accident report has to be sent to the respective Government Authorities. Therefore contractor shall inform the owner's representative such matter immediately for their needful action.

9.5.5
In addition, contractor shall submit periodic reports on safety to the authorised BHEL official from time to time as prescribed.

9.5.6
Before commencing the work, the contractor shall appoint/nominate a responsible officer to supervise implementation of all safety measures and liaison with his counterpart of BHEL.

9.6 **AUDIT REVIEW AND INSPECTION**

9.6.1
BHEL shall conduct audit on the contractor performance and compliance with the project specific requirements of the Environment and Occupational Health & Safety Management systems. The programme of audit shall cover all activities under the contract but will focus particularly on high-risk activities. The Construction Manager shall decide the schedule of audit. The audit findings shall be communicated to the contractors and necessary remedial action as advised by BHEL Engineers shall be under taken within the stipulated time.

9.6.2
Inspections shall be carried out regularly by the contractors and by BHEL Engineers on activities, facilities, equipment, documentation, to cover the following aspects.

- Compliance with procedures and systems
- Availability, condition and use of PPE
- Condition of maintenance tools, equipments, facilities
- Availability of fire fighting equipments and its condition
- Use of fire fighting equipments and first aid kit
- Awareness of occupational health hazard
- Awareness of safe working practices
- Presence of quality supervision
- Housekeeping

The Safety coordinator shall visit and inspect work sites daily. All unsafe acts, unsafe conditions that have imminent potential for causing harm/injury/damage will be immediately corrected. He shall maintain a daily logbook giving details of unsafe acts or conditions observed and the corrective action taken and recommendations for preventing recurrence. Adequacy of corrective actions will be verified

The contractor shall take remedial measures as per the findings of each inspection
Besides the above, the contractor shall be required to carry out the following inspections

Sl no	Equipment	Scope of inspection	Inspection by	Schedule
1	Hand tools	To identify unsafe/defective tool	User	Daily
2	Power tools	To identify unsafe/defective tool	User	Daily
3	Fire Extinguishers	To check pressure and any defect	User / Safety Coordinator	Daily Every month
4	Lifting equipment/tackles	To check for defects and efficacy of brakes	User Third party	Daily Every Year
5	PPE	To check for defects	User	Daily

9.7 **NON COMPLIANCE**:-

9.7.1
NONCONFORMITY OF SAFETY RULES AND SAFETY APPLIANCES WILL BE VIEWED SERIOUSLY AND THE BHEL HAS RIGHT TO IMPOSE FINES ON THE CONTRACTOR AS UNDER **for every instance of violation noticed**:

Sl. No	Instance of Violation	Fine (in Rs)
01	Not Wearing Safety Helmet	50/-
02.	Not wearing Safety Belt	100/-
03.	Grinding Without Goggles	50/-
04.	Not using 24 V Supply For Internal Work	500/-
05.	Electrical Plugs Not used for hand Machine	100/-
06.	Not Slinging property	200/-
07.	Using Damaged Sling	200/-
08.	Lifting Cylinders Without Cage	500/-
09.	Not Using Proper Welding Cable With Lot of Joints And Not Insulated Property.	200/-
10.	Not Removing Small Scrap From Platforms	200/-
11.	Gas Cutting Without Taking Proper Precaution or Not Using Sheet Below Gas Cutting	200/-
12.	Not Maintaining Electric Winches Which are Operated Dangerously	500/-
13.	Improper Earthing Of Electrical T&P	500/-
	Major Accident or Accidents causing partial loss of earning to the victim	50,000/- per victim
14	Fatal Accident or Accidents causing permanent loss of earning to the victim	1,00,000/- per victim

Any other non-conformity noticed not listed above will also be fined as deemed fit by BHEL. The decision of BHEL engineer is final on the above. The amount will be deducted from running bills of the contractor. The amount collected above will be utilised for giving award to the employees who could avoid accident by following safety rules. Also the amount will be spent for purchasing the safety appliances and supporting the safety activity at site.

9.8

CITATION:-If safety record of the contractor in execution of the awarded job is to the satisfaction of safety department of BHEL, issue of an appropriate certificate to recognize the safety performance of the contractor may be considered by BHEL after completion of the job

9.9 Memorandum of Understanding

After Award Of Work, Contractors Are Required To Enter Into A Memorandum Of Understanding As Given Below:

Memorandum of Understanding

BHEL, PSWR is committed to Health, Safety and Environment Policy (EHS Policy) as given in the booklet titled " Safe Working Practices" issued to all contractors.

M/s _____ do hereby also commit to the same EHS Policy while executing the Contract Number _____

M/s _____ shall ensure that safe work practices not limited to the above booklet are followed by all construction workers and supervisors. Spirit and content therein shall be reached to all workers and supervisors for compliance.

BHEL will be carrying out EHS audits twice a year and M/s _____ shall ensure to close any non-conformity observed/reported within fifteen days.

Signed by authorized representative of M/s----------

Name :

Place & Date:

9.10

Comprehensive list of National Standards for reference and use wherever applicable in the execution of Civil, Erection and Commissioning Contracts.

IS No	YEAR	Amd upto	DESCRIPTION
IS 10204	1982		PORTABLE FIRE EXTINGUISHERS MECHANICAL FOAM TYPE
IS 10245	1994		SPECIFICATION FOR BREATHING APPARATUS
IS 10291	1982		SAFETY CODE FOR DRESS DRIVERS IN CIVIL ENGINEERING WORKS
IS 10658	1983		HIGHER CAPACITY DRY POWDER FIRE EXTINGUISHERS (TROLLEY MOUNTED)
IS 10662	1992		COLOUR TELEVISION
IS 10667	1983		GUIDE FOR SELECTION OF INDUSTRIAL SAFETY EQUIPMENT FOR PROTECTION OF FOOT AND LEG
IS 11037	1984		ELECTRONIC FAN REGULATORS

IS No	YEAR	Amd upto	DESCRIPTION
IS 11057	1984		INDUSTRIAL SAFETY NETS
IS 11451	1998		RECOMMENDATION FOR SAFETY AND HEALTH REQUIREMENT RELATING TO OCCUPATION EXPOSURE TO ASBESTOS
IS 1169	1967		PEDESTAL FANS
IS 1179	1967		SPECIFICATION FOR EQUIPMENT FOR EYE AND FACE PROTECTION DURING WELDING
IS 11833	1986		DRY POWDER FIRE EXTINGUISHERS FOR METAL FIRES
IS 11972	1987		CODE OF PRACTICE FOR SAFETY PRECAUTION TO BE TAKEN WHEN ENTERING A SEWARAGE SYSTEM
IS 1287	1986		ELECTRIC TOASTER
IS 13063	1991		STRUCTURAL SAFETY OF BUILDINGS ON SHALLOW FOUNDATIONS ON ROCKS
IS 13385	1992		SPECIFICATIONS FOR FIRE EXTINGUISHERS 50 LITRE WHEEL MOUNTED WATER TYPE (GAS CARTRIDGES)
IS 13386	1992		SPECIFICATIONS FOR FIRE EXTINGUISHERS 50 LITRE MECHANICAL FOAM TYPE
IS 13415	1992		CODE OF SAFETY FOR PROTECTIVE BARRIERS IN AND AROUND BUILDINGS
IS 13416	1992		RECOMMENDATIONS FOR PREVENTIVE MEASURES AGAINST HAZARDS AT WORKING PLACE PART 1 TO PART 5
IS 13430	1992		CODE OF PRACTICE FOR SAFETY DURING ADDITIONAL CONSTRUCTION AND ALTERATION TO EXISTING BUILDINGS
IS 13849	1993		PORTABLE FIRE EXTINGUISHERS DRY POWDER TYPE (CONSTANT PRESSURE)
IS 1446	1985		CLASSIFICATION OF DANGEROUS GOODS (FIRST REVISION)
IS 1476	1979		REFRIGERATORS
IS 1641	1988		CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS (GENERAL): GENERAL PRINCIPLES OF FIRE GRADING AND CLASSIFICATION
IS 1642	1989		CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS-DETAILS OF CONSTRUCTION
IS 1643	1988		CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS (GENERAL): EXPOSURE HAZARD
IS 1646	1997		CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS (GENERAL): ELECTRICAL INSTALLATIONS
IS 1904	1986		CODE OF PRACTICE FOR DESIGN AND CONSTRUCTION OF FOUNDATIONS IN SOIL
IS 1905	1987		STRUCTURAL SAFETY OF BUILDINGS MASONARY WALLS
IS 2082	1985		ELECTRICAL GEYSERS
IS 2171	1985		PORTABLE FIRE EXTINGUISHERS DRY POWDER TYPE (CARTRIDGE)
IS 2309	1989		PRACTICE FOR THE PROTECTION OF BUILDINGS AND ALLIED BUILDINGS AGAINST LIGHTENING
IS 2312	1967		EXHAUST FANS
IS 2361	1994		SPECIFICATION FOR BUILDING GRIPS - FIRST REVISION
IS 2418	1977		TUBULAR FLUORSCENT LAMPS IS 2418 (FT-1)
IS 2750	1964		STEEL SCAFFOLDINGS

IS No	YEAR	Amd upto	DESCRIPTION
IS 2762	1964		SAFE WORKING LOADS IN KGS FOR WIRE ROPE SLINGS
IS 2878	1986		FIRE EXTINGUISHERS CARBON DIOXIDE TYPE (PORTABLE AND TROLLEY MOUNTED)
IS 2925	1984		SPECIFICATION FOR INDUSTRIAL SAFETY HELMETS
IS 3016	1982		CODE OF PRACTICE FOR FIRE PRECAUTIONS IN WELDING AND CUTTING OPERATIONS- FIRST REVISION
IS 3315	1974		DESERT COOLERS
IS 3521	1989		INDUSTRIAL SAFETY BELTS AND HARNESS
IS 368	1983		IMMERSION WATER HEATERS
IS 3696	1991		SAFETY CODE OF SCAFFOLDS AND LADDERS PART 1 TO 2
IS 3737	1996		LEATHER SAFETY BOOTS FOR WORKERS IN HEAVY METAL INDUSTRIES
IS 374	1979		CEILING FANS INCLUDING REGULATORS
IS 3764	1992		EXCAVATION WORK - CODE OF SAFETY
IS 3786	1983		METHOD FOR COMPUTATION OF FREQUENCY AND SEVERITY RATES FOR INDUSTRIAL INJURIES AND CLASSIFICATION OF INDUSTRIAL ACCIDENTS
IS 3935	1966		CODE OF PRACTICE FOR COMPOSITE CONSTRUCTION
IS 4014	1967		CODE OF PRACTICE FOR STEEL TUBULAR SCAFFOLDING
IS 4081	1986		SAFETY CODE FOR BLASTING AND RELATED DRILLING OPERATIONS
IS 4082	1977	1996	STACKING AND STORAGE OF CONSTRUCTION MATERIALS AND COMPONENTS AT SITE
IS 4130	1991		DEMOLITION OF BUILDINGS - CODE OF SAFETY PART 1 TO 2
IS 4138	1977		SAFETY CODE FOR WORKING IN COMPRESSED AIR (FIRST REVISION)
IS 4155	1966		GLOSSARY OF TERMS RELATING TO CHEMICAL AND RADIATION HAZARDS AND HAZARDOUS CHEMICALS
IS 4209	1967		CODE OF SAFETY FOR CHEMICAL LABORATORY
IS 4250	1980		FOOD MIXERS
IS 4262	1967		CODE OF SAFETY FOR SULFURIC ACID
IS 4756	1978		SAFETY CODE FOR TUNNELING WORK
IS 4912	1978		SAFETY REQUIREMENTS FOR FLOOR AND WALL OPENINGS, RAILINGS AND TOE BOARDS
IS 5121	1969		SAFETY CODE FOR PILING AND OTHER DEEP FOUNDATIONS
IS 5182	1969	1982	METHODS FOR MEASUREMENT OF AIR POLLUTION
IS 5184	1969		CODE OF SAFETY FOR HYDROFLUORIC ACID
IS 5216	1982	2000	RECOMMENDATIONS ON SAFETY PROCEDURES AND PRACTICE IN ELECTRICAL WORK PART I AND II
IS 555	1979		TABLE FANS
IS 5557	1995		INDUSTRIAL AND SAFETY LINED RUBBER BOOTS (SECOND REVISION)
IS 5916	1970		SAFETY CODE FOR CONSTRUCTION INVOLVING USE OF HOR BITUMINOUS MATERIALS
IS 5983	1980		SPECIFICATION FOR EYE PROTECTORS - FIRST REVISION
IS 6234	1986		PORTABLE FIRE EXTINGUISHERS WATER TYPE (STORED PRESSURE)

IS No	YEAR	Amd upto	DESCRIPTION
IS 692	1994		CRITERIA FOR SAFETY AND DESIGN OF STRUCTURES SUBJECTED TO UNDERGROUND BLASTS
IS 6994	1973		SPECIFICATION FOR SAFETY GLOVES
IS 7155	1986		CODE OF RECOMMENDED PRACTICE FOR CONVEYOR SAFETY (PART 1 TO 8)
IS 7205	1974		SAFETY CODE FOR ERECTION OF STRUCTURAL STEEL WORK
IS 7293	1974		SAFETY CODE FOR WORKING WITH CONSTRUCTION MACHINERY
IS 7323	1994		GUIDELINES FOR OPERATIONS OF RESERVOIRS
IS 7812	1975		CODE OF SAFETY FOR MERCURY
IS 7969	1975		SAFETY CODE FOR HANDLING AND STORAGE OF BUILDING MATERIALS
IS 8089	1976		CODE OF SAFE PRACTICE FOR LAYOUT OF OUTSIDE FACILITIES IN AN INDUSTRIAL PLANT
IS 8091	1976		CODE OF PRACTICE FOR INDUSTRIAL PLANT LAYOUT
IS 8095	1976		ACCIDENTS PREVENTION TAGS
IS 818	1968	1997	CODE OF PRACTICE FOR SAFETY AND HEALTH REQUIREMENTS IN ELECTRIC AND GAS WELDING, AND CUTTING OPERATIONS
IS 8448	1989		AUTOMATIC LINE VOLTAGE CORRECTOR (STABILISER)
IS 8519	1977		GUIDE FOR SELECTION OF INDUSTRIAL SAFETY EQUIPMENT FOR BODY PROTECTION
IS 8520	1977		GUIDE FOR SELECTION OF INDUSTRIAL SAFETY EQUIPMENT FOR EYE, FACE AND EAR PROTECTION
IS 875	1987		STRUCTURAL SAFETY OF BUILDING: LOADING STANDARD PART 1 TO 5
IS 8807	1978		GUIDE FOR SELECTION OF INDUSTRIAL SAFETY EQUIPMENT FOR PROTECTION OF ARMS AND HANDS
IS 8978	1985		INSTANTANEOUS WATER HEATERS
IS 8989	1978		SAFETY CODE FOR ERECTION OF CONCRETE FRAMED STRUCTURES
IS 940	1989		PORTABLE FIRE EXTINGUISHERS WATER TYPE (GAS CARTRIDGE)
IS 9457	1980		SAFETY COLOURS AND SIGNS
IS 9679	1980		CODE OF SAFETY FOR WORK ENVIRONMENTAL MONITORING
IS 9706	1997		CODE OF PRACTICE FOR THE CONSTRUCTION OF AERIAL RPEWAYS FOR THE TRANSPORTATION OF MATERIAL
IS 9759	1981		GUIDELINES FOR DEWATERING DURING CONSTRUCTION
IS 9815	1989		SERVO MOTOR OPERATED LINE VOLTAGE CORRECTOR (SERVO STABILISER)
IS 9944	1992		RECOMMENDATIONS ON SAFE WORKING LOAD FOR NATURAL AND MAN-MADE FIBRE ROPE SLINGS
IS 996	1979		SINGLE PHASE ELECTRIC MOTORS
ISO 3873	1977		SAFETY HELMET

SECTION-10

SPECIAL CONDITIONS OF CONTRACT

10.0 DRAWINGS AND DOCUMENTS

10.1
The detailed drawings, specifications available with BHEL engineers will also form part of this tender specification. Revision of drawings/documents may take place due to various considerations as is normal in such large project. Work will have to be carried out as per revised drawings/ documents. These documents will be made available to the contractor during execution of work at site.

10.2
One set of necessary drawings/documents to carry out the erection work will be furnished to the contractor by BHEL on loan that shall be returned to BHEL after completion of the work. Contractor's personnel shall take care of these documents given to them.

10.3
The data furnished in various sections and appendices and the drawings enclosed with this tender specification describe the equipment to be installed, tested and commissioned under this specification, briefly. However, the changes in the design and in the quantity may be expected to occur as is usual in any such large scale of works.

10.4
If any error or ambiguity is discovered in the specification/information contained in the documents/drawings and tender, the contractor shall forthwith bring the same to the notice of BHEL before submission of offer.

10.5
In case an ambiguity is detected after award of work, the same must be brought to the notice of BHEL before commencement of the work/activity. BHEL's interpretation in such cases will be final and binding on the contractor.

SECTION-11

SPECIAL CONDITIONS

11.0 TIME SCHEDULE, MOBILIZATION, PROGRESS MONITORING, PRICE VARIATION, OVER RUN ETC.

11.1 TIME SCHEDULE & MOBILIZATION

11.1.1 INITIAL MOBILIZATION AND TENTATIVE SCHEDULE

CONTRACTOR SHALL REACH SITE, MAKE HIS SITE ESTABLISHMENT AND BE READY TO COMMENCE THE TOP PRIORITY ACTIVITIES **WITHIN ONE MONTH** FROM THE DATE OF FAX LETTER OF INTENT OR AS PER DIRECTIONS OF CONSTRUCTION MANAGER OF BHEL.

THE CONTRACTOR HAS TO SUBSEQUENTLY AUGMENT HIS RESOURCES IN SUCH A MANNER THAT THE ENTIRE WORK IS COMPLETED TO ACHIEVE THE FOLLOWING TENTATIVE SCHEDULE:

1)	ST ERECTION START Unit I	Aug 2010
2)	ST ERECTION START Unit II	Oct 2010
3)	SYNCHRONIZATION OF GT Unit I	Dec 2010
4)	SYNCHRONIZATION OF GT Unit II	June 2011
5)	SAFETY VALVE FLOATING AND STEAM BLOWING Unit I	Jan 2011
6)	SAFETY VALVE FLOATING AND STEAM BLOWING Unit II	July 2011
7)	SYNCHRONIZATION OF STG Unit I	Feb 2011
8)	SYNCHRONIZATION OF STG Unit II	Aug 2011
9)	STABILISATION & RELIABILITY RUN IN CC MODE Unit I	Feb 2011
10)	STABILISATION & RELIABILITY RUN IN CC MODE Unit II	Aug 2011

11.1.2
In order to meet the completion schedule for above major milestones in general, and all other intermediate targets set during the course of execution, contractor shall arrange all necessary resources in consultation with BHEL.

11.1.3 CONTRACT PERIOD

The total contract period will be 16 (sixteen) months from the date of start of erection. Erection, Testing, Calibration and Commissioning of permanent equipments required for completion of system shall be completed within the time schedule given above. Grace Period as specified later here will be allowed at BHEL's discretion.

The contractor shall reach site and establish his site office and mobilize to commence the work as per directions of BHEL's Construction Manager. **The contract shall commence from the date of deployment of contractor's T&P, proper site setup and erection of first equipment. All the above three conditions are to be fulfilled (certified by BHEL engineer) for deciding the date of commencement of the contract.**

BHEL, owing to its commitment to their customer, may ask contractor to compress the total completion schedule by upto 15%. This will result in advancement of various milestones. Contractor shall plan his activities and mobilise additional resources accordingly to the satisfaction of BHEL engineer within the quoted rates.

11.1.4 GRACE PERIOD
NOT APPLICABLE

11.2 PROGRESS MONITORING, CONTRACT EXTENSION AND OVER RUN

11.2.1 PROGRESS MONITORING
Refer "General Condition Of Contract"

11.2.2 ASCERTAINING AND ESTABLISHING THE REASONS FOR SHORTFALL

The onus probandi that the causes leading to extension in the contract period is not due to any reasons attributable to the contractor is on him (the contractor). Review of the performance as stated vide cl. 11.2.1 above will be made considering the availability of components to be erected and other constraints over which the contractor has no control. The programme will be reviewed area-wise and the following facts will be recorded in case of shortfall at the end of every month:

A) Erection/ commissioning programme not achieved owing to non-availability of fronts.

B) Erection/commissioning programme not achieved owing to non-availability of materials.

C) Erection/commissioning programme not achieved owing to non-availability of tools and plants, manpower and consumables by the contractor or any other reason attributable to the contractor.

D) Erection/commissioning programme not achieved due to ant other reasons not attributable to the contractor.

11.2.3 CONTRACT EXTENSION

Refer "General Condition Of Contract"

11.2.4 OVERRUN COMPENSATION
Refer "General Condition Of Contract"

11.2 **PRICE VARIATION**
Refer "General Condition Of Contract"

11.4 Foreclosing of Contract

11.4.1
BHEL, at its discretion may foreclose the contract at any time after the completion of contract period from the date of starting the work at site.

11.4.2
In case it is decided to withdraw any portion of work or foreclose the contract, the percentage value of the work withdrawn / left over shall be determined mutually. BHEL engineer's decision in regard to status of an item shall be final and binding on the contractor.

11.4.3
The date of completion of work for the purpose of guarantee vide clause 2.13 of general conditions will be the date on which the contract is foreclosed.

11.5
Clause 2.12 of GCC regarding force majeure shall, inter-alia, include stoppage of work due to 'local bandhs' arising out of external factors.

11.6 Contract Variations

11.6.1 Variation in Quantities

Refer "General Condition Of Contract"

11.6.2 Additional Item
Equipments /instruments required to be erected for this work, though not limited to but are generally as per rate schedule. For any items or class of work not specified herein but required for total completion of work, the same shall be carried out as per BHEL requirement. However the payment of these items/class of work shall be regulated on the basis of mutually agreed rate arrived at by either of the following methods, which should be done prior to undertaking the work:

A. Based on rate of identical/similar items in the rate schedule
B. Based on the rate arrived from nearby items in the rate schedule

Wherever any item rate for similar type of work or nearby item rate is not existing in the rate schedule, rate will be worked out on the basis of work element or from fundamentals of estimation or existing rates in other job.

11.7 INTREST BEARING RECOVERABLE ADVANCE

Refer "General Condition Of Contract"

11.8 DEFINITION OF WORK COMPLETION

The contractor's scope of work under these specifications will be deemed to have been completed in all respect, only when all the activities are completed satisfactorily and so certified by BHEL site in charge. The decision of BHEL in this regard shall be final and binding on the contractor.

11.9
The work under the scope of contractor will deem to have been completed in all respect, only when all the activities in these specifications are completed satisfactorily and so certified by BHEL engineer. The decision of BHEL in this regard shall be final and binding on the contractor.

11.10 Schedule Compression

BHEL, owing to its commitment to their customer, may ask contractor to compress the total completion schedule by upto 20%. This will result in preponement of various milestones. For achieving the same, contractor shall plan his activities and mobilise additional resources accordingly to the satisfaction of BHEL engineer within the quoted rates.

SECTION-12
SPECIAL CONDITIONS OF CONTRACT

12.0 TERMS OF PAYMENT

12.0.1
The contractor shall submit his monthly RA account bills with all the details required by BHEL on specified date every month covering progress of work in all respects and areas for the previous calendar month. However, first RA Bill shall be released only after signing of Contract Agreement.

12.0.2
~~Clause 2.6 of general conditions of contract shall be referred to as regards mode of payment, and measurement of the work completed.~~

12.0.3
Release of payment in each running bill will be restricted to 95% of the value of work admitted, as per the percentage break-up for the stage of work completion stipulated vide clauses hereinafter.
Release of 5 % payment shall be as per 'General Conditions of Contract'
The guarantee period of **12 months** from the date of completion of entire work as certified by BHEL.

12.0.4
The payment for running bills will normally be released within around 30 days of submission of running bill with measurement sheets. Contractor shall make his own arrangement for making payment of impending labour wages and other dues in the meanwhile.

12.0.5
BHEL will release payment through Electronic Fund Transfer (EFT)/RTGS. In order to implement this system, the following details are to be furnished by the Contractor pertaining to his Bank Accounts where proceeds will be transferred through BHEL's banker:

1. Name of the Company
2. Name of Bank
3. Name of Bank Branch
4. City/Place
5. Account Number
6. Account type
7. IFSC code of the Bank Branch
8. MICR Code of the Bank Branch

BHEL may also choose to release payment by other alternative modes as suitable.

Note: Contractor shall maintain good house keeping & collect all scrap materials periodically from various area of work site, deposit the same at one place earmarked at site or shift the same to a place earmarked in BHEL/ client's stores. ***1% value of each RA bill will be earmarked against compliance of the above, to be released only on satisfactory collection and deposit of scrap as stated above. In case of failure of contractor to comply with this requirement, BHEL will make suitable arrangement at contractor's risk and cost. In such case, any expenditure over and above the withheld 1% amount will also be recovered suitably from the RA bills of vendor.***

12.2 STAGES OF PROGRESSIVE PRO-RATA PAYMENTS

12.2.1 The agreed rates for each item shall be paid progressively as per the break up given hereunder (aggregating 100%), based on the progress of work in each month.

SL NO	TYPE OF PAYMENT (Refer Rate Schedule)	CALIBRATION	ERECTION	TESTING AND COMMISSIONING	FINAL PAINTING	CABLE DRESSING /TAGGING
1	N1.1-N1.2, N2.1-N2.14, N3.1-M3.12, N4.1-N4.8	NA	55%	40%	NA	5%
2	M1-M3	NA	60%	40%	NA	NA

12.2.2 TRANSFORMERS, 287 MVA (GT), 160 MVA (STATION), 40 MVA (UAT), 2500 KVA/ 2000 KVA/ 1600 KVA SERVICE TRANSFORMER (Item No A 1 to A 6)

S N	DESCRIPTION OF ACTIVITY	PERCEN-TAGE
01	COLLECTION OF MATERIALS AND TRANSPORTATION FROM BHEL STORES TO SITE EXCEPT THE TRANSFORMER TANK	10%
02	POSITIONING AND ALIGNMENT TRANSFORMER TANK AS PER LAY OUT DRAWING	5%
03	INTERNAL INSPECTION OF CORE AND WINDING TAPS SWITCH OFF-LOAD/ON-LOAD, H.V./L.V. BUSHING TURRET ASSEMBLY, VACUUM PULLING, OIL FILTERATION AND FITTING OF OIL UPTO CORE AND WINDING LEVEL	15%
04	ASSEMBLY OF ALL ACCESSORIES, PIPES AND FITTINGS, CONSERVATOR TANK, COOLER BANK/RADIATOR BANK, BUSHINGS, MARSHALLING BOX, CABLING FROM MARSHALLING BOX TO FIELD DEVICES, FANS AND PUMPS ETC.	17%
05	OIL FILLING IN COMPLETE ASSEMBLED TRANSFORMERS, COMPLETION OF DRY OUT AND FILTERATION OF OIL OF COOLING BANK, ACCEPTANCE OF DRY OUT.	20%
06	PRE-COMMISSIONING CHECKS, ELECTRICAL TESTS, CALIBRATION AND PROTECTION AND INTER LOCK CHECKS	13%
07	**INTEGRATED ELECTRICAL TESTING/ COMMISSIONING WITH ASSOCIATED CONNECTED EQUIPMENT,** BACK CHARGING/FORWARD CHARGING	13%
08	TRIAL RUN AND FULL LOADING	2%
09.	FINAL PAINTING	5%

12.2.3 ISOLATED PHASE BUS DUCT FOR GENERATOR TRANSFORMER (Item Sl. No. B 1& B2)

SL. NO	DESCRIPTION OF ACTIVITY	PERCE NT-AGE
01	COLLECTION OF MATERIAL, TRANSPORTATION FROM BHEL STORES	10%

SL. NO	DESCRIPTION OF ACTIVITY	PERCE NT-AGE
	TO SITE	
02	ERECTION AND ALIGNMENT OF SUPPORTING STRUCTURE	10%
03	PLACEMENT OF BUS DUCT, SUB-ASSEMBLIES, LAVT CUBICLE, NG TRANSFORMER AND RESISTANCE CUBICLE, AIR PRESSURIZATION UNIT AND ITS PIPING AND ACCESSORIES, EXCITATION TRANSFORMER AND ITS TRUNKING CUBICLE, WALL FRAME ASSEMBLY, SEAL AIR BUSHINGS	20%
04	ALIGNMENT OF BUS DUCT ASSEMBLIES, WELDING OF CONDUCTORS, MAKEUP PIECES, SHUNTS, FLEXIBLES, CURRENT TRANSFORMERS AND VOLTAGE TRANSFORMER, SURGE PROTECTOR ETC. INSTALLATION, LINE, NEUTRAL TEE OFF DUCT CTs, WIRING UPTO MARSHALLING BOX, DPD TEST ON CONDUCTOR WELD JOINTS ETC.	25%
05	PRE-COMMISSIONING TESTS, HIGH VOLTAGE TEST	10%
06	COMPLETION OF AIR LEAKAGE TEST	3%
07	FINAL BOX-UP AND END TERMINATION AND MAKING READY FOR ENERGIZATION	5%
08	COMPLETION OF SHORT CIRCUIT/OPEN CIRCUIT TEST WHICH INCLUDES FIXING AND REMOVING OF CERTAIN LINK AND NORMALISATION AND SYNCHRONIZATION OF THE UNIT, **INTEGRATED ELECTRICAL TESTING / COMMISSIONING WITH ASSOCIATED CONNECTED EQUIPMENT**	10%
09	TRIAL RUN AND FULL LOADING	2%
10.	FINAL PAINTING	5%

12.2.4 NON-SEGREGATED AND SEGREGATED PHASE BUS DUCT 11 & 6.6 kV (Item Sl No C1, C2 & D1)

SL. NO	DESCRIPTION OF ACTIVITY	PERCEN T-AGE
01	COLLECTION OF MATERIAL, TRANSPORTATION FROM BHEL STORES TO SITE	10%
02	ERECTION, ALIGNMENT, GROUTING SUPPORTING STRUCTURE	15%
03	PLACEMENT, ALIGNMENT, BOLTING OF CONDUCTOR, ENCLOSURES, COPPER FLEXIBLES, WALL FRAME ASSEMBLIES, SEAL OFF BUSHINGS, CONDUIT AND WIRING FOR ANTI-CONTENTATION HEATERS, EARTHING INTER CONNECTING BRIDGING BUS DUCT BETWEEN THE SWITCH BOARD ETC.	40%
04	PRE-COMMISSIONING AND COMPLETION OF AIR LEAK	10%
05	COMPLETION OF AIR PRESSURIZATION TEST	5%

06	ENERGIZATION OF INDIVIDUAL BUS DUCT AND SWITCH BOARD, **INTEGRATED ELECTRICAL TESTING / COMMISSIONING WITH ASSOCIATED CONNECTED EQUIPMENT**	13%
08	TRIAL RUN AND FULL LOADING	2%
09.	FINAL PAINTING	5%

12.2.5 GENERATOR STARTING FREQUENCY CONVERTER (Item Sl. No GG)

SL. NO	DESCRIPTION OF ACTIVITY	PERCENT-AGE
01	COLLECTION OF MATERIAL, TRANSPORTATION FROM BHEL STORES TO SITE	10%
02	PLACEMENT, ALIGNMENT, GROUTING OF LOAD CONVERTOR/INVERTOR PANELS, COMMON CONTROL PANELS, FIXING OF HOT AIR EXHAUST DUCT ETC.	13%
03	VACUUM BREAKER PLACEMENT, ALIGNMENT, SUB-ASSEMBLIES, GROUTING ETC.	15%
04	PLACEMENT, ALIGNMENT OF POWER TRANSFORMERS, ASSEMBLIES OF LOOSE ACCESSORIES AND OIL FILLING	15%
05	DRYING OUT OF TRANSFORMERS	10%
06	PLACEMENT, ALIGNMENT OF D.C. LINK REACTOR	10%
07	PRE-COMMISSIONING TESTS ON LCI, COMMON CONTROL PANEL, BREAKERS, TRANSFORMERS, REACTOR ETC.	20%
08	NO LOAD TRIAL RUN OF MOTORS	5%
09	FULL LOADING AND TRIAL RUN OF UNIT	2%

12.2.6 GTG & STG EXCITATION SYSTEMS & ACCESSORIES (Item Sl. No HH & II)

SN	DESCRIPTION OF ACTIVITY	PERCENT-AGE
01	COLLECTION OF MATERIAL, TRANSPORTATION FROM BHEL STORE TO SITE	10%
02	PLACEMENT, ALIGNMENT, GROUTING, INTER CONNECTION OF BUS BAR AND WIRING, FIXING OF LOOSE COMPONENTS AND AIR EXHAUST OUTLET DUCT FOR REGULATION, FIELD FLUSHING AND THYRISTOR PANELS	60%
04	PRE-COMMISSIONING TESTS	15%
05	UNIT SYNCHRONIZATION AND STABILIZATION, **INTEGRATED ELECTRICAL TESTING/ COMMISSIONING WITH ASSOCIATED CONNECTED EQUIPMENT**	13%
06	TRIAL RUN AND FULL LOADING	2%

12.2.7 GENERATOR CIRCUIT BREAKER, GENERATOR/ ST/UAT /CONTROL & PROTECTION PANEL & ACCESSORIES , 11 KV / 3.3KV / 415V / DCDB SWITCHGEAR BOARDS, (Item Sl No E1, J1 to J3, K1, K2, L1 to L15)

SL. NO	DESCRIPTION OF ACTIVITY	PERCENT-AGE
01	COLLECTION OF MATERIAL AND TRANSPORTATION FROM BHEL STORES TO SITE	10%
02	PLACEMENT ON FOUNDATION, ASSEMBLIES ETC.	20%
03	ADJUSTMENT, ALIGNMENT, GROUTING, ELECTRICAL INTER-CONNECTIONS,INTER PANEL WIRING AND BUS BAR, INSTALLATION OF LOOSE ACCESSORIES ETC.	35%
04	PRE-COMMISSIONING AND ELECTRICAL TEST, MECHANICAL/ELECTRICAL CHECKS INCLUDING PROTECTION, INTERLOCK TESTING AND MAKING THE SYSTEM READY BY ENERGIZATION	15%
05	**INTEGRATED ELECTRICAL TESTING/ COMMISSIONING WITH ASSOCIATED CONNECTED EQUIPMENT**	8%
05	ENERGIZATION OF SWITCH BOARD AND TRIAL OF INDIVIDUAL FEEDERS ON LOAD	10%
06	COMPLETION OF TRIAL RUN OF MAIN TG SET/FULL LOADING	2%

12.2.8 CABLE TRAY & SUPPORTING STRUCTURE, ABOVE GROUND EARTHING, GI LATTICE & PIPE STUCTURE (Item Sl No. P1-P10, Q1.1-Q1.4, Q2.1-Q2.2, Q3.1-Q3.2, Q4.1, Q5.1, Q6.1, Q7.1-Q7.4, Q8.1-Q8.8, S1-S5)

SN	DESCRIPTION OF ACTIVITY	PERCEN-TAGE
01	COLLECTION OF MATERIALS AND TRANSPORTATION FROM BHEL STORES TO SITE	10%
02	ERECTION, ASSEMBLY, ALIGNMENT, EARTHING ETC AS PER DRG, FIXING OF LEBALS, DANGER BOARD, MARKING OF TOWER & GANTRY STRUCTURE, PREPARATION / SUBMMISSION OF FQA LOG SHEET / ERTECTION PROTOCOL ETC.	85%
03	ENERGISATION OF SYSTEM FROM 400 / 220 KV SIDE SYSTEM, PREPARATION / SUBMMISSION OF COMMISSIONING PROTOCOL ETC.	5%

12.2.9 AVIATION LAMP & LA PKG, CABLE TERMINATION & JOINIING KITS, MARSHALLING BOX, JUNCTION BOX, STRUCTURAL STEEL FABRICATION & INSTALLATION (Item Sl. No. FF, O1 & O2, R1-R2, TT)

SN	DESCRIPTION OF ACTIVITY	%TAGE

01	COLLECTION OF MATERIALS AND TRANSPORTATION FROM BHEL STORES TO SITE	10%
02	COMPETION OF ERECTION, PREPARATION / SUBMMISSION OF FQA LOG SHEET / ERTECTION PROTOCOL ETC	85%
03	FINAL PAINTING	5%

12.2.10 Testing of Commissioning of Equipment erected by other agencies: Item nos. U1 to U5 of Rate Schedule

1. 80% of the agreed unit rates on completion of testing and off-load commissioning.
2. 10% after on-load commissioning of each item.
3. 5% after completion of trial operation of unit.
4. 5% on completion of facilities and handing over.

12.2.11

For the items where the payment is to be made against unit of weight, the actual weight of items erected by contractor will be paid after assessing the weight on the basis of shipping list or standard engineering practice. BHEL engineer's decision will be final and binding on contractor in this regard.

12.2.12

i) BHEL site at its discretion may further split up the percentage break up shown above and effect payment to suit the site condition, cash flow requirements according to the progress of the work.

ii) However for any items missed out in terms of payment specified herein, but required for total completion of work, payment of such items shall be regulated on the basis of percentage break up arrived at by any one of the following methods so as to effect payment to suit the site condition, cash flow requirements according to the progress of the work

1. Based on percentage break up mentioned for identical/similar items.
2. Based on the percentage break up arrived from nearby items.
3. In case 1 or 2 above do not exist, then BHEL site may derive percentage break up to suit the type of work.

iii) Before release of payment for (i) and (ii) above, BHEL site shall obtain requisite approvals from the competent authority.

12.3 MEASUREMENT OF THE WORK COMPLETED

12.3.1

The Bidder shall quote separate unit rates for each item as detailed in Rate Schedule. Payment will be made by BHEL according to agreed item rates, break up of stage payments and actual executed quantities.

12.3.2
In rate schedules, all inclusive unit rates have been called for entire scope of work for respective item including erection, calibration, testing and commissioning as applicable for various device and instrument and payment shall be made as per split up furnished in the table earlier in this section.

12.3.4
For all payment purpose, measurement shall be made on the basis of physical measurement. Contractor shall make physical measurement in presence of BHEL engineer. Contractor shall maintain records for utilization of material system-wise.

12.3.5
All the surplus, scrap and serviceable materials shall be returned by the contractor to BHEL's stores as per the instruction of engineer.

12.3.6
All the cables returned to stores should carry aluminium tag(s) indicating the size and type of cables. Cable of more than five -meter lengths is termed as "serviceable material".

12.3.7
Any item returned to stores shall be clearly identified and tagged for its serviceability or any defects in the returned items.

12.3.8
Wherever additional instrumentation work has to be carried out for performance guarantee test, the same has to be executed by the contractor as per the applicable rates already provided in the rate schedule.

For the items where the payment is to be made against unit of weight, the actual weight of items erected by contractor will be paid after assessing the weight on the basis of shipping list or standard engineering practice. BHEL engineer's decision will be final and binding on contractor in this regard.

12.4 Payment for the work completed

12.4.1
The bidder shall quote separate unit rates for each item as detailed in rate schedule. payment will be made by bhel according to agreed item rates, break up of stage payments and actual executed quantities.

12.4.2 Measurement for payment
In rate schedules, all inclusive unit rates have been called for entire scope of work for respective item including erection, calibration, testing and commissioning as applicable for various device and instrument and payment shall be made as per split up furnished in the table earlier in this section.

12.4.3
For all payment purpose, measurement shall be made on the basis of physical measurement. physical measurement shall be made by contractor in presence of BHEL engineer. Contractor shall maintain records for utilization of material system-wise.

12.4.4
All the surplus, scrap and serviceable materials shall be returned by the contractor to BHEL's stores as per the instruction of engineer

12.4.5

All the cables returned to stores should carry aluminium tag(s) indicating the size and type of cables. cable of more than five -meter length is termed as “serviceable material”.

12.4.6
Any item returned to stores shall be clearly identified and tagged for its serviceability or any defects in the returned items.

12.4.7
Wherever additional instrumentation work has to be carried out for performance guarantee test, the same has to be executed by the contractor as per the applicable rates already provided in the rate schedule.

SECTION-13

SPECIAL CONDITIONS OF CONTRACT

Refer “General Condition Of Contract”

SECTION-14

SPECIAL CONDITIONS OF CONTRACT

INSURANCE

Refer “General Condition Of Contract”

SECTION-15 (Rev dated 12/1/2009)

SPECIAL CONDITION OF CONTRACT

15.0 EARNEST MONEY DEPOSIT, SECURITY DEPOSIT & BANK GUARANTEE

Refer "General Condition Of Contract"

15.1 Security Deposit

Refer "General Condition Of Contract"

15.2 BANK GUARANTEE

Refer "General Condition Of Contract"

15.3.1 Guidelines for acceptance of Bank Guarantees are as follows :

- Vendors are advised to obtain BG from any of the following BHEL consortium banks

State Bank of India	The Hongkong and Shanghai banking Corporation Ltd.
ICICI Bank Ltd	ABN Amro Bank N.V
Bank of Baroda	IDBI Ltd
Canara Bank	Punjab National Bank
Citi bank N.A	Standard Chartered Bank
Corporation Bank	State Bank of Travancore
Detshe Bank	State Bank of Hydrabad
HDFC Bank Ltd	Syndicate Bank

- The Bank Guarantees of all Public sector banks shall be accepted (Other than consortium banks also).
- The Bank Guarantees of Co-operative banks shall not be accepted.
- Bank Guarantees of other banks (banks other than consortium bank, public sector bank, & Co-operative banks) can be accepted subject to an overall exposure limit (at BHEL, PSWR, Nagpur) of RS. 10 crores for banks with net worth of more than Rs. 500 crores as on last balance sheet date and Rs 5 crores for banks with net worth between Rs. 350 to Rs 500 crores (A certificate and copy of latest Balance Sheet to be given at the time of submission of bank guarantees .
- In case Bank Guarantees given by non consortium banks (Private sector or Public sector), the bank Guarantees shall be enforceable at Nagpur, Maharastra.

SECTION 16
SUSPENSION OF BUSINESS DEALING WITH CONTRACTORS
(w.e.f 18.05.09)

16.1 A bidder may be put on HOLD for a period of 6 months, for future tenders for specific works on the basis of one or more of the following reasons:

I. Bidder does not honour his own offer or any of its conditions within the validity period.
II. Bidder fails to respond against three consecutive enquires of BHEL.
III. After placement of order, Bidder fails to execute a contract.
IV. Bidder fails to settle sundry debt account, for which he is legitimately liable, within one year of its occurrence.
V. Bidder's performance rating falls below 60% in specific category.
VI. Bidder works are under strike/ lockout for a long period.

16.2 A Bidder may be de-listed from the list of registered Bidders of the region for a period of 1 year on the basis of one or more of the following reasons:-

I. Bidder tampers with tendering procedure affecting ordering process or commits any misconduct which is contrary to business ethics.
II. Bidder has substituted, damaged, failed to return, short returned or unauthorizedly disposed off materials/ documents/ drawings/ tools etc of BHEL.
III. Bidder no longer has the technical staff, equipment, financial resources etc. required to execute the orders/ contracts.

16.3 A Bidder can be banned from doing any business with all Units of BHEL for a period of 3 years on the basis of one or more of the following reasons:

I. Bidder is found to be responsible for submitting fake/ false/ forged documents, certificates, or information prejudicial to BHEL's interest.
II. In spite of warnings, the Bidder persistently violates or circumvents the provisions of labour laws/ regulations/ rules and other statutory requirements.
III. Bidder is found to be involved in cartel formation.
IV. The Bidder has indulged in malpractices or misconduct such as bribery, corruption and fraud, pilferage etc which are contrary to business ethics.
V. The Bidder is found guilty by any court of law for criminal activity/ offences involving moral turpitude in relation to business dealings.
VI. The Bidder is declared bankrupt, insolvent, has wound up or been dissolved; i.e ceases to exist for all practical purposes.
VII. Bidder is found to have obtained Official Company information/ documentation by questionable means.
VIII. Communication is received from the administrative Ministry of BHEL to ban the Bidder from business dealings.

SECTION 17
INTEGRITY PACT

NOT APLLICABLE

Appendix- I

Details (wherever required) of items listed in the rate schedule

Please Note:

1. All the items in general are to be erected and commissioned by the contractor, unless specifically mentioned otherwise.
2. In such cases where systems are described with component quantities (viz., Vibration monitoring systems, Lube Oil skids, etc., etc.) lumpsum rates are to be quoted. No separate payment will be made for the component items of those systems, although these systems may have certain items for which separate unit rates are also available elsewhere.
3. The dimensions and weights mentioned are only approximate. No extra claims will be entertained due to change in dimensions/weight.

❖ GENERATOR and STATION TRANSFORMER (SL NO. A1 & A2)

SN	DESCRIPTION	GENERAL INFORMATION	
1	Rating	287MVA 230/15.75kV GTGT	160MVA 230/15.75kV GTGT
2	Weight of core &winding (kg)	144000 approx.	105000 approx.
3	Total weight of assembled transformer including oil (kg)	273000 approx.	197000 approx.
4	Transportation / shipping weight (gas filled)(kg)	172000 approx.	125000 approx.
5	Weight of tank &fitting, marshalling kiosk &wiring, cooler bank, conservator & pipe work, supports, rollers HV/LV turrets, pumps, bushings HT/LT, OFAF Coolers, Fans, Marshalling box, Cabling from marshalling box to field devices and other accessories & fittings(kg)	72865 approx.	44865 approx.
6	Oil quantity		

	Oil in transformer tank (ltrs)	49000 approx.	30400 approx.
	Oil in cooler, conservator, &pipe work(ltrs)	15500 approx.	9600 approx.
	Total oil quantity(ltrs)	64500 approx.	40000 approx.
7	Weight of heaviest packages(kg)	172000 approx.	125000 approx
8	Dimensions of assembled transformer(mmxmmxmm)	16100x8160x7805 approx.	14200x8500x7350 approx.

- **UNIT AUX TRANSFORMER (SL NO. A3)**

Quantity per unit – 2 Nos.

SL. NO	DESCRIPTION	UNIT TRANSFORMER
1	Rating	40MVA, 3-PHASE 15.75/6.9 KV
2	Type of cooling	ONAF/ ONAN
3	Winding connection	Dyn11yn11
4	**WEIGHT OF ACCESSORIES**	
	Weight of core & winding	40 MT
	Tank & fitting including HV/LV bushings turrets, rollers	31 MT
	Total weight of transformer including oil	92 MT
	Shipping weight of transformer (gas filled)	50 MT
5	**Oil Quantity**	
	Total oil quantity	23000 LITRES

- **Sl No B1 & B2 : Isolated phase Busduct for GTG/STG**

CONDUCTOR/ ENCLOSURE SIZE DETAILS FOR GTG & STG BUS DUCT **(Quantity per set)**

A. GTG BUS DUCT (15.75 kV)
1. ENCLOSURE SIZE
Main bus duct -1070mm O/D 8 mm thick AL Sheet

Tap Off Bus Duct - 780 mm O/D x 4.78 mm thick AL sheet

2. CONDUCTOR SIZE
Main Bus Conductor - 530mm O/D x 16 mm thick
Length - 75 m x 3 ph = 225m
& 10 m x 1 ph = 10m
Tap Off Conductor - Ch. Box A/F 152O/D x 8.1mm thick
Length - 40 m x 3 ph = 120m

3. SUPPORT STRUCTURE - 18 MT

B. STG BUS DUCT (11 kV)
1. ENCLOSURE SIZE
Main bus duct -1000mm O/D x 8 mm thick AL sheet

Tap Off Bus Duct - 780 mm O/D x 4.78 mm thick AL sheet

2. CONDUCTOR SIZE
Main Bus Conductor - 450 mm x 15 mm thick
Length - 80m x3 ph = 240m
& 10 m x 1 ph = 10
Tap Off Conductor - Ch. Box A/F 152mmO/D, 8.1 thick
Length - 10m x 3 ph = 30m
3. SUPPORT STRUCTURE - 16 MT

❖ **Sl No C1 : LT Busduct**

Each set consist of :

1) 15 METRE STRAIGHT RUN

2) 90 DEG BEND – 4NOS

3) FLEXIBLE (Cu) AT TRANSFORMER END GAP AND SWGR END – 1SET

4) ADAPTER – 1NO.

5) EXPANSION JOINT – 1NO.

6) WALL FRAME ASSEMBLY – 1NO.

7) PHASE CROSSOVER – 1NO.

8) SET OF HARDWARE AT TRF. & SWGR END

9) SUPPORT STRUCTURE – 200KG OF GI

❖ **Sl No D1 : SP Busduct (Quantity per set)**

A. SP BUS DUCT (6.6 KV)

1. ENCLOSURE SIZE - Rectangular 450x 1350x 3.5 mm tk

2. CONDUCTOR SIZE - Ch. Box A/F 152, 8.1 tk

B. WALL FRAME - 4 SETS

APPENDIX-II

PAINTING SPECIFICATION

PART A:-

This section defines the technical requirements for surface preparation selection and application of paints on equipment, vessels, machinery, piping, ducts etc. However, manufacturers shall follow their standard procedures for painting their equipment. The Bidder shall submit a detailed painting procedure for approval of Employer / Employer's Representative after the award of contract.

1 The following surface and material shall require painting:

(a) All un-insulated carbon steel and alloy steel equipment like columns, vessels, drums, storage tanks, heat exchangers etc.
(b) All un-insulated carbon steel and low alloy piping, fitting and valves (including painting of identification marks).
(c) All pipe structural steel supports, walkways, platforms, hand rails, ladders etc.

2 The following surfaces and material shall not require painting:

(a) Non-ferrous materials
(b) Austenitic stainless steel
(c) Plastic and / or plastic coated materials
(d) Insulated surface of equipment and pipes except colour coating wherever required.
(e) Painted equipment like blowers, pumps, valves, etc., with finishing coats in good condition and with matching colour-code.

3 **Codes and Standards**
Painting of equipment shall be carried out as per the specifications indicated below and shall conform to the relevant IS specification for the material and workmanship.
The following Indian Standards may be referred to carrying out the painting job.

IS : 5 : Colours for ready mixed paints and enamels
IS : 1303 : Glossary of terms relating to paints
IS : 2379 : Colour code for identification of pipelines.
IS : 2395 : Code of practice for finishing of concrete, masonry and plaster surfaces (Parts I and II)
IS : 2338 : Code of practice for finishing of wood and wood based materials (Parts I & II)
IS : 158 : Ready mixed paint, brushing, bituminous, black, lead free, acid, alkali, water and heat resisting
IS : 2074 : Ready mixed paint, air drying, red oxide zinc chrome, and priming.
IS : 104 : Ready mixed paint, brushing, zinc chrome, priming
IS : 2932 : Enamel, synthetic, exterior (a) undercoating (b) Finishing.

SIS : 55900 : Swedish standard for blasting

4 **Surface Preparation**
The surface shall be prepared in a manner suitable for coatings. Chemical derusters or rust converters shall not be applied. Acid cleaning is subject to approval of Purchaser / Purchaser representative.

4.1 **Blasting**
The surface of the part / component shall be blasted before the coating material is applied.
Unless otherwise specified in the documents, the surface shall satisfy the following requirements after blasting:

(a) Blasting according to SIS 055900, Grade Sa-2 1/2.

Depending on production flow, weldable, ethyl zinc silicate shop primer, dry film thickness 15 – 25 microns shall be used.

4.2 **Manual Rust Removal**
Manual rust removal shall be allowed for welded zones and for touching up installed components
4.3 **Cleaning**

Removal of impurity

	Impurity	Removal
(a)	Dust, loose deposits	Vacuum-cleaning, brushing
(b)	Adhesive deposits	Power brushing
(c)	Oils, greasy impurities	Wet blasting, use of detergent additives by agreement
(d)	Salt deposits	Rinsing
(e)	Markings (e.g., felt tip pen)	Organic solvents to manufacturer's specifications e.g., Trichloro trifluoro ethane and solvents containing acetone (renew solvent and rag frequently).

5 **Processing**

5.1 **General**

Application Conditions
The primer shall be applied to properly prepared surfaces only. The specifications of the coating material manufacturers shall be observed. The minimum temperature shall be +5°C and the relative humidity shall not exceed 80%. The temperature of the work piece shall be atleast 3°C above dew point.

5.2 **Application Procedure**
The primer shall be applied by means of brush or by spray. The top coats shall be applied by means of brush, roller or by spray. At points where coating application is interrupted, the individual layers shall be adequately stepped to ensure proper layer sequence when coating operations are resumed.

5.3 **Touching Up**

Before each layer is applied, previous coating shall be touched up where necessary by way of rust removal and cleaning, according coating manufacturer's specifications. The final top coat shall be reapplied completely, if required.

5.4 **Uncoated Surfaces**
Moving parts of machines (e.g., stems, shafts, sliding and locating bearings), nameplates, instruments and sealing surface shall not be coated. Welds shall be left free of coating upto a distance of 30 mm on each side of the weld edge until erection and weld examinations, if any, have been completed.

5.5 **Bond Strength**
The pull-off stress determined using the pull-off test method for adhesion shall be not less than 1.5 N/mm_2, according to ISO 4624.

6 **Surface Conditions of Coating Surfaces**
The coating surface shall have a uniform film thickness, shade and gloss and shall be free from inclusions, sags and wrinkles.

7 **Coating Systems**
7.1 **General Requirements for Coating Systems**
Coating materials according to SSPC, BS 5493 or DIN 55 928 shall be used. Intermediate coats are to be pigmented with micaceous iron oxide. The materials shall be matched with each other so that they are compatible. Coatings deviating this specification shall be subject to approval. Standards of surface preparation and painting shall give a time to first maintenance of 10 years. The colour and gloss of top coats shall be in accordance with sub-clause suggested colour codes for painting (Sub-clause 13.10).

7.2 **Standard Coating System (External Coatings)**
(a) For painting of civil structures in general and other steel structures not covered below shall be carried out as specified in PART B of the specification.
(b) **Galvanised iron and steel requiring paint finish at site**

(i) At site
Surface Treatment
Mechanical cleaning from contaminants by means of washing or steam jetting and sweep blasting with fine sand or etching (TWash).

Touch-up mechanical damages:
De rusting St 3 and application of high build epoxy primer DFT 80 μm.

Finish coating:
Analogous to standard painting scheme

7.3 **Painting of indoor components such as valves, pumps, motors, electrical parts, tanks etc.**

At works
Surface preparation:
Blasting according to SIS 055900: grade Sa 2 1/2. Depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer dry film thickness 15 – 25 μm, may be used.

Prime coat:
Two (2) layers of zinc phosphate epoxy, total dry film thickness 75 μm.

At site
Thorough cleaning to remove oil, grease, dirt and any other contaminants. Derusting of all mechanical damages according to SIS 055900 Grade ST3. Touch up with 1 pack inorganic ethyl zinc silicate, dry film thickness 50 μm.

Finish coat:
Two (2) layers of a 2 pack epoxy polyamide glossy, according to colour specification, dry film thickness 60 μm.
Total system dry film thickness 135 μm.

Remarks:
Equipment coated with a standard application system can be accepted if the quality of this application system is corresponding with the quality of the above mentioned system.

7.4 **Painting of Outdoors equipments (external surfaces) such as piping, valves, pumps, motors, electrical parts, tanks etc.**
Weather exposure, weather resistance, temperature upto 120_0C as per 13.7.1 and 13.7.3 however.

Surface Preparation:
Blasting according to SIS 055900: grade Sa 2 1/2. Depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer dry film thickness 15-25 μm, may be used.

Prime Coat:
Two (2) layers of zinc phosphate epoxy, total dry film thickness 75 μm. Intermediate Coat:
One (1) layer 2 pack high build epoxy polyamide Mio, dry film thickness 100 μm.

Finish Coat:
One (1) layer of a 2 pack aliphatic polyurethane glossy minimum dry film thickness 50 μm.
Total system dry film thickness 225 μm.

7.5 **Special Coating System (External Coatings)**
(a) Parts exposed to temperatures above 120^0C, upto 200^0C, not insulated

(i) At works
Surface Preparation:
Blasting according standard SIS 55900 Grade Sa 2 1/2 and ISO 8501- 1: 1988. Depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer, dry film thickness 15-25 μm, may be used.

Prime coat
Inorganic ethyl zinc silicate, dry film thickness 75 μm.

(i) At site
Pre-treatment:
Derusting of all mechanical damages, according to ISO 8501-1: 1989, grade St 3 Touch-up with 1 pack inorganic ethyl zinc silicate, dry film thickness 50 μm.

Removal of all decontaminants from prime coat.

Intermediate Coat:
1 pack silicon acrylic, dry film thickness 35 μm.

Final coat :
1 pack silicon acrylic, dry film thickness as 35 μm. Total system dry film thickness 145 μm.
Final coat according to colour code.

(b) **Parts exposed to temperatures above 200^{0}C, upto 400^{0}C, not insulated**

(i) At works
Surface Preparation:
Blasting according to ISO 8501-1: 1988 grade Sa 2 1/2. Depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer, dry film 15-25 μm, shall be used.

Prime coat:
Inorganic ethyl zinc silicate, dry film of thickness 75 μm.

(ii) At site
Pre-treatment:
Derusting of all mechanical damages, according standard Sa 2 1/2 to ISO 8501-1: 1988. Touch-up with coating system according to manufacturer's recommendations.

(c) **Insulated Parts, continuously exposed to condensing water or parts exposed to temperatures**
For parts that are provided with insulation on site.

(i) **Insulated parts, exposed to condensing water**

At works
Surface Preparations:
Blasting according standard Sa 2 1/2 to ISO 8501-1: 1988. Depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer, dry film thickness 15-25 μm shall be used.

Prime coat:
Inorganic ethyl zinc silicate, dry film thickness 75μm.

(ii) **Insulated parts exposed to temperatures** Parts, exposed to temperatures upto <400^{0}C at works
Surface Preparation:
Blasting according to standard Sa 2 1/2 to ISO 8501-1: 1988. Depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer, dry film thickness 15-25 μm shall be used.
Parts, exposed to temperatures above 400^{0}C at works (Steam pipes, pressure tubes and parts for the HRSG, such as heating surfaces, heaters and super heaters reheaters, etc.)

Surface preparation:
Blasting according standard Sa 2 1/2 to ISO 8501-1: 1988.

Temporary primer:
Varnish.

(d) **Intermittent exposure due to condensing water / chemicals (Indoors)**

(i) At works
Surface Preparation:

Blasting according to standard Sa 2 1/2 to ISO 8501-1: 1988. Depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer, dry film thickness 15-25 μm may be used.

Prime Coat:
Two layers of zinc phosphate epoxy primer total dry film thickness greater than or equal to 75 μm.

(ii) At site
Pretreatment:
Derusting of all mechanical damages, according standard Sa 3 to ISO 8501-1: 1988, touch-up with 2 pack high build epoxy with volume solid content of more than 85%, 75 μm.

Intermediate Coat:
2 pack high build epoxy, dry film thickness 80 μm.

Finish coat:
2 pack epoxy according to colour appearance, dry film thickness of 50 μm. Total system dry film thickness 205 μm. When exposed to weathering, weather resistance finish coat shall be applied.

(e) **Water exposure**

Surfaces permanently or predominantly in contact with water.

(i) At site / works
Pretreatment:
Removal of all welding pearls. Blasting according standard Sa 3 to ISO 8501-1: 1988. Coat:
4 coats 2 pack coal-tar-epoxy, dry film thickness 125 μm each. Total system dry film thickness 500 μm. Touch-up after erection as required.

7.6 **Buried / underground piping system**

(a) Where pipelines are buried, underground protection shall be provided for the piping system as indicated in any one of the methods given below:
(i) Coal tar primer, coal tar enamel, inner wrap of fibre glass, final outer wrap of enamel impregnated fibre glass. Total thickness of coating shall not be less than 4.0 mm.
(ii) With anti-corrosive tape of minimum 4 mm thick conforming to IS-10221 and AWWA C 203-93.

(b) Pipe surfaces shall be cleaned by shot or sand blasting before application.

(c) Tests to be carried out after application
(i) Bond / Adhesion test
(ii) Holiday test

8 **INTERNAL COATINGS**
8.1 **Tanks (Internal Surfaces) as specified in relevant sections of specification**
Industrial, deionised, demineralised and potable water upto 60^0C pH range: 4.5 – 9.5.
Blasting according to ISO 8501-1: 1988, grade Sa 2 1/2.

Prime coat:
Two layers of zinc phosphate epoxy primer total DFT greater than or equal to 75 μm.

Pretreatment:
Derusting of all mechanical damages, according to standard Sa 3 to ISO 8501-1:1998, touch up with 2 pack high build epoxy with volume solid content of more than 85%, 75 μm.

Intermediate coat:
2 pack high build epoxy, dry film thickness 80 μm.

Finish coats:
2 pack solvent free epoxy paint dry film thickness 150 μm per coat. In case of service or potable water tanks, the coating material selected shall not taint the water. QA / QC procedure, including pinhole inspection, for shall be submitted for approval by Employer / Employer's Representative.

8.2 **Rubber Lining of Pipes, Valves and Tanks as specified in relevant sections.**
(a) At works
Pretreatment:
Blasting according standard 2 1/2 to ISO 8501-1 : 1988. Rubber lining:
Hard-rubber 5mm for DM water applications, thickness greater than or equal to 3 mm for others. In case of failure of rubber lining for both pipes and vessels, the rubber lining shall be replaced by COROCOAT

9 **Painting for Electrical Items**
9.1 All the steel work shall be thoroughly cleaned of rust, scale, oil, grease, dirt and swarf by pickling, emulsion cleaning, etc. The sheet steel shall be phosphated / oven dried and then painted with two coats of zinc rich primer paint. After application of the primer, two coats of finishing synthetic enamel paint shall be applied. The colour of the finishing coats inside shall be glossy white and exterior of the treated sheet steel shall be shade 631 of IS-5 / RAL 7032 for all switchboard/MCC/ Distribution boards, control panels, etc.
9.2 All electrical equipment shall be given tropical and fungicidal treatment and outdoor equipment shall be provided with rain hood to prevent entry of rain water into the equipment.

10 **Suggested Colour Codes for Painting**

Sl. No. Item / Service	**Colour**	**IS–5**	**Colour (Band)**	**IS - 5**
10.1 Structures, platforms, galleries,ladders and handrails.	Dark Admirability Grey	632	- -	- -
10.2 Boiler casing, ducting	Nut Brown	413	- -	- -
10.3 Crane				
(a) Crane structure	Golden Yellow	356	Black	-
(b) Trolley and hook	Crimson	540 -	- -	- -
10.4 Pump motors, compressors	Light Grey	631	- -	- -
10.5 Tanks (without insulation and cladding)				
(a) Outdoor	Aluminium	- - -		
(b) Indoor	Light Grey	631	- -	- -
10.6 Vessels and all other proprietary equipment (without insulation and cladding)	Light Grey	631 - -		

10.7 Switchgear	Light Grey	631	- -	- -
10.8 Control and relay panels	Light Grey	631/ 7078 of IS1650	- -	- -
10.9 Turbines	Light Grey	631	- -	- -
10.10 Generators and exciter	Light Grey	631	- -	- -
10.11 Transformers	Aluminium	- - -		
10.12 Machinery guards Signal	red	537	- -	- -
10.13 Piping (Without insulation and cladding)				
(a) **Water System**				
(I) Boiler feed	Sea Green	217	- -	- -
(ii) Condensate	Sea Green	217	Light Brown	410
(iii) DM Water	Sea Green	217	Light Orange	557
(iv) Soft Water	Sea Green	217	French Blue	166
(v) Bearing cooling water	Sea Green	217	French Blue	166
(vi) Potable and filtered water	Sea Green	217	French Blue	166
(vii) Service and clarified water	Sea Green	217	French Blue	166
(viii) Cooling water	Sea Green	217	French Blue	166
(ix) Raw water	Sea Green	217	White	-
(b) **Air system**				
(i) Station air	Sky Blue	101	- -	
(ii) Control air	Sky Blue	101	White	-
(c) **Oil system**				
(i) Light oil (HSD)	Light Brown	410	French blue	166
(ii) Lubricating oil	Light Brown	410	Light grey	631
(iii) Transformer oil	Light Brown	410	Light Orange	557
(d) **Gas system**				
(i) Fuel gas (Regassified LNG)	Canary Yellow			
(ii) Carbon dioxide	Canary Yellow	309	Light grey	631
(iii) Hydrogen	Canary Yellow	309	Signal red	537
(e) **Fire Services**	Fire red	536	- -	- -
(f) **Effluent pipes**	Black	- - -	- -	- -
(g) **Vacuum pipes**	Sky Blue	101	Black	
(h) **Drainage**	Black	- - -	- -	- -

NOTES

1. This colour code basically refers to IS: 2379 for piping with necessary modifications.
2. Where band colour is specified, same shall be provided at 10 metre intervals on long uninterrupted lines and also adjacent to valves and junctions.

PART B :-

1.1 All steel structures shall receive two primer coats and two finish coats of painting. First coat of primer shall be given in shop after fabrication but before dispatch to erect at site after

surface preparation as described below. The second coat of primer shall be applied after erection and final alignment of the erected structures. Two finish coats shall also be applied after erection.

1.2 Steel surface, which is to be painted, shall be cleaned of dust and grease and the heavier layers of rust shall be removed by chipping prior to actual surface preparation. The surface shall be cleaned to grade ST-2 as per SIS05-5900 or as per IS:1477 (part -I). Surface preparation shall be done by means of sand blasting, which shall conform to IS Standard.

1.3 Primer coat shall consist of one coat of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns.All paints shall be of approved brand and shade as per the OWNER'S requirement.

1.4 Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with min. DFT of 100 microns.

1.5 Top coat shall consist of one coat of epoxy paint suitably pigmented of approved shade and color with glossy finish and DFT of 75 microns. Additionally finishing coat of polyurethane of minimum DFT of 25 microns shall be provided.

1.6 The paint may be applied in one coat, in case high built paint is used, otherwise two coats shall be applied.

1.7 Total DFT shall not be less than 300 microns.

1.8 Intermediate / top / finishing coat paints shall be form the same manufacture and the paints shall have compatibility with one another. Applications shall be as per manufactures recommendations.

1.9 All other steel members like doors, rolling shutters, pipe supports etc. shall be painted as per the details as above.

1.10 Joints to be site welded shall have no paint applied within 100 mm of welding zone. Similarly where friction grip fasteners are to be used no painting shall be provided. On completion of the joint the surfaces shall receive the paint as specified.

1.11 Surfaces inaccessible after assembly shall receive two coats of primer prior to assembly. Surfaces inaccessible after erection including top surfaces of floor beams supporting gratings or chequered plate shall receive one additional coat of finish paint over and above number of coats specified before erection. Portion of steel member embedded / to be encased in concrete shall not be painted.

APPENDIX–III

T&P TO BE PROVIDED BY BHEL FREE OF CHARGE (ON SHARING BASIS, BASED ON AVAILABILITY)

i. EOT crane in TG floor will be made available on sharing basis for handling panels when required

While all efforts will be made for amicable sharing of the above, non-availability of the above due to any reason shall not absolve the contractor of performing his responsibilities in time. The contractor shall undertake sufficient pre-planning and arrange his own handling/transport equipment as deemed necessary.

Appendix IV

LIST OF MAJOR TOOLS & PLANTS & MMD TO BE BROUGHT BY THE CONTRACTOR

A. T&P FOR ELECTRICAL WORKS

SN	DESCRIPTION	MINIMUM QUANTITY
01	TRANSFORMER OIL PURIFICATION PLANT WITH VACUUM PUMP FOR EVACUATION OF TRANSFORMER ALONGWITH ACCESSORIES & HOSES. A) CAPACITY 5000/6000 LTR PER HOUR B) CAPACITY 2000/2500 LTR.PER HOUR C) CAPACITY 750/1000 LTR. PER HOUR	 1 NO. 1 NO. 1 NO.
02	TRANSFORMER OIL TRANSFER/STORAGE TANK WITHSTANDING FULL VACUUM CAP. 10 KILOLITRES	2 NOS
03	PRIMARY INJECTION KIT UPTO 10000 AMPS	1 NO.
04	SECONDARY INJECTION KIT WITH INTEGRAL TIMER FOR RELAY TESTING	1 NO.
05	3 PHASE VARIAC	1 NO. EACH
06	SINGLE PHASE VARIAC 28 AMPS	1 NO.
07	TRANSFORMER TURNS RATIO TEST KIT	1 NO.
08	HV TEST KIT AC, 0 –50 KV &DC, 0- 100 KV PREFERSBLY WITH DRY TYPE TRANSFORMER	1 NO. EACH

SN	DESCRIPTION	MINIMUM QUANTITY
09	TRANSFORMER OIL BDV TEST KIT 0-100 KV WITH 2.5MM AIR GAP.	1 NO.
10	PORTABLE AIR COMPRESSOR WITH DRIER AND REGULATOR MAKE "TOSHNIWAL"/"KHOSLA" RATED FOR 7/10 KG/CM2	1 NO.
11	SOLDERING IRON "SOLDRON" MAKE 25 WATT	2 NOS.
12	VACUUM PUMP	1 NO.
13	MULTIMETRES	
	a>DIGITAL 3 1/2 DIGIT OF REPUTED MAKE b> ANALOG MOTWANE MAKE c> DIGITAL 4 1/2 DIGIT OF REPUTED MAKE	6 NOS. 3 NOS. 2 NO.
14	STANDARD MILLI AMPS/MILLIVOLTS SOURCE MAKE RANGE 0 TO 60 mA AND 0 TO 100 mV	2 NO.
15	INSULATION TESTER HAND OPERATED 25OV/500V/1000 V RATED MAINS/BATTERY OPERATED	1 NO. EACH
16	INSULATION TESTER MAINS OPERATED 2500/5000V	2 NO.

SN	DESCRIPTION	MINIMUM QUANTITY
17	DC POWER SUPPLY 0 TO 250 V DC, 5 A MAKE "APLAB" OR EQUIVALENT (VARIABLE SOURCE)	2 NO
18	PHASE SEQUENCE INDICATOR	1 NO.
19	FREQUENCY SOURCE 45 TO 55 HZ WITH 110V	1 NO.
20	TONG TESTER AC 5/10, 25/60/300 AMP RANGE REPUTED MAKE	1 NO. EACH
21	TONG TESTER DC 30/60/300 AMP	1 NO.
22	STOP WATCH	1 NO.
23	CONTAINER FOR TRANSFORMER OIL SAMPLING	10 NOS.
24	TARPOLIN FIRE PROOF	As required
25	DC SHUNT 400 AMP 75 MV	1 NO.
26	3 PHASE SHIFTER	1 NO.
27	INDUSTRIAL TYPE VACUUM CLEANER	1 NO.
28	MICRO OHM METER	1 NO.
29	DECADE RESISTANCE BOX	2 sets.
30	TELETALK 2 WIRE SYSTEM	6 SETS
31	PORTABLE BLOWER WITH HEATING ARRANGEMENT	1 NO.
32	TORQUE WRENCH (12-60Nm, 50-225 Nm)	1 NO EACH
33	WATTMETER AC/DC 0-125-250V, 0-5-10A	1 NO
34	OSCILLOSCOPE	1 NO
35	TACHOMETER NON CONTACT TYPE 0 to 4000 RPM	1 NO

36	TAN DELTA TEST KIT	1 NO
37	OIL SPECIFIC GRAVITY AND PPM MEASURING INSTRUMENT	1 NO
38	RHEOSTAT	3 NOS
39	POLARITY TEST KIT	1 NO
40	NON – CONTACT TYPE DIGITAL THERMOMETER	1 NO
41	RELAY TESTING KIT	1 NO
42	FERRULE PRINTING MACHINE	1 NO
43	PHANTAM LOAD KIT	1 NO
44	Secondary current injection kit upto 300 amp	1 no.
45	Dead weight tester rated 400 Kg/cm2 and with weights and test gauge facility. Make 'Budenberg or 'Ravika'	1 no.
46	Oil temperature bath suitable to calibrate the instruments range 0 – 200 deg. C with standard temperature gauges and thermostatic control	2 nos.
47	Muffle furnace – 800 deg. C with standard temperature gauges	1 no.
48	Standard gauges 12" dial size make "Budenberg" or "H Guru" or "Odin"	
	A) – 1-0 kg/cm2 pressure gauge(vacuum gauge) B) 0 – 5 or 6 kg/cm2 pressure gauge C) 0 – 10 kg/cm2 – do – D) 0 – 25 kg/cm2 – do – E) 0 – 60 kg/cm2 – do – F) 0 – 100 kg/cm2 –do – G) 0 – 250 kg/cm2 – do – H) 0 – 600 kg/cm2 – do – I) 0.2 to 1 kg -- do --	1 no. 1 no. 1 no. 1 no. 1 no. 1 no. 1 no. 1 no. 1 no.
49	Manometers (+/-) 1000 mm water column With hand bulb for lab and small manometers for field purpose.	2 nos.
50	Manometer (+/-) 500mm mercury column with hand bulb for lab and small manometer for field purpose.	1 no.
51	Inclined manometer (+/-) 300 mm water column	1 no.
52	Glass thermometer 0-120 deg. C, 0-200 deg.c and 0-600 deg.c	1 no. Each
53	RTD/Pt 100 source	1 nos.
54	Vacuum pump for Power Transformer	1 no.
55	Function generator	1 no.

Note:

Instruments shown above are for the regular works only. However, separate sets of tools and instruments are to be arranged and provided to commissioning gang. If contractor fails to arrange the testing instruments as listed above, BHEL site will arrange the instruments at the cost of contractor. Contractor to submit calibration report from recognized agency prior to deployment of same at site and periodical calibration of the same to be arranged by contractor as per procedure of BHEL.

B. T&P FOR MECHANICAL WORK

SN	DESCRIPTION	MINIMUM QUANTITY
	HANDLING EQUIPMENTS	
1	TURN BUCKLES	AS PER REQMT
2	'D' SHACKLES	AS PER REQMT
3	STEEL WIRE ROPES	AS PER REQMT
4	MANILA ROPES	AS PER REQMT
5	CHAIN PULLEY BLOCK/TIRFUR	AS PER REQMT
	MAJOR T&P	
1	PIPE BENDING MACHINE – 2" SIZE	2 NOS
2	ELECTROHYDRAULIC PIPE BENDING MACHINE	1 NO.
2	GRINDING MACHINE	4 NOS
3	DRILLING MACHINES 1/4", 1/2", 3/4" & 1"	1 NO. EACH
4	COPPER TUBE BENDER AND CUTTER SIZES 6MM, 8MM, 1/2", 1/4"	1 NO. EACH
5	DYE SETS FOR THREADING UPTO 2" PIPE.	2 NOS
6	SPIRIT LEVEL	2 NOS.
7	TAP SETS FOR BOTH BSP AND MPT THREADS UPTO 1" EACH	1 SET EACH
8	MEASURING INSTRUMENTS LIKE MICROMETRES AND CALIPERS	1 SET EACH
9	WELDING GENERATORS	3 NO.
10	WELDING TRANSFORMER	3 NO.
11	TIG WELDING SET	2 NO.
12	MECHANICAL TOOL KIT FOR FITTERS	4 NOS.
13	ELECTRICIAN TOOL KIT	4 NOS.
14	CRIMPING TOOLS	4 NOS.
15	FLOOD LIGHT FITTINGS	5 NOS.
16	FIRE EXTINGUISHERS	3 NOS.
17	DISTRIBUTION BOARDS WITH POWER CABLE COMPLETE AS REQUIRED	1 SET
18	PAINTING BRUSH	AS PER REQMT.
19	FIRE PROOF TARPAULIN	AS PER REQMT.
20	SAFETY BELTS AND SAFETY HELMETS	AS PER REQMT
21	24V A/C TRANSFORMER & HAND LAMPS	4 NOS.
22	MIG WELDING MACHINE WITH ACCESSORIES AIR COOL TYPE	2 NOS.
23	CRIMPING TOOL HYDRAULIC UPTO 600 SQ.MM	1 NO.
24	TORQUE WRENCH SET	1 SET
25	ELECTRODE DRYING OVENS	AS REQUIRED
26	FERRULE PRINTING MACHINE	2 NOS.
27	HYDRAULIC JACKS 250T CAPACITY/100T	4 NOS.EACH

28	TUFFER CAPACITY 15T	2 NOS.
29	CHAIN PULLEY BLOCKS 5/10T	1 NO.EACH
30	MOBILE PICKUP / CARRY CRANE (SUITABLE CAPACITY)	AS PER REQMT.
31	TRUCK / TRAILER	AS PER REQMT.

OTHER THAN THE ABOVE, ONE COMPUTER, PRINTER AND OTHER NECESSARY PERIPHERALS WILL HAVE TO BE MAINTAINED BY THE CONTRACTOR IN HIS SITE OFFICE.

NOTE:

THE LIST OF INSTRUMENTS / EQUIPMENTS TO BE BROUGHT BY THE CONTRACTOR AS SHOWN ABOVE SECTIONS A AND B **ARE ONLY INDICATIVE**. ANY OTHER INSTRUMENTS / EQUIPMENTS REQUIRED FOR THE EXECUTION OF THE WORK IS TO BE NECESSARILY ARRANGED BY THE CONTRACTOR WITHIN THE QUOTED RATES.

THE TESTING/CALIBRATION INSTRUMENTS WHICH ARE USED TO BE DULY CALIBRATED IN THE INTERVAL PRESCRIBED BY BHEL ENGINEERS FROM THE REPUTED AGENCIES DECIDED BY BHEL AND TEST CERTIFICATE TO BE FURNISHED.

APPENDIX–VA

CONSUMABLES TO BE ARRANGED BY CONTRACTOR

1. PRINTED FERRULES.

   PVC NUMBERED FERRULES ALSO TO BE ARRANGED FOR SUCH PLACES WHERE PRINTED FERRULE CANNOT BE USED.
2. CRIMPING TYPE COPPER LUGS UPTO SIZE 4 SQMM,
3. CABLE IDENTIFICATION TAGS
4. CABLE DRESSING & CLAMPING MATERIAL,
5. PVC CABLE TIES
6. G.I. CLAMPS FOR IMPULSE PIPES/ AIR LINES/COPPER TUBING, TEFLON TAPES FOR SEALING ETC.
7. WELDING ELECTRODE & OTHER CONSUMABLE.
8. ALL PRIMER AND PAINTS UNDER THE SCOPE
9. FASTNERS FOR INSTRUMENT MOUNTING.
10. ANCHOR FASTNER

NOTE: - The above listed consumable is only indicative, however the contractor shall arrange consumables as per work requirement.

BHEL shall provide only cable glands, cable lugs above 4 sq mm size and HT cable jointing kits.

Appendix-VB

Consumables/items to be provided by BHEL free of charge

01 Metallic Cable glands

02 Steel for support frame of permanent equipment.

03 Lugs beyond 4 sqmm size

APPENDIX–VI

FORMAT FOR MONTHWISE MANPOWER DEPLOYMENT PLAN

(CATEGORYWISE NUMBERS TO BE INDICATED FOR EACH MONTH)

* USE ADDITIONAL SHEETS TO COVER THE TOTAL CONTRACT PERIOD

SL. NO.	CATEGORY	MONTH															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
01	RESIDENT ENGINEER																
02	ERECTION ENGINEERS																
03	COMISSIONING ENGINEERS																
04	ERECTION SUPERVISORS																
05	COMISSIONING SUPERVISORS																
06	QUALITY ASSURANCE ENGINEER																
07	SAFETY ENGINEER																
08	MATERIALS MANAGEMENT SUPERVISORS																
09	STRUCTURAL & OTHER WELDERS																
10	STORE KEEPERS																
11	ELECTRICIANS/ INSTRUMENT TECHNICIAN																
12	SEMISKILLED/ UNSKILLED WORKERS																
	MONTH WISE TOTAL																

APPENDIX–VII

FORMAT FOR DEPLOYMENT PLAN FOR MAJOR TOOLS AND PLANTS

* USE ADDITIONAL SHEETS TO COVER THE TOTAL CONTRACT PERIOD

S.N.	DESCRIPTION & CAPACITY OF T&P	MONTHS															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
01																	
02																	
03																	
04																	
05																	
06																	
07																	
08																	
09																	
10																	

APPENDIX-VIII

CONCURRENT COMMITMENTS

SL. NO.	FULL POSTAL ADRESS OF CLIENT AND NAME OF OFFICER IN-CHARGE	DESCRIPTION OF THE WORK	VALUE OF THE CONTRACT	COMMENC-EMENT DATE	SCHED U-LED COMPL E-TION	% COM PL-TD. AS ON DATE	ANTICI PA-TED COMPL N. DATE	REMARKS

DATE:

SIGNATURE OF THE BIDDER

APPENDIX IX

RELAY TESTING FACILITY

(Mark the appropriate option)

Relay testing facility will be provided by:-

Sl No.	**Options**	**Mark the appropriate option**
1	By Bidder	
2	Any of the agencies recommended by BHEL	
3	Outsourced to the agency other than those recommended by BHEL	

NOTE :

1. Incase option 1 is chosen, the bidder have to submit the evidence of their resources and resourced capability to take up the relay testing along with their offer.
2. Incase option 3 is chosen, the bidder have to submit sufficient proof and credentials of experience of the party along with their offer.

DATE SIGNATURE OF BIDDER

APPENDIX-X

ANALYSIS OF UNIT RATE QUOTED

SN	DESCRIPTION	% OF QUOTED RATE	REMARKS
01	SITE FACILITIES VIZ., ELECTRICITY, WATER OTHER INFRASTRUCTURE.		
02	SALARY AND WAGES + RETRENCHMENT BENEFITS		
03	CONSUMABLES		
04	T&P DEPRECIATION & MAINTENANCE		
05	ESTABLISHMENT & ADMINISTRATIVE EXPENSES		
06	OVERHEADS		
07	PROFIT		
	TOTAL	100%	

DATE: SIGNATURE & SEAL OF THE BIDDER