

# **TENDER SPECIFICATION**

**No. BHE/PW/PUR/SLT-CNI/556**

FOR

HANDLING AT SITE STORES/STORAGE YARD, TRANSPORTATION TO SITE OF WORK, COMPLETE ERECTION, CHECKING OF CALIBRATION, TESTING, ASSISTANCE FOR COMMISSIONING AND HANDING OVER OF CONTROL & INSTRUMENTATION WORKS FOR BOILER AND ITS AUXILIARIES, STEAM TURBINE, TURBOGENERATOR AND THEIR AUXILIARIES, STATION C&I PACKAGE FOR 2 X 125 MW SLPP II UNIT 3&4 .

AT

**GUJARAT INDUSTRIAL POWER COMPANY LIMITED**

EXPANSION OF SURAT LIGNITE POWER PLANT (SLPP)

NANI NAROLI, TALUKA-MANGROL

DISTT: SURAT, GUJARAT

**PART: I**

**TECHNICAL BID SPECIFICATION & NOTICE INVITING TENDER, GCC**



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

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**LEGEND:**

\$: Attached at the end of hard copy of Tender Specifications Part-I. Hosted in BHEL web page (www.bhel.com) as file titled "NIT+GCC-556".

@: Issued as separate hard copy booklet 'Tender Specifications Part-II (Price Bid)'. Hosted in BHEL web page (www.bhel.com) as file titled "PRICE BID-556"

**Note:**

Rest of the tender documents are included in Tender Specifications Part-I. Hosted in BHEL web page (www.bhel.com) as file titled "TECH BID-556"

# **BHARAT HEAVY ELECTRICALS LIMITED**

(A GOVERNMENT OF INDIA UNDERTAKING)  
POWER SECTOR - WESTERN REGION  
SHREEMOHINI COMPLEX  
345-KINGSWAY, **NAGPUR**-440 001

HANDLING AT SITE STORES/STORAGE YARD, TRANSPORTATION TO SITE OF WORK, COMPLETE ERECTION, CHECKING OF CALIBRATION, TESTING, ASSISTANCE FOR COMMISSIONING AND HANDING OVER OF CONTROL & INSTRUMENTATION WORKS FOR BOILER AND ITS AUXILIARIES, STEAM TURBINE, TURBOGENERATOR AND THEIR AUXILIARIES, STATION C&I PACKAGE FOR 2 X 125 MW SLPP II UNIT 3&4 .

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## **GUJARAT INDUSTRIAL POWER COMPANY LIMITED**

EXPANSION OF SURAT LIGNITE POWER PLANT (SLPP)

NANI NAROLI, TALUKA-MANGROL

DISTT: SURAT, GUJARAT

### **PART: I**

#### **TECHNICAL BID SPECIFICATION**

**&**

#### **NOTICE INVITING TENDER, GCC**

**EARNEST MONEY DEPOSIT:** Please see Special Conditions of Contract.

**LAST DATE FOR TENDER SUBMISSION:** Please obtain updated information from web page "<http://www.bhel.com>" → Tender Notifications → View Corrigendums.

THESE TENDER SPECIFICATION DOCUMENTS CONTAINING PART-I (TECHNICAL BID SPECIFICATION) AND PART- II (PRICE BID), ARE ISSUED TO:

M/s. ....

.....

PLEASE NOTE:

THESE TENDER SPECS DOCUMENTS ARE NOT TRANSFERABLE.

BIDDER SHALL NOTE THAT THEIR OFFER WILL BE CONSIDERED SUBJECT TO THE APPROVAL OF BHEL'S CUSTOMER.

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-KINGSWAY, NAGPUR 440 001  
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**PROCEDURE FOR SUBMISSION OF SEALED TENDERS & INSTRUCTIONS TO  
BIDDERS**

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. GENERAL 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:

1. Contractor should have adequate resources including major T&P at his disposal for this job.
2. Contractor should have sound financial stability.
3. Bidder should meet quality requirement regarding workmanship, deployment of personnel, erection tools and necessary inspection, measurement & testing instruments.
4. All information as called for in various appendices and clauses of tender specification should be furnished in completeness. Please refer the checklist.
5. Clarification on Tender Specifications, if any, shall be obtained by the bidder before submitting their offer.
6. Offers must be submitted without any deviation.
7. 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.
8. **Bidder shall note that their offer will be considered subject to the approval of BHEL's customer.**

## PROJECT INFORMATION

## PROJECT INFORMATION

### INTRODUCTION

**GUJARAT INDUSTRIES POWER COMPANY LIMITED (GIPCL)**, AS PART OF EXPANSION PLAN IS INSTALLING THE TWO UNITS EACH OF 125 MW UNDER “2X125 MW, EXPANSION PROJECT (PHASE II)-UNIT-3 & 4” PLAN IN THEIR EXISTING 2X125 MW PHASE-I PREMISE AT SURAT LIGNITE POWER PLANT (SLPP), NANI NAROLI, P.O. NANI NAROLI-394110, TALUKA- MANGROL, DIST.- SURAT.

THE SITE IS LOCATED AT A DISTANCE OF APPROXIMATELY 28 KMS FROM KOSAMBA, VILLAGE NANI NAROLI, TALUK MANGROL, DISTRICT SURAT, GUJARAT STATE,

THE FURTHER INFORMATIONS ARE AS GIVEN BELOW:

1.0	CUSTOMER	:	Gujarat Industries Power Co. Ltd. P. O. Petrochemicals – 391 346 District Baroda, India
2.0	CONSULTANT	:	TCE Consulting Engineers Limited 73/1, St. Mark's Road Bangalore – 560 001.
3.0	PROJECT	:	Surat Lignite Power Plant 2 x 125MW – Phase II (Expansion Project) Unit Nos. 3 & 4
4.0	LOCATION	:	At a distance of 28 kms from Kosamba, Village Nani Naroli, Taluk Mangrol, District Surat, Gujarat State, India.
5.0	NEAREST AIRPORT	:	Baroda, Gujarat State
6.0	ROAD APPROACH	:	Accessible by road from two points Kim and Kosamba which are on Mumbai-Ahmedabad highway. From Kim, the site is around 23 kms and from Kosamba, the site is around 28 kms.
7.0	NEAREST RAILWAY STATION	:	Kim/Kosamba is on Mumbai-Ahmedabad broad gauge line. Same is at a distance of 32 kms from the proposed power project site.
8.0	NEAREST PORT	:	Mumbai
9.0	ALTITUDE	:	About 50 m above mean sea level.
10.0	SEISMIC ZONE	:	Zone – III as per Indian Standard IS:1893 (Current Issue).
11.0	RAINFALL(ANNUAL TOTAL R.O.MEAN)	:	1800 mm (Maximum rainfall occurs during June to September)
12.0	AMBIENT AIR EMPEPERATURE		

- (a) Maximum dry bulb : 45.6 Deg. C.
  - (b) Minimum dry bulb : 4.4 Deg. C.
  - (c) Maximum daily average dry bulb : 37.3 Deg. C
  - (d) Reference Temperature for design of electrical equipment / devices : (+) 50 Deg. C
- 13.0 RELATIVE HUMIDITY
- (a) Maximum : 87%
  - (b) Minimum : 33%
  - (c) Average : 71%
  - (d) Relative humidity for design of equipment / devices : (+) 100%
- 14.0 CLIMATIC CONDITION : Hot, humid and dusty.
- 15.0 WIND DATA
- 15.1 (a) Wind load as per IS 875 (Part-3) 1987
- (i) Basic wind speed : 44 m/sec.
  - (ii) Factor K1 : 1.07
  - (iii) Terrain category 1 & the corresponding value of K2 : 1.09

**ABOVE INFORMATION FURNISHED ARE FOR GENERAL GUIDANCE OF CONTRACTOR. CONTRACTOR IS ADVISED TO VISIT THE SITE AND APPRAISE HIMSELF ABOUT THE CONDITIONS OF SITE AND INFRASTRUCTURE AVAILABLE IN THE AREA FOR FULFILLING THEIR COMMITMENTS UNDER THE CONTRACT.**

#### **INTRODUCTION**

Check List			
(Vide Para 1.3 Of Section-I of General Conditions Of Contract)			
1	Name of the Bidder with Postal Address for Correspondence		
2	Name of Contact Person with Telephone & Fax No.	Mr./Ms Tel No. Fax No.	
3	Nature of the firm	PROPRIETARY / PARTNERSHIP / LIMITED CO.	
4	Details of EMD Please Indicate whether 1) One Time EMD or, 2) Only for this Tender	DD No. .... DD Date..... Name of Bank..... Amount: Rs.....	
5	Validity of Offer (BHEL's Requirement: 180 days from Due Date)	Validity _____ days	
6	Mobilization Time (Please refer Section-11 of SCC)	Mobilization Time _____	
7	Whether any conditions stipulated?	<div> <b>Yes</b> (vide Document reference: </div> <div> <b>No</b> </div>	
		<b>Bidder to note that tender with conditions unacceptable to BHEL shall be rejected.</b>	
8	Bidder has visited the project site and acquainted with the site conditions	Yes	No
9	Details of concurrent jobs are furnished ( <b>Appendix-VII</b> )	Yes	No
10	Headquarters organization is furnished	Yes	No
11	Proposed site organization is furnished	Yes	No
12	Names and particulars of directors/partners are furnished	Yes	No
13	Financial status of the firm ( <b>Annexure 'A' of GCC</b> ) is furnished	Yes	No
14	<b>Copy of Audited Profit &amp; Loss Account</b> for preceding three years duly authenticated on each copy by bidders Chartered Accountants	Yes	No



<b>Check List</b>			
(Vide Para 1.3 Of Section-I of General Conditions Of Contract)			
15	<b>Latest Certificate by Bidder's Banker for Overdraft &amp; BG Limits</b> is Furnished (Certificate shall not be older than six months from the Last Date for offer submission)	Yes	No
16	Latest copy of <b>IT Return</b> along with copy of <b>PAN Card</b> are Furnished	Yes	No
17	Month-wise <b>Manpower Deployment Plan (Appendix – IVA)</b> is furnished	Yes	No
18	<b>Analysis of Unit Rates</b> quoted ( <b>Appendix-V</b> ) is furnished	Yes	No
19	<b>Month-wise deployment plan for major T&amp;P (Appendix-IVB)</b> is furnished	Yes	No
20	Whether all the pages of the Tender Specification documents are read, understood and signed	Yes	No
21	<b>Power of Attorney</b> enclosed in favour of person making offer	Yes	No
22	Bidder has familiarized himself with all Relevant Local Laws & Local Conditions	Yes	No
23	Safety Requirement of this work in a Running plant Premises has been understood.	Yes	No
24	Erection and Commissioning programme furnished	Yes	No
25	<b>List of Jobs completed</b> in last seven years is furnished ( <b>Appendix-VI</b> )	Yes	No
26	Whether <b>copies of detailed Work Orders (with BOQ)</b> and <b>Completion Certificates</b> in support of above furnished	Yes	No
27	Whether contractor has left any job unfinished? If so, give reasons.	Yes	No
28	Whether any client has terminated the contractor's work before completion? If so, furnish reasons for the same	Yes	No

Note: strike off or tick '**yes**' or '**no**', as applicable

Date:

Signature of Bidder

## Declaration by Bidder's Authorized Signatory

I.....hereby  
certify that all the information and data furnished by me with regard to this  
tender specification No. **BHE/PW/PUR/SLT-CNI/556** is true and complete to  
the best of my knowledge. I have gone through the specification, 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 with the offer.**

Bidder's name and address

Authorised representative's signature with  
Name and Address

Date:

## CERTIFICATE OF NO-DEVIATION

### **TENDER SPECIFICATION No. BHE/PW/PUR/SLT – CNI/556**

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 of the Bidder

**SECTION-3**  
**OFFER OF THE BIDDER**

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/SLT-CNI/556 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 TENDERERS
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 AND 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 FURNTHUR 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:  
DATE :

SIGNATURE OF BIDDER:  
ADDRESS:

WITNESSES WITH THEIR ADDRESS

SIGNATURE	NAME	ADDRESS
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1.

2.

## **SECTION-4**

### **SPECIAL CONDITIONS OF CONTRACT**

#### **4.0 SCOPE OF WORK INVOLVING ERECTION, TESTING, ASSISTANCE FOR COMMISSIONING, CALIBRATION.**

##### **4.1.1**

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.

##### **4.1.2**

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 co-operate with the personnel of other agencies, co-ordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

##### **4.1.3**

All the work shall be carried out as per the instructions of BHEL engineer. BHEL engineer's decision regarding the correctness of the work and method of working shall be final and binding on the contractor.

##### **4.1.4**

The services, tests and support to be provided by the agency for the work mentioned in the various sections of this tender are indicative and not exhaustive, but not limited to these for the completion of the work in all respects.

##### **4.1.5**

Contractor shall calibrate, erect, commission all the equipments, cabinets/panels, instruments and cabling etc. as per sequence prescribed by BHEL at site. The sequence of erection / commissioning methodology will be decided by the BHEL engineers depending upon the availability of materials/work fronts etc. No claims for extra payment from the contractor will be entertained on the grounds of deviation from the methods of erection / commissioning adopted in erection / commissioning of similar jobs or for any reasons whatsoever.

##### **4.1.6**

The work to be carried out under the scope of this specification covers the complete work of loading, handling, transporting, unloading, pre-assembly, erection, calibration, testing, air flushing, pre-commissioning tests, Assistance for Commissioning of systems, trial run of various auxiliaries, achieving various activities till handing over of the unit to BHEL's customer, providing maintenance team to cater to guarantee responsibilities and maintenance thereafter. The work shall conform to dimensions and tolerances specified in various drawings that will be provided during the erection. If any portion of the work is found to be defective in workmanship or not conforming to drawings or other specifications, the contractor shall dismantle and re-do the work duly replacing the defective materials at his cost, failing which the work will be got done departmentally or by engaging other agencies and recoveries will be effected from contractor's bills towards expenditure incurred including 30% departmental charges.

#### 4.1.7

The terminal points as decided by BHEL shall be final and binding on the contractor.

#### 4.1.8

Descriptions of certain packages appearing in the rate schedule are available in this section and also in Appendix-I, to give general idea to bidder about the type of equipment to be erected, calibrated, tested and commissioned.

#### 4.1.9

During the course of erection, testing and commissioning C&I work certain rework / modification / rectification / repairs/ fabrication etc., will be necessary on account of feed back from various thermal power stations or units already commissioned and/or units under erection and commissioning and also on account of design discrepancies and manufacturing defects and site operation/ maintenance requirements. Contractor shall carryout such rework / modification / rectification/ fabrication repairs etc. promptly and expeditiously. Daily log sheets indicating the details of work carried out, man-hours, consumables used etc., shall be maintained by the contractor and got signed by BHEL engineer every day. Claims of contractor, if any, for such works will be dealt as per clauses 13.1 to 13.9.

#### 4.1.10

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

#### 4.1.11

All tools, tackles, fixtures, equipments, materials, manpower, supervisors/ engineers, consumables, electrodes including oxygen, acetylene argon etc gases, primers, paints etc. required for this scope of work shall be provided by the contractor. All expenditure including taxes and incidentals in this connection will have to be borne by him unless otherwise specified in the relevant clause. The contractor's quoted rates should be inclusive of all such contingencies. Electrodes shall be baked / dried in the electrode drying oven (range 375 – 425 deg C) to the temperature and period specified by BHEL Engineer before their use. Necessary drying oven / portable oven shall be provided by the contractor at his cost.

#### 4.1.12

The scope of work under this tender specification covers transportation, calibration, erection, testing and commissioning, etc. of control/ instrumentation and electrical equipments of the following packages.

#### **A. Boiler Control & Instrumentation and its Auxiliaries**

Digital Distributed microprocessor based system panels for FSSS, , HP Bypass, auxiliary PRDS, soot blowers, coal milling system, Lime stone milling system, VFD based feeder control remote /local, Electronic water level indicator, air heaters, electrical panels for DC control supply, controlled circulation pumps, starter panel for mill lube oil /fans and field devices/ instrumentation work for above system, piping, cabling etc.

#### **B. Turbo generator Control & Instrumentation and its auxiliaries**

Digital distributed microprocessor based system panels consist of TSC, EHTC, LPBP, TSI, ATT, LSR/AS, ATRS, turbine protection and monitoring, Gamp and field instrumentation work / cabling, boiler feed pumps /condensate extraction pump, and misc. System like lube oil, seal oil, hydrogen gas system, vacuum pumps etc.

### **C. Station C&I / Balance of Plant**

Digital Distributed microprocessor based system panels for Balance of Plant controls, consisting of Open Loop and Closed Loop controls, interlock and protection systems for various HT, LT, pneumatic, hydraulic drives, remote multiplexed signal acquisition, alarm processing, MMI including computers and accessories, computer furniture, control desk, Large Video Screen, Steam and water analysers, Opacity monitors, Flue gas analysers, instrumentations, cabling, etc, etc.

#### **4.1.13**

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:

Based on rate of identical/similar items in the rate schedule

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 or existing rates in other job.

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.

### **4.2.1 Collection of materials**

#### **4.2.1.1**

The contractor shall take delivery of equipment, materials from the storage yard/stores/sheds of BHEL/customer. He shall also make arrangements for verification of equipment, safe custody, watch and ward of equipment after it has been handed over to him till these are fully erected, tested and commissioned and taken over by the customer. The contractor should note that the transport of equipments to erection site, assembly yards etc should be done by the prescribed route in the most professional manner without disturbing other ongoing works of various contractors. Special equipments such as laboratory equipments, measuring and control equipments, gauges, panels, console inserts, switches, transmitters, controllers, power cylinders, cables, conduits etc. shall be stored when taken over by the contractor in appropriate manner as per BHEL's instructions. The contractor should also note that while taking delivery of materials from BHEL stores (open/closed), it may be necessary to handle other items which could be blocking the exit route of the materials. This aspect shall be taken care of in the quoted rates and no extra payment shall be done in this regard. It shall be the contractor's responsibility to arrange necessary cranes/tractors, trailer, trucks, slings, labour, etc., etc., for transport of equipment.

#### **4.2.1.2**

The contractor shall take delivery of the components, equipments and special consumables from the storage area/sheds of BHEL/customer after getting the approval of the engineer/customer on standard indent forms to be specified by BHEL/customer.

#### **4.2.1.3**

The contractor shall handover all parts/materials remaining extra over the normal requirement with proper identification tags in a packed condition to BHEL stores. In case of any misuse or use over actual design requirements, BHEL reserves the right to recover the cost of parts/materials used in excess or misused. Decision of BHEL engineer in this regard will be final and binding on the contractor.

#### **4.2.2**

##### **Void**

#### **4.2.3**

All works such as cleaning, levelling, aligning, trial assembly, dismantling of certain equipments/components for checking and cleaning, fabrication of tubes and pipes as per general engineering practice and as per BHEL engineer's instructions at site, cutting, weld depositing, grinding, straightening, chamfering, filing of cut outs/openings for mounting of console inserts, modules, indicators, recorders, drilling of holes for gland entries, reaming, scrapping, cable laying, dressing, fitting up etc. as may be applicable in such erection works are treated as incidentals to erection work and are necessary to complete the work satisfactorily shall be carried out by the contractor as part of the work.

#### **4.2.4**

Overhauling, cleaning, servicing of equipments / instruments, valves etc. during erection and commissioning stages will be arranged by the contractor. However, gaskets /packing for replacement will be provided by BHEL free of cost. All equipments shall be preserved and protected before and after erection as per the advice of BHEL engineer.

#### **4.2.5**

The contractor should take all reasonable care to protect equipment and materials under his custody either in his stores or at site. Copper tubing, brass fittings, brass valves etc forming an integral part of equipment or system are liable to greater damages / pilferages /theft / losses. It will be responsibility of contractor to arrange for adequate security round the clock for protection from such damages / pilferages / theft / losses.

#### **4.2.6**

All equipment shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc. shall be used for unloading and/or handling of the equipments without the specific written permission of the engineer. The equipment from the storage yard shall be moved to the actual site of erection/location at the appropriate time as per the direction of BHEL engineer so as to avoid damage/loss of such equipment at site.

#### **4.2.7**

The contractor shall collect all scrap materials periodically from various levels of power house, working area of the power station, auxiliary and piping around power station and collect the same at one place earmarked for the same. Loads of scraps are to be shifted to a place earmarked by BHEL. Failure to collect the scrap is likely to lead to accidents and as such BHEL reserves the right to collect and remove the scrap at contractor's risk and cost if there is any failure on the part of contractor in this respect.

#### **4.2.8**

All the surplus, damaged, unused materials, package materials, containers, special transporting frames, gunny bags etc. shall be returned to the BHEL stores/customer's stores by the contractor.

#### **4.2.9**

All pipes and tubes, equipments, instruments issued to contractor and kept at site for erection shall be covered with plastic caps/steel caps or shall be closed with suitable plugs by the contractor.



#### 4.2.10

The contractor shall ensure that all the packing materials and protection devices used for the various equipments during transit and storage are removed before these equipments are erected in position.

#### 4.2.11

Contractor shall plan and transport equipments/components from storage yard/sheds to erection site and erect them in such a manner and in a sequence that material accumulation at site should not lead to congestion. Materials shall be stacked neatly, preserved and stored in the contractor's shed and work areas in an orderly manner. It may be specifically noted that the space available for putting up the thermal power plant is limited and accumulation of material may lead to the necessity of shifting and restacking the materials to enable other agencies to carry on with their work or to comply with customer's requirements. If required, the contractor shall arrange shifting of surplus material expeditiously failing which the same will be arranged by BHEL and all charges together with departmental charges at 30% will be recovered from his bills.

#### 4.2.12

House keeping in the erection and pre-assembly area is as important as the well-planned and orderly work. The access to site for inspection, approaches by BHEL and customer engineers and leading of the material shall be made available by the contractor at all times. The shifting and reshifting of erection materials, tools and plants and clearance of restrictions, filling of ditches, undulation near the pre-assembly and boiler area is the responsibility of the contractor. Contractor should visit the site and acquaint himself with all restrictions and difficulties that he may encounter during erection/commissioning stages.

### 4.3 Brief description of work

#### 4.3.1 Installation of panels

Electrical control panels, electronic control panels, etc., are normally supplied in set of either one/two/three or loose shipping sections with integral or loose supplied base frame.

These panels may have to be installed as stand alone or in groups consisting of number of panels in each row, depending upon the plant layout and foundation arrangement.

#### 4.3.2

Installation of panel shall include fixing of base frame, fabrication of base frame if required, levelling, alignment, fixing of anti-vibration pads, removal of side covers, fixing of cubicle interconnection hardware, 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 and sealing of cable entries. In certain case where canopies are not supplied but have to be fabricated out of MS sheets provided by BHEL, payment will be done on square meter basis.

#### 4.3.3

Panels have to be shifted to their locations through floor openings, temporary openings like floor grills, door etc. which shall be part of work and no claim whatsoever will be entertained with regard to non-availability of opening as per shortest route etc. Panel have to be erected at different locations and elevation in boiler, TG, GTG hall, LT & HT switchgear room, unit control room, ESP control room etc.

#### 4.3.4

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.

#### 4.3.5

Wherever 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 rates shall be applicable.

#### 4.3.6

Normally the panels shall be supplied with instrument, relay, meters, electronic modules etc. mounted and pre-wired. However, if these are supplied loose / separately for safety in transit, contractor shall mount/wire such devices as part of the panel installation work and no separate rates shall be applicable unless otherwise specially listed in the rate schedule.

#### 4.3.7

No separate payment shall be made for replacement of any devices like electronic modules, relays, conductors, terminal block, push buttons etc. which are found defective during pre-commissioning / post-commissioning of any equipment / item.

#### 4.3.8

For the panels erected by other agencies, commissioning/calibration work and trouble shooting has to be carried out by the contractor as part of testing and commissioning work as per the quoted rates.

#### 4.3.9

Minor civil works like drilling, chipping, punching holes and opening in concrete floors, slabs and brick walls, grouting, related to Rack, support installation, minor civil works required for installation of control panels, Junction boxes etc., shall be included in the erection cost of such items. Also all miscellaneous civil works like chipping away and making good as necessary in floor slab/wall for cabling / earthing etc., as required are included in the scope for which no separate payment is applicable. The scope also includes supply of grouting material, if any.

### **4.4.0 Structural steel fabrication and installation**

#### 4.4.1

Structural steel material like MS angles, channels, beams, flats, plates etc. shall be supplied in running meters and same shall be used for fabrication of panel base frame, cable tray supports, canopies, instrument and junction box frames, impulse pipe/instrument air pipe supports and instruments etc.

#### 4.4.2

This shall include cutting into size, conduiting of end connections, if required, welding, grinding of excess weld deposits, drilling of holes for mounting of device/instrument, installation at location, levelling, alignment, providing bracings, painting etc. No gas cut holes will be permitted. Contractor to follow the BHEL supplied welding schedule and welding procedures.

#### 4.4.3

All the fabricated supports/frames shall be applied with one coat of primer red oxide paint before installation and two coat of synthetic enamel of prescribed shade of final paint,. If required, BHEL shall prescribe time gap between first and second coat of final paint. Paint, primer etc supply are in contractor's scope.

#### 4.4.4

Frame installation/cable tray accessories' 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.

#### 4.4.5

In certain packages, galvanised members of junction box frames and instrument racks shall be supplied in cut to sizes and frame assemblies are required to be done as per drawing by bolting/welding. The installation rate as quoted shall include the assembling of the frames.

#### 4.4.6

Gas cutting of tray/impulse pipe support and gas cut holes in frame shall be avoided. Only drilled hole shall be permitted in frame etc.

### **4.5 Laying of pipes and tubes (impulse pipe & instrument air pipe)**

#### 4.5.1

Root valves are generally provided on process pipeline by other agencies. Prior to starting impulse pipe, contractor to identify the process point with respect to PI Diagram.

#### 4.5.2

Installation of impulse pipe of CS/AS/SS material shall include cleaning, air flushing, cutting to length from running meter, edge preparation, cold bending, welding of sockets / reducers / tee / cross / isolating valves / union, nut and tail pieces / nipples, condensing and other pots, etc., mounting of SS/CS valve manifolds and compression fittings, providing supports, clamping, conducting leak test / hydraulic pressure test, painting as per colour code (primer and two coats) and erection and commissioning of other standard accessories as per instrument hook-up diagram. Piping works shall involve either arc or TIG welding. Paint, primer etc supply is in the scope of the contractor. Colour codes for impulse piping, etc will be as per standard codes. Contractor to follow the BHEL supplied welding schedule and welding procedures. The decision of BHEL engineer will be final in this regard.

#### 4.5.3

IBR certified welders shall be deployed for welding of impulse pipe and contractor shall take approval for welder and welding consumables from BHEL site engineer.

#### 4.5.4

Laying of GI pipe for instrument air line shall include air blowing, cutting from the running meter length, threading, installation of elbows/tee/reducer /moisture traps/auto drain pot/check valves/isolating valves, supporting clamping, conducting leak test and also seal welding of threaded joints, if required.

#### 4.5.5

Threaded joints of air pipeline shall be made leak proof by using Teflon tapes or sealing compound. All consumables shall be in the scope of contractor.

#### 4.5.6

All fittings and accessories for impulse pipe and air pipeline shall be provided by BHEL. Quoted rate for piping shall include cost of installation of such fittings and no separate rates are envisaged.

#### 4.5.7

Contractor shall provide GI "U" clamps for impulse pipe and GI pipes within the quoted rates for installation of the same.

#### 4.5.8

Impulse pipes shall be applied with one coat of primer red oxide paint and two coats of synthetic enamel of prescribed shade of final paint. BHEL may prescribe a time gap between first coat and second coat of final paint.

#### 4.5.9

Hydraulic test for impulse lines and Instrument air lines shall be carried out before the lines are taken into service. No extra payment shall be made for this.

#### 4.5.10

Installation of Copper tubes/SS tubes/copper pipes shall include cutting into required length, laying, bending, cleaning, brazing wherever required, fixing of brass fittings like compression fittings/tees/end connectors/straight connectors/ bulk heads/valves etc., supporting clamping including supply of clamps and hardware, flushing and conducting leak test.

### **4.6 Installation of Cable trays/cable ducts**

#### 4.6.1

Various types of sheet metal, galvanised cable tray, i.e. Perforated, ladder type, sealed metal duct, solid bottom tray, shall be provided in standard lengths along with accessories like hardware, bends, reducers, coupler plate, tray covers and tray clamps etc.

#### 4.6.2

Installation of cable tray/cable duct shall include cutting, laying, jointing, supporting, drilling holes in the support, providing tees/reducers/ bends/ clamps as per tray route layout, fabrication of bends/tees/reducers from straight length, fixing of tray covers, welding of tray on support, cleaning and application of cold galvanizing paint on weld joints (supply of paint is in the scope of contractor). Installation of tray/duct covers, wherever provided, will be done as a part of tray erection and no extra rates will be payable.

#### 4.6.3

In case cable trays 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 instance.

#### 4.6.4

Cable trays/ducts have to be routed underground in cable trench, over head on structure, valves, floors etc. for various applications such as cable laying, copper tubes, conduits, thermocouple, temperature gauge capillary etc.

#### 4.6.5

### **4.7 Cable laying (power / control / instrumentation shielded / unshielded cables / plug-in cables / coaxial / UTP / STP / data highway, armoured / un-armoured, single / multi-core, PVC/HR PVC/FRLS/TEFLON/XLP insulation)**

#### 4.7.1

Cable laying includes cutting to the required length, laying in overhead/ underground cable trench/through pipes/flexible conduits, dressing/clamping in tray, drilling of holes in gland plates in panels and junction box, glanding, splicing, dressing of spliced wire inside the panel and JB, providing PVC numerical/ alphabetical / printed ferrules, termination by using crimp type copper tinned/ aluminium lugs, insulated/un-insulated, termination (crimp, soldering, etc.), plug-in connections with insert type crimping, providing identification PVC/aluminium cable tags (at both the ends and at 15 m

intervals throughout the route length and also at each bend), continuity checking, insulation resistance checking, high voltage test on HT cables.

#### 4.7.2

Entry to the panels and JB's may be at top, sides or bottom. All cables are required to be properly supported and clamped near to the JB/panel.

#### 4.7.3

Wherever cable glanding is not possible, either due to the gland plate size limitations or more number of cable entries, prefabricated plug-in cables, etc., for such cases cables may have to be lifted inside the panel by either making cut-out in gland plate and providing rubber profile for sharp edge protection or alternatively, providing 4" or 6" PVC pipe coupling gland and these pipe coupling gland shall be supplied by contractor within the quoted rate of cable laying.

#### 4.7.4

Copper tinned lugs of various types (pin, ring, fork, snap-on) upto 4 sq.mm, PVC cable ties, PVC ferrules, PVC button and tapes, cable identification tag of PVC/metallic, clamping and dressing material with hardware, PVC sleeves etc. shall be supplied by the contractor within the quoted rates for cable laying. The quality of material shall be got approved from BHEL engineer prior to their use on job.

#### 4.7.5

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

#### 4.7.6

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 JB and grounded at panel end only. While terminating the shield wire either in panel or JB, PVC sleeves are to be used to avoid two-point earthing.

#### 4.7.7

Wherever cables run through ducts, conduits, valves, etc., they shall be sealed using fire/weather proof compound. In addition to this, cable entry in panels, MCCs, instruments, electrical actuators etc., are also required to be sealed. The required material for doing so shall be included by contractor in the cabling scope.

#### 4.7.8

Many of the cable trays and cables have to be laid in cable trenches. For this purpose, the cover of the trenches have to be opened for working in site and whenever the cables are to be laid in existing cable tray, all safety precautions have to be observed.

After completing the work, the trenches have to be cleaned and covers put back into position. Contractor shall also carry out de-watering from the trenches if required and arrange pumps etc., at his cost.

#### 4.7.9

Looping wire at terminal block of panels and electrical actuator as shown in the inter-connection diagrams or as required is to be done by contractor at no extra cost.

#### 4.7.10

Contractor shall carefully plan the cutting schedule of each cable drum in consultation with site engineer such that wastage are minimised.

##### 4.7.10.1

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

Item	% Wastage on issued Qty
1. Fabrication steel	2
2. Each size of power cables	1
3. Each size of control/Inst cables	2
4. Impulse pipe/tubes/GI pipes/copper tube	1

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.

#### **4.7.11 Terminal Connections:**

The types of cable terminations are generally as detailed below:

SG package, TG package, Station C&I and Auxiliaries

1) All field cables in SG package are crimp type of different sizes.

All JB's are both side screw type.

All console tiles wiring: screwed or plug-in type to be fabricated at site.

### **4.8 Field instrumentation**

#### **4.8.1**

Various type of primary/secondary indicating/recording instrument for pressure, temperature, flow, level and analytical measurement shall be supplied either loose or mounted along with the equipment.

#### **4.8.2**

Scope of work under erection/calibration/testing/commissioning shall include calibration, setting, adjustment, writing instrument tag number with paint, report making, installation, servicing, minor repairs/servicing, putting instrument into service, signal checking from field upto the functional group panels and remote indicating instrument, functional checks, interlock and protection/alarm checks by simulating the field devices, trouble shooting during pre-commissioning/post-commissioning till system is handed over to the customer.

#### **4.8.3**

It is the responsibility of contractor to make erection, calibration/testing protocols for various C&I equipments/devices and they should get duly certified by customer/BHEL engineer and should be submitted to BHEL engineer regularly. However, sample formats will be given by BHEL and have to be printed by contractor in adequate numbers.

#### **4.8.4**

Contractor shall establish calibration laboratory with adequate facilities and they should arrange standard test instruments duly calibrated from recognized agencies and calibration report of the same to be submitted prior to start of calibration of the field instruments/devices.

#### **4.8.5**

Wherever thermowells are supplied along with temperature gauges, thermocouples, temperature switches, thermostats, etc., the contractor has to co-ordinate with the mechanical contractor for identification and fixing of thermowells on the pipeline. However actual fixing of thermowells on pipeline and seal welding shall be done by mechanical contractor and is not a part of instrument installation.

#### **4.8.6**

Installation of instrument shall also include drilling of holes and tapping for mounting of instrument and local instrument frames/panels and supply of hardware for mounting of the instrument.

#### 4.8.7

Some devices line solenoid valves, feedback position transmitters, limit switches, air filter regulators, airlock relays, positioners etc., are supplied assembled along with mechanical equipments like pneumatic control valves, power cylinders, trip valves, dampers, motorized actuators, etc. These will need removal, calibration/testing, refixing, adjustment, etc., and commissioning. Separate payment shall not be made for this. The rates quoted for the commissioning of these equipments (viz., pneumatic control valves, power cylinders, trip valves, dampers, etc.) should take care of the above. Also, the contractor shall remove such devices prior to erection either at site or at store to avoid damages/pilferages and keeping in safe custody and the same shall be installed prior to commissioning of such equipment.

##### 4.8.7.1

Transmitter enclosure / open racks for various packages which are to be erected and commissioned at various locations of the Boiler, turbine and outdoors, shall be supplied with internal tubing, air filter regulators, rotameters, provision of continuous or intermittent purging arrangements wherever required, etc. The quoted rates for these racks / enclosures shall include the erection and commissioning of all such items inside these racks / enclosures.

#### 4.8.8

It shall be the responsibility of the contractor to ensure that the calibrated instruments show correct reading while installed in the system.

However, recalibration may become necessary due to reasons not attributable to the contractor, e.g. Lapse of Time after first calibration, Need for change in range/parameter, etc. If re-calibration is required due to no fault of the contractor, the rates payable for re-calibration shall be as under:

Recalibration Charges = 60% of the Percentage Stage Payment for Calibration as per split-up defined in Terms of Payment (Section-12)

The contractor shall keep record of such instrument with the reason for re-calibration and certified by the BHEL Engineer.

Note: For recalibration of skid mounted items or other systems where lump sum rates are quoted, the recalibration charges, if admissible, will be calculated from the relevant unit rates quoted for same / similar items elsewhere in the rate schedule. The decision of BHEL Engineer shall be final and binding on the contractor.

#### 4.8.9

For the cases where required, the contractor shall carry out re-orientation of bottom/top entry arrangement for process connection if needed due to site condition in existing instrument rack/enclosure/JB and re-location of existing instrument including removing of the existing tubing and re-installation of the same at appropriate location due to any change in grouping of the instrument and no extra payment shall be applicable.

#### 4.8.10

In certain cases instruments / devices are supplied on equipment or drawn by other agencies as part of mechanical package. The same are to be received or to be collected from other agencies for keeping in safe custody to avoid damages. The same are to be erected back after calibration for which unit rate shall be applicable for erection and calibration. Contractor shall maintain record of such instrument duly certified by BHEL engineer. However for removal of such instrument, no separate rate/payment shall be applicable.

#### **4.9.0 Unit control desk and components**

##### **4.9.1**

Unit control desk will be supplied in one or more shipping sections for erection at site. Console Inserts shall be supplied either mounted on console grid or supplied loose. Also, the items (indicators, pushbuttons, etc.) of the console insert may be supplied mounted in the console insert or may be supplied loose. The lumpsum rates quoted for console inserts should take the above into consideration. No separate payment will be done for the erection of individual components of console inserts. However, for the other items like recorders, indicators, digital display units etc., unit rate shall be applicable. Alarm facia on the control desk may be supplied mounted or loose. Mounting these, if required, will not attract any extra payments. The commissioning of these will constitute a part of the panel commissioning from where the alarm is driven.

##### **4.9.2**

Wherever control desk / panel is not supplied by BHEL or is in customer scope of supply and installation, loose item supplied by BHEL if any, shall have to be mounted by the contractor.

##### **4.9.3**

Console/console tiles shall have plug-in/screwed/soldering/crimp snap-on, connection. Interconnecting cable between console and process control panel shall be either of pre-fabricated plug-in cable or plugs are required to be made at site with crimp insertion type of pins. BHEL shall provide plugs and any special lugs at free of cost. However, other ordinary lugs required for the work shall be arranged by contractor.

##### **4.9.4**

Generally, 0.5 sq.mm multi pair shielded cables are envisaged for console cabling. Cable may have to be terminated at different console tiles, spliced wire of individual cable need to be routed through PVC sleeves upto the plug end of the tiles.

#### **4.10 Battery/battery charger/UPS/ ACDB**

##### **4.10.1**

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.

##### **4.10.2**

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.

##### **4.10.3**

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.

##### **4.10.4**

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



#### 4.10.5

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

#### 4.10.6

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.

### **4.11.0 Vibration monitoring system for auxiliaries (Fans, Blowers, Pumps etc.)**

System comprises of transducers with integral cables, weldable pads, wall mounted cabinet including monitors. The pads required to be welded on SS block on HT motors end shield and fan bearing housing. In case of pad sizes more than the SS block provided on motor, contractor shall get the pads machined as per the required size and blue matching to be carried out before welding on bearing housing. No extra charges will be applicable.

### **4.12.0 Control panels**

SG, TG, Station C&I system panels are based on Max DNA distributed digital control philosophy. Max DNA system is having communication through UTP cables amongst themselves. The system consists of computer network with servers and workstations and various peripherals like printers, etc. Optical fibre cables are also used for communication, especially for larger distances. The various components/devices are generally located in control room/computer room/diagnostic and shift in charge room. Some panels (viz. network panels) are also located in outdoor plants and other units.

The entire work of erection, testing, commissioning of the connected devices/equipments as listed in rate schedule is to be carried out including laying of peripherals cables (either plug-in or plugs to be fabricated at site), placement of computer furniture in computer room as per lay out. The computer furniture shall be supplied either assembled or in knocked down condition, which have to be assembled at site. The quoted rate shall be inclusive of cable laying, termination and placement of furniture against each device as given in the rate schedule.

### **4.12.1 Steam and water analyser system**

The system consists of the following in general:

Wet system panel consisting of Primary sample coolers, Secondary coolers, tubing and fittings for individual stream of steam and water lines and associated devices assembled together and housed in sheet metal enclosure. Process sample line of SS material to be terminated at panel end with bulk head connection. Sample lines will be socket welded type. Ph, conductivity, etc sensors will be supplied loose with integral / prefab cables, to be mounted and wired up in relevant panels.

Recorder panel may be supplied separately where the recorders (supplied as loose items) will have to be mounted and wired up.

In wet analyser panel, Phosphate, chlorine, silica, hydrazine, chloride, etc analysers along with accessories will be supplied loose for mounting, wiring and tubing at site.

Chiller Unit, auxiliary cooling water, etc would be supplied as package with accessories like SS/CS pipes, chilled water circulating pump, chilled water storage tanks, valves and fittings.

Commissioning support will be provided by vendor.

### **4.12.2 Flue Gas Analysers**

#### **4.12.2.1 Oxygen Analysers**

The system consists of Zirconia probes, electronic units Panel for mounting electronic unit, purging and calibration gas arrangements, etc. The probes are meant for direct mounting on duct / chimney, etc., at suitable elevation.

#### **4.12.2.2 NOX, SOX, CO analysers**

NOX, SOX, CO analysers systems consist of extraction type sampling probes and shall be mounted on the chimney at a considerable height. This will also consist of other accessories like gas extraction sampling pumps, sampling tubing, electrical heat tracer, insulation, test gas cylinders, purge air compressors, etc, etc.

#### **4.12.2.3 Opacity Monitor**

This consists of transmitters, receivers, Local electronic units and housing, air blower and associated hoses / pipes, JB and cables.

#### **4.13 Final painting**

##### **4.13.1**

All the fabricated frames, instrument racks, Junction box frame, trays / impulse pipes, supports, panel base frame, etc., wherever applicable shall be first painted with one coat of primer paint (metal red oxide) and then two coats of synthetic enamel paint of approved shade (decided by BHEL Engineer) after thoroughly cleaning the surface of dust, rust, scale, grease, oil, etc., by wire brushing, scrapping or any other suitable method. The quoted rates should be inclusive of all these including supply of paints and consumables.

##### **4.13.2**

Other equipments like JBs, Panels, transmitter racks, Local gauge boards etc., shall be painted with two coats of synthetic enamel paint. The quoted rates should be inclusive of application of two final coats of synthetic enamel paint. All the consumables such as wire brush, other cleaning materials, painting implements, etc., is to be arranged by the contractor at his own cost. All equipment painting will be done by spray painting. The quoted rates should be inclusive of all these including supply of paints and consumables.

##### **4.13.3**

All the weld joints of GI cable trays and GI structural members shall be applied with a coat of cold galvanising zinc paint. Paint, etc shall be arranged by contractor at his cost.

#### **4.14.0 Misc. Other instrument/equipment erection, calibration and Assistance for Commissioning.**

##### **4.14.1**

Wherever panels, pneumatic power cylinders and control valves have been erected by the mechanical contractor, calibration/ commissioning has to be carried out by the contractor.

##### **4.14.2**

**VOID (For SADC, not applicable for this project)**

##### **4.14.3**

In the case of electronic water level indicator, electrodes may be supplied loose and the same need to be fixed in the pressure vessel as per the drawings. No extra charges will be payable.

##### **4.14.4**

The calibration of NRVs in the turbine extraction system has to be carried out by the contractor. Position transmitters are to be erected by contractor within quoted rates of position transmitter calibration, if supplied loose.

##### **4.14.5**

The solenoids in the corner valves / HEA will be received in mounted condition and will be erected by the mechanical contractor. The contractor has to provide the services required for dismantling the solenoids and reinstalling the same after

servicing/adjustment. Payments will be made as per testing/commissioning portion of the rate quoted for these items and no extra charges will be payable for removal and refixing. Small items like speed regulators, etc. will have to be fitted in the copper tubing route of corner stations. No separate rate will be applicable for such devices.

#### 4.14.6

Dimension and weight as mentioned against control panels, MCCs, etc. in rate schedule are only approximate and there may be changes in dimension and weight in actual supply of the equipment and no rate variation shall be applicable on this account.

#### 4.14.7

Wherever brief description of the system is given under various sub-heads, it is only for the understanding system requirements. It does not indicate the total specification of work. For such system, other clauses are also applicable wherein work details are specified.

#### 4.14.8

Supervision services for certain sub-vendor supplied packages (viz. TSI, SWAS, Flue gas analysers, Fuel oil flow meters, battery systems, etc) will be in supplier's scope for installation and commissioning. However, contractor shall carry out the work as per the instruction of their engineers and also provide necessary assistance during the execution of the work.

#### 4.14.9

Normally, cable glands on junction boxes side are received in mounted condition. While terminating the cables as per drawings, the cable glands are to be removed and fixed. Wherever cable glands are not received along with junction boxes, the cable glands as per the requirement will be provided by BHEL and the contractor has to make necessary holes/adjust the available holes in the JB for fixing these. No separate payment will be made for drilling of holes and fixing the cable glands to the junction boxes. Nameplates for JB will be supplied separately. These are to be suitably written and fixed onto the JB. Separate payment will not be made for this.

#### 4.14.10

The push buttons and indicators in C&I systems are provided as loose with different type of connectors. The fixing of connectors and their wiring from push buttons to indicators shall be the responsibility of contractor. No separate payment will be made for fixing of connectors. The cable laying and termination charges will be paid as per applicable rate schedule.

### **4.15.0 Pre-commissioning/Commissioning and Post-Commissioning Activities**

#### 4.15.1

The work is also inclusive of various commissioning activities of the boiler and turbine package along with its auxiliaries and station C&I package. The various activities, tests, trial runs may have to be repeated till satisfactory results are obtained and also to satisfy the requirements of customer/consultant/ statutory authorities like boiler inspector, electrical inspector etc.

#### 4.15.2

In case any malfunctioning and/or defects are found during tests, trial runs such as loose components, undue noise or vibration, strain on connected equipments etc., the contractor shall immediately attend to these defects/ malfunctions and take necessary corrective measures. If any readjustment and realignment is necessary, the same shall be done as per BHEL engineer's instructions.

#### 4.15.3

During each stage of commissioning, if any part of the instrument needs repair/rectification/rework/replacement, the same shall be done expeditiously and promptly by the contractor. Contractor's claim, if any, for such repair/rectification/rework/ replacement etc. for reasons not attributable to contractor will be governed by Section-13 of the special conditions of contract. The parts to be replaced shall however be provided by BHEL free of cost.

#### 4.15.4

The pre-commissioning activities will start prior to light up of boiler and various trials, commissioning operations shall continue till the unit is handed over to customer. Simultaneous commissioning activities will be in progress in various areas, checking of equipments erected, making ready for trial runs, alkali flushing, chemical cleaning, mass flushing etc. All these works need specialized gangs including electricians/instrument mechanics in each area. Contractor shall earmark separate manpower for various commissioning activities. This manpower shall not be disturbed or diverted.

The mobilization of these commissioning gangs shall be such that planned activities are taken up in time and also completed as per schedule and the work undertaken round the clock if required. It is the responsibility of contractor to discuss on day to day / weekly / monthly basis the requirement of manpower, consumables, tools and tackles with BHEL engineer and arrange for the same. If at any time the requisite manpower, consumables, T&P are not arranged then BHEL shall make alternate arrangements and necessary recoveries with overhead cost will be made from the bills of the contractor.

#### 4.15.5

Contractor shall cut open works if needed as per BHEL engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over without any extra payment.

#### 4.15.6

In case any rework / repair / rectification / modification / fabrication etc. is required because of contractor's faulty erection which is noticed during commissioning or at any stage, the same has to be rectified by the contractor at his cost. If any improvement /repair /rework/rectification/ fabrication/ modification due to design improvement/ requirement is involved, the same shall be carried out by the contractor promptly and expeditiously. Claims if any, for such works from the contractor shall be governed by section-13 of Special Conditions of Contract.

#### 4.15.7

It is the responsibility of contractor to provide for necessary labour, tools and tackles and consumables till the completion of work under these specifications even in case erection, testing and commissioning of this work is delayed due to reasons not attributable to the contractor.

#### 4.15.8

During commissioning activities and carrying out various tests, minor items like gauges, manometers, etc., have to be temporarily erected and put in service to suit the commissioning activities. BHEL will provide the necessary gauges and equipment. Contractor has to carry out the erection, calibration, dismantling of the same. After completion of activities the temporary systems have to be removed and returned to stores. No extra charges will be payable towards these.

#### **4.15.9 Assistance for Commissioning**

During pre-commissioning, commissioning, post commissioning and trial operation stages of various systems, certain category of manpower with T&P and consumables

will have to be provided to BHEL commissioning engineers exclusively at their disposal. It shall be the responsibility of the contractor to provide Engineers, Electricians, technicians, Helpers, Fitters etc along with necessary consumables, hand tools, calibration equipment etc, for the various commissioning activities in progress. During peak months there could be requirements of separate commissioning gangs simultaneously in even upto 12 to 15 areas. Contractor has to augment the manpower as and when required as per work demand and necessity at site. The quoted rates shall include this.

#### 4.15.10

It shall be specifically noted that contractor manpower may have to be engaged round the clock simultaneously at different areas and hence considerable number of personnel and their overtime payment and also deployment of multiple sets of tools etc., may be involved. This aspect must be considered by the contractor while quoting their rates. No additional compensation by for the same shall be payable, irrespective of number of persons engaged or number of working hours per day.

#### 4.15.11

For electrical works, 415 volts and above, the contractor has to bring qualified electricians.

#### 4.15.12

Certain systems may be supplied with portable programming units, which are to be connected at various locations during pre-commissioning to handing over. Necessary cabling interconnecting the programming units and other connected panels has to be carried out by the contractor and are to be dismantled after work. For the purpose of testing, monitoring, commissioning, etc., these programming units will have to be repeatedly connected and disconnected at various locations. These will be considered as part of commissioning activities and no separate payment will be entertained for the above.

### **4.15.13 Calibration, Testing and Assistance for Commissioning**

Calibration, testing & commissioning activity as specified in this technical specification and rate schedule against various equipments, devices, systems etc. are broadly classified below. However, there may be some overlapping between the activities (erection, calibration and testing, commissioning). The classification of activity is only a guideline for understanding the total volume of work in each activity. The contractor shall have no claim for performing or providing manpower for such overlapping work, which is also within the scope of the work.

#### **A Calibration**

Verification after drawing of material of various types, range of the field devices with respect to instrument schedule, data sheet or system document. Codification of instruments as per system tag numbers Calibration/adjustment of instrument as per system requirement/set values. Providing head correction in case of pressure measurement as per calculated values or actual measured value for the instrument, which are used for interlock protections/monitoring. This is generally applicable for turbine / generator, lube oil systems, lube oil system of fans etc.

Verification of installation of instruments for range, type, tag number as per physical location of process point as per process, instrumentation diagram.

Checking and ensuring the proper function of instrument.

All the recorders shall be made functional with proper chart movement and ink marking.

**B Erection**

- Drawl of material from store, verification, inspection as per shipping list, drawings and documents.
- Preservation, up-keeping, safe custody of the erected equipments till handing over to the customer.
- Verification of installation as per drawing and document for the correctness of cabling, JB's, impulse pipe, various field device, panels, instruments etc.
- Continuity check and IR value check of cables.
- Verification of correction of cable termination with respect to instrument, electrical hook-up diagram, panel interconnection diagram, JB schedule.
- Checking earthing of the equipments and cable shield wire continuity.
- Energizing the functional group control panels and field devices.
- Flushing of impulse pipe before making the instruments process connections through.
- Any leakages, damages to impulse pipe, field device connections, air connections etc. Shall be fully attended by contractor.
- All cable glands/piping/tubing to be fixed as per installation requirement before commissioning.

**C Testing, Assistances for Commissioning & Trial Operation**

- Checking/verification of binary/analogue input and output signal from field and panel and up to recording/indicating instrument/MMI monitors.
- Adjustment, testing, calibration of pneumatic drive (control valve, trip valve, power cylinder for gate/dampers), electrical actuator operated valve/gate/dampers of other functional elements.
- Checking the operating electrical/pneumatic drive through functional group panel, remote control desk, MMI, CRT operation and repeatability and smooth operation to be checked.
- Checking the interlock, protection and alarm for various processes by simulation of field devices/process changes.
- Functional check of sub-loop control, sub group control and auto loop and fine-tuning.
- Adjustment of limit switches/feed back position transmitter checking the actuator for correct Limit switch operation for correct position indication and repeatability shall be ensured.
- Motor IR value measurement, bearing/winding RTD checking, drying out of motor, providing assistance for trial run of motor which includes monitoring temperature rise winding/bearing during trial run.
- Contractor shall prepare calibration/testing report/protocols.
- During trial run of various systems, if the performance of any instrument is found erratic, un-satisfactory and requires re-adjustment, re-calibration etc., the defect shall be attended by contractor.
- Observing and checking the performance of the various devices on load/process variation. Any deficiencies/defect noticed during the variable load conditions, the same should be attended properly.
- Observe the proper functioning of sub-group/sub-loop control.
- Check the operation of various controls in manual/auto mode for smooth functioning.
- Clearing of all bad / invalid signals noticed during commissioning.
- Providing necessary assistance for Trial Operation of the unit is in scope of this specification. Smooth operation and availability of all instrument/controls of the systems installed under the scope herein, shall be ensured by the contractor. Contractor shall provide adequate number of skilled manpower and T&P for this purpose. Interruption in Trial Operation for reasons attributable to the

Contractor shall result in re-start of the Trial Operation all over again; consequential extension in Time Schedule / Contract Period shall be to the contractor's account.

- If any small wiring correction or minor modification in control panel wiring is noticed during the commissioning, it shall be carried out as a part of commissioning activity.

#### **D Post-commissioning**

- Contractor shall rectify the defect observed/informed by customer during the trial run.
- Contractor shall submit the as- built drawing as per guidelines and instruction of BHEL engineer.
- After trial run/handing over of the equipment, if due to unforeseen reasons, certain works crop up; the contractor shall provide all the assistance.

#### **PG Test Assistance**

For PG test assistance, laying of impulse pipes, cables, data logging system etc. and installation of instrument tapping points shall be done by the contractor. These activities may be carried out at any point of time before or after Completion of Facilities. Payments will be made as per item rates of comparable similar or identical items in the rate schedule. Such temporary installations shall have to be dismantled and returned to stores after the completion of PG Test for which no separate payment is admissible. The material used for PG Test such as cables, impulse pipes etc are to be separately reconciled.

#### **4.16.0 Guidelines for erection**

##### **4.16.1 Impulse Pipelines**

###### **4.16.1.1**

All impulse lines, air lines shall be thoroughly cleaned by removing the dust, burrs etc., and any foreign matter inside the pipe/air line is to be cleaned by compressed air or any other suitable means before installation.

###### **4.16.1.2**

The routing of pipe lines shall include sufficient flexibility near tap off points to allow for thermal expansion of process equipment.

###### **4.16.1.3**

The pipes shall be cold bent using hydraulic bending machines only.

###### **4.16.1.4**

The horizontal impulse lines shall be laid with proper slopes towards the tapping point.

###### **4.16.1.5**

Supports for piping and tubing shall be adequate and in no case exceed limits shown below:-

A) 1/4" OD / 3/8" OD copper	continuous
B) 1/2" NB pipe/tube	5 ft.
C) 3/4" NB pipe/tube	5 ft.
D) 1" NB pipe/tube	8 ft.

###### **4.16.1.6**

All CS impulse line welding shall be done through welding generator/rectifier and only structural welding may be done with welding transformer.

###### **4.16.1.7**

Impulse pipes of alloy steel/SS/carbon steel etc. shall be TIG welded. Contractor shall arrange for necessary TIG welding sets, electrodes etc.

Alloy Steel impulse pipes are to be preheated as per requirement before welding.

#### 4.16.1.8

Minimum number of fittings shall be used on all pipelines wherever possible; to keep threaded joints to a minimum wherever threaded connections are to be made.

#### 4.16.1.9 Testing

On completion of pipeline installation, the pipelines shall be hydraulically tested. Contractor shall arrange for water filling pump, hydraulic test pump and standard gauges and conduct the test satisfactorily.

#### 4.16.1.10

The impulse lines shall be isolated from instruments and tested at 2 times the maximum working pressure. The fall in pressure shall not be more than 1 kg/cm<sup>2</sup> or 1% of the working pressures whichever less, in 30 minutes and there shall be no leaks at any of joints/welds when isolated from source of pressure.

#### 4.16.1.11 Air Piping

All instrument air pipelines shall be isolated from the instruments and pressurised pneumatically to maximum work pressure. They shall then be isolated from the source of pressure and fall shall be less than 1 PSI in 20 minutes.

#### 4.16.1.12 Pneumatic Signal Lines

All pneumatic signal lines shall be disconnected and blown through with instrument air. The line shall be blanked off and pressurised pneumatically 20 psi and checked with soap solution for leaks and attended accordingly.

#### 4.16.1.13

Items like connectors, tees, bends, cross, condensate pots, manifolds, small root valves etc shall be erected within the quoted rates of Impulse pipes.

#### 4.17.1 Electrical cabling /wiring

All the cables will be properly laid in cable trays, dressed and clamped with aluminium flats. The cable will be terminated at both ends with suitable lugs and printed ferrules and will be glanded properly. Contractor shall arrange suitable material (if required) for making entry points of cables to field equipments waterproof. All care to be taken by contractor to prevent water entry into any instrument, JB, Panel etc. Suitable equipment and consumables for ferrule printing has to be arranged by the contractor at his own cost. For cable identification, the contractor shall provide at his cost aluminium tags at regular intervals (15 m) through each run of cable.

#### 4.17.1.1

All electrical connections shall be tested for polarity and proper connections.

#### 4.17.1.2

Insulation test of the various circuits shall be done.

#### 4.17.1.3

The checking of operation of individual equipment and instruments to which the cabling/wiring connected shall also be done by the contractor.

#### 4.17.1.4

Wherever supplied, GI cable trays shall be of bolted construction only with fixing screws and coupler plates.

#### 4.17.1.5

To the extent possible, all the trays shall be fixed in vertical orientation



#### 4.17.1.6

Sharp bends of cable trays shall be avoided in all type of cable trays.

#### 4.17.1.7

Installation of cable racks and supports structure shall be carried out in all the required areas. Steel embedment shall be provided in the cable trenches, ceiling slabs and concrete blocks for installing the cable racks and support structures.

- A) Ladder perforated type cable trays shall be used in cable trenches and vertical risers.
- B) Perforated cable trays shall be used in higher elevations in boiler and TG area.

#### 4.17.1.8

Cable racks in the trenches and control room are to be shared with other contractors installing cables in different areas wherever required. Contractor shall cooperate with the other contractors in sharing the cable trays and proper dressing and clamping the cables.

#### 4.17.1.9

Where power and control cables are to be laid in the same route, suitable barriers to segregate them physically shall be employed.

#### 4.17.1.10

Space equal to the diameter of cable shall be provided between power cables of six over 50 mm in diameter.

#### 4.17.1.11

When cables pass through floors, walls etc., it shall be passed through a pipe for mechanical protection and the pipe ends sealed suitably.

#### 4.17.1.12

Care shall be taken to avoid short bending and kinking of conductor damaging insulation and stressing the cable beyond pulling force recommended by the manufacturer. Cable shall be protected at all times from mechanical damage.

#### 4.17.1.13

The minimum radius of formed bend of an insulated cable shall be 12d for un-armoured cables and 15d for armoured cables where 'd' is the overall diameter of the cables.

#### 4.17.1.14

No cable shall be laid in ducts or trenches where other services such as oil pipes, steam or water pipes are laid.

#### 4.17.1.15

Where cabling passes through brickwork or concrete work, the contractor shall provide suitable local protection against mechanical damage wherever necessary.

#### 4.17.1.16

The layout of all cables shall be arranged to give adequate clearance from other services and cables shall be routed to avoid hot zones.

#### 4.17.1.17

Jointing of cables shall be avoided as far as practicable. However, jointing if at all necessary shall be done by crimping type cable joints after getting approval of BHEL engineer.

#### 4.17.1.18

The cable schedules indicating cable sizes, tentative cables routing information will be furnished by BHEL at site to the contractor. Required steel inserts on cable trenches, ceilings of the platforms in TG hall for erecting the cables will be provided by BHEL. The contractor shall design number of cable/racks to accommodate the cables on racks/trays properly.

#### **4.17.2.0 Earthing installations**

##### **4.17.2.1**

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

##### **4.17.2.2**

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.

##### **4.17.2.3**

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.

##### **4.17.2.4**

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

##### **4.17.2.5**

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

##### **4.17.2.6**

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

##### **4.17.2.7**

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

##### **4.17.2.8**

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 galvanizing zinc paint. Contractor to arrange the required paints and other items at his cost.

#### **4.18.0 Instruments and Equipment**

##### **4.18.1**

All field-mounted instruments are to be located in such a way as not to obstruct walkways or plant equipment access but shall be easily accessible for maintenance. Handrails shall not be used for mounting or supporting instruments.

##### **4.18.2**

Racks/stands and supports for instruments and transmitters shall be fixed on RCC column/floor by chipping and grouting or by welding to steel structure. In no case these shall be welded to floor grills.

#### 4.18.3

The power cylinders support/base erection will be welded to steel structure or by grouting. The power cylinder will be properly aligned and linkage mechanism wherever required shall be connected to the driven equipment. All accessories for power cylinders line air sets, solenoid valves, air lock, limit switches, if supplied loose, shall be fixed, aligned and connected up.

#### 4.18.4

When installing flow and pressure transmitters/switches for Liquid /steam/condensate vapour services, the instrument is to be mounted below its primary element or tapping point. For gas service applications, the instrument is to be mounted above Primary element tapping point.

#### 4.18.5

During erection and commissioning stage, the site mounted instrument shall be protected suitably. Contractor shall provide suitable security arrangement in main control room, and other areas where equipments are positioned, at no extra cost.

#### 4.18.6

All brackets/racks and support steel work for tubing impulse lines/instruments shall be painted with two coats of primer and two coats of final colour prior to installation. Paints, etc supply in the scope of contractor.

#### 4.18.7

Contractor shall arrange for own fire fighting equipments for the materials stored under contractor's custody.

#### 4.19.0

Guidelines for handling and storage of electronic cubicles / subassemblies / loose items.

#### 4.19.1

Immediately after unloading at site, the electronic equipment should be kept in a covered area. Handling and lifting of package should be done without jerks or impacts. Packing case should not be dropped or slid along the floor under any circumstances. Suitable forklift should be used to move the case to its final position. All above points are to be strictly followed as electronic equipments may get damaged due to vibration and shock.

#### 4.19.2

After unloading at site, the package of the equipment shall be inspected for external damage. In case the package is damaged, package number and details of damage should be noted. The details of damage should be reported to concerned site engineer.

#### 4.19.3

Cases should be opened/unpacked using correct nail pullers. While opening the planks, care should be taken to see that equipment inside is not damaged. Cases should not be unpacked in areas where they are exposed to rain, water/liquid splashing, dust or other harmful materials like chlorine gas, sulphur dioxide etc.

#### 4.19.4

After opening the case, all supports provided for transport are to be removed with due care.

#### 4.19.5

Hinged frames should not be opened when equipment is not secured to floor as this is likely to cause it to topple over. The hinged frame can be opened only if the equipment is still fixed on to bottom wooden pallet.

#### 4.20.0 Storage

##### 4.20.1

The equipment should be preferably in its original package and should not be unpacked until it is absolutely necessary for its installation or advised by BHEL engineer. The equipment should be best protected in its cases. It should be arranged away from walls.

##### 4.20.2

The wooden pallet provided for packing itself can be retained for raised platform to protect equipment from ground damp, sinking into ground and to circulate air under the stored equipment. This will also help in lifting packing with fork-lifter.

##### 4.20.3

Periodic inspection if silica gel placed inside the equipment is necessary. It has to be replaced or regenerated when decolourisation takes place.

##### 4.20.4

Due care should be taken to ensure that the equipment is not exposed to fumes, gases etc., which can affect electrical contacts of relays and terminal boards.

##### 4.20.5

The storage room and the equipment should be checked at regular interval to ensure protection from termites, mould growth, condensation of water etc., which can damage the equipment.

##### 4.20.6

All the equipments, materials and goods kept in the store room should be identified and registered in a book. Inspection report should be recorded. Any discrepancy observed should be communicated to site engineer.

##### 4.20.7

The packing material shall be retained if the cubicle is to be repacked after inspection.

#### 4.21.0

##### Sub-assemblies

##### 4.21.1

All subassemblies should be kept in a separate place where it is easily accessible.

##### 4.21.2

Subassemblies should have a protective cover in case it is stored without wooden packing/case to prevent accumulation of dust. Silica gel packets should also be kept along with it.

##### 4.21.3

Subassemblies should not be stacked one above the other.

#### 4.22.0 Loose items

The loose items supplied for the main equipment falls into various categories like tools, cables, prefabricated cables, console inserts, recorders, VDU/CRT, other display units, printers, sensors and transducers, cable glands, cable ducts, frames, racks, etc. These are to be categorized and stored separately.

#### **4.23.0 Guidelines for handling of electronic modules**

##### **4.23.1**

All the modules shall be handled by qualified persons only.

##### **4.23.2**

Electronic modules should only be touched when it is absolutely essential to do so.

##### **4.23.3**

Before touching any electronic module, the operator should discharge the static electricity by earthing himself or better still, ensure constant discharge by wearing an earthed wrist strap.

##### **4.23.4**

The operator should not wear clothing made entirely from synthetic fibres, but a mixture containing at least 65% cotton.

##### **4.23.5**

The PCB should always be held by front panel or by module frame and electronic components / connectors should never be touched.

##### **4.23.6**

The electronic modules should not be placed close to television sets or CRT units.

##### **4.23.7**

Soldering irons and any other tools used must be grounded.

##### **4.23.8**

All modules using CMOS components are packed in antistatic bags when transported loose to avoid ESD failures. The antistatic bags must always be used to transport modules at site from one place to the other.

#### **4.24**

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 10,000/- (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.

#### **4.25 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 both electrical and C&I area. The bidder must also take this aspect into consideration.

#### **4.26**

Equipments / instruments etc., under the above scope of erection and commissioning are generally dispatched from BHEL's manufacturing units / vendor's works at site well before start of erection. Sometimes, such dispatched materials may get stuck up with transporters/railways. The contractor shall provide support / manpower for necessary chase up for removal of such bottlenecks in transportation. Also, for smaller items, it could be necessary to depute his person to personally carry certain items from works to site. Requirement of such activities that will be decided by BHEL engineer and chase up activities, if required, shall be performed under authorization by BHEL. The above services shall be provided within the quoted rates.

#### **4.27 Exclusions**

The following are specific exclusions from this work.

1. Erection of dampers, valves, electrical actuators.
2. Attachment welding of thermocouple pads for boiler tube metal temperature measurement flow nozzles and control valves. Installation of thermowells on the pipelines.
3. Erection of valves, actuators along with valves, damper actuators along with dampers, burner tilt power cylinder, seal air dampers and scanner air emergency dampers.
4. Erection of electro hydraulic actuators, control valves.
5. Erection of control valves.

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 that 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 Labour Colony**

BHEL'S customer will provide the open land with single point for drinking water and electricity. Contractor shall make further arrangements for constructing the labour colony and including lighting, water distribution and suitable provisions of drainage/sanitation.

##### **5.2 Tools & Plants and MMD**

###### **5.2.1**

The contractor shall provide all required Tools and Plants, inspection, Measuring and Monitoring Devices (MMD), Handling & Transportation Equipments for the scope of work covered under these specifications. An indicative list of major T&P and MMD to be deployed by the Contractor is given in the **Appendix-III**. It may be noted that this list does not intend to exhaustively cover the contractor's responsibility with regard to T&P to be deployed by him. BHEL will provide the services of their T & P listed in relevant Appendix, free of charge, on sharing basis. Refer section-7 for further details in this regard.

###### **5.2.2**

All tools and tackles to be deployed by the contractor for the work shall have the prior approval of BHEL engineer with regard to brand, quality and specification.

###### **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 targets 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/rectifiers will be permitted. The use of welding transformers 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) and tests. Test/calibration certificates shall be furnished to BHEL. MMD shall be calibrated only at accredited laboratory as per the list available with BHEL or any other laboratory approved by BHEL.

The contractor shall provide all the necessary steel scaffolding materials, temporary structures and necessary safety devices etc. during preassembly, calibration, erection, testing and commissioning of the equipment.

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

### 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

All consumables to be used for the work shall have prior approval of BHEL engineer with regard to brand and quality specifications. 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 manufacturers.



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

### 5.4.1

Contractor at his cost shall arrange all the required welding electrodes as approved by BHEL. It shall be the responsibility of the contractor to obtain prior approval of BHEL, regarding manufacturer, type and brand name of welding 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 to BHEL for verification & records.

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 required gases for welding and gas cutting like Oxygen, Acetylene, Argon (welding quality), Nitrogen etc. shall be arranged by the contractor at his cost.

### 5.4.3

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.

### 5.4.4 TEST PIECES FOR WELDERS QUALIFICATION TEST.

Materials for Test Pieces for qualification of structural welders shall be supplied by the Contractor. Contractor shall also prepare the test coupons from such materials. All expenses in respect of **welders' qualification test and Welding Process 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's customer free of charges within the project premises as per the availability of space.

**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.**

### 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

Contractor shall arrange adequate floodlights, hand lamps and area lighting. Provision of distribution lines for lighting from the single point to the required place with proper distribution boards, observing the safety rules laid down by the electrical authorities of the state shall be done by the contractor including all the materials like cables, fuses, switch boards etc

## 5.7 CONSTRUCTION POWER & WATER

### 5.7.1

Construction power (three phase, 415v / 440v, 200 amps, 4-wire) will be provided at one point near the site approximately 500 Meters from erection site free of charge. However all taxes, duties, levies, charges etc, as applicable, shall also be born by the contractor. Presently no such charges are applicable. Accordingly, required energy meter, all cables, fuses, distribution boards, switches, switchboards, bus bars, earthing arrangements, protection devices e.g. ELCB, if any, and any 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 installations, if any, prior to these being put to use or as may be specified, shall be the responsibility of the contractor.

### 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 installations shall comply in all respects with the appropriate statutory requirements. The installation and maintenance of this shall be done by licensed and experienced Electrician.

### 5.7.3

The contractor shall install necessary Capacitor Bank etc. with appropriate control mechanism to maintain the Power Factor as per the guidelines in vogue from time to time in this regard. Any levy imposed by the customer / authority for any deviation in power factor shall be passed on to the contractor.

### 5.7.4

Contractor shall be equipped with back-up power supply arrangement like DG set and diesel operated welding machine etc. to tackle situations 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.

#### **5.7.5**

BHEL is not responsible for any loss or damage to the contractor's equipment as a result of variations in voltage or frequency or interruptions in power supply. Contractor shall take suitable insurance policy for such accidental loss/ damages.

#### **5.7.6**

Water for Drinking and Construction purposes shall be provided at one point. Further drawing and distribution is to be done by the contractor, including cost of materials and laying/installation

### **5.8 Contract Labour**

#### **5.8.1**

The contractor in the event of his engaging 10 or more workmen will obtain independent license under the Contract Labour (regulations and abolition) Act 1970 from the concerned authorities based on the certificate (form –V) issued by the principal employer/customer.

#### **5.8.2 Provident Fund**

Contractor will deduct the necessary amount from his employees towards provident fund and contribute equal amount as per government of India labour laws. Contractor regularly to the provident fund commissioner and get the account code will deposit this amount. Contractor shall submit the account code duly certified by pf commissioner to BHEL project in-charge.

#### **5.8.3**

Contractor shall also comply with the provisions of ESIS act in vogue and submit evidence thereof to BHEL site in-charge. All other expenses such as 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.

#### **5.8.4**

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

#### **5.8.5**

Where applicable, provisions of workman compensation act shall be adhered to.

#### **5.8.6**

BHEL/customer may insist upon 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.

## **5.9 Taxes, Duties, Levies**

### **5.1**

Refer to Clause 2.8.4 of General Conditions of Contract. Notwithstanding anything contained therein, the following provisions shall be applicable for this contract.

#### **5.1.1**

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.

#### **5.1.2 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 and remittance record of such tax immediately after depositing the tax with concerned authorities. 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.

#### **5.1.3 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.

#### **5.1.4 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.

#### **5.1.5 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) Progress reports – periodically
- 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.

## **Section-6**

### **Special Conditions of Contract**

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

The contractor shall deploy all the skilled/semiskilled/ unskilled labour including highly skilled workmen like high-pressure welders 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-IV. 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 /customer.

#### **6.6 WATCH AND WARD**

Contractor has to arrange and provide watch and ward round the clock. Any theft or damage of component due to negligence of the contractor will have to be replaced/repaired by the contractor. The areas are unit control/ESP control room and field.

#### **6.7 Industrial Relations and Labour Laws**

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 and any other such authorities under whom this work falls.

6.8

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.

#### **6.9 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.

The contractor shall deploy adequate laboures and supervisory staff in the following areas.

- A) Overall planning, monitoring & control
- B) Equipments Erection
- C) Welding & NDT & Stress Relieving operators, induction.
- D) Testing & Commissioning
- E) Quality Control and Quality Assurance
- F) Materials Management
- G) Safety, Fire & Security
- H) Industrial Relations and Fulfillment of Labour Laws and Other Statutory Obligations.

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**

#### **7.0 Obligations Of BHEL**

#### **7.1 Facilities Provided By BHEL**

#### **7.2 Space 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 will supply consumables free of charges as listed in **Appendix-II B**.

#### **7.6 Test Blanks (Plates & Pipes)**

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

#### **7.7 Filler Wire and Welding Electrodes**

All the welding consumables shall be arranged by contractor.

#### **7.8 Tools & Plants**

BHEL will provide the Tools & Plants listed in **Appendix II A** free of charges on sharing basis.

BHEL will also provide any special tools that are supplied by BHEL manufacturing units/vendors/suppliers as special installation tools under regular DU/DESS numbers in various product groups free to contractor. Contractor shall return these tools after the completion of the specific task for which such tools are intended, in good working order after proper servicing/overhauling.



## **Section-8**

### **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.
- 8.3 A daily logbook of all measurements and testing/calibration should be maintained by contractor on the job for detailing inspection details of various equipments.
- 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. 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 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 conform to job requirement in respect of measurement range, accuracy level & any other specification. The indicative list of MMDs required for this work and to be made available by the contractor is given in appendix-III. The list will be reviewed by BHEL and the contractor shall meet any augmentation needed.
- 8.7 The MMDs deployed by the contractor shall, at all stages of work, have valid and current calibration. BHEL shall be done the calibration of these MMDs from the agencies accredited/ approved. Copy of calibration certificates in respect of these MMDs has to be submitted to BHEL. Periodical status report regarding validity of calibration has to be submitted to BHEL. Re-calibration/ re-validation shall be done periodically as per BHEL specifications. Contractor shall conform to the specifications of BHEL regarding storage of the MMDs.
- 8.8 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.

**8.9** In the course of work BHEL may counter/ finally check the measurements with their own MMDs. Contractor shall render all assistance in conduct of such counter/final measurements.

**8.10** 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 for the services of quality assurance engineer.

**8.11** Stage Inspection By FES/QA Engineers

Apart from day-to-day inspection by BHEL engineers stationed at site and also by customer's engineers, stage inspection of equipments under erection and commissioning at various stages of erection and commissioning by teams of engineers from field engineering services of BHEL's manufacturing units and quality assurance teams from field quality assurance factory quality assurance and commissioning engineers from technical services of BHEL will also be conducted. Contractor shall arrange all labour, tools and tackles etc, for such stage inspections as part of work.

## **8.12 Statutory Inspection of Work:**

### **8.13 Statutory Inspection of Work**

8.13.1

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.

8.13.2

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

- 1) Inspectorate of the Chief Electrical Inspector of Maharashtra OR Central Electricity Authority as per statute.
- 2) Any other authority connected to this work.

The scope includes getting the approval of the installations from the statutory authorities, which includes arranging for inspection visits of statutory authority periodically as per BHEL engineer's instructions, submitting documents, radiographs etc. and following up the matter with them. Contractor shall also make all arrangements for offering the products/systems for inspection, as applicable, to the concerned authority.

8.13.3

It shall be contractor's responsibility to obtain approval of statutory authorities, whenever applicable, for conducting any work which comes under the purview of these authorities.

8.13.4

BHEL will pay fees for visits, inspection fees etc. of these statutory authorities. Please refer Section-5 for working arrangement for payment of fees in this regard. All other expenses shall be borne by the contractor. In case these inspections have to be repeated due to reasons attributable to the contractor

and fees have to be paid again, the contractor has to pay such additional charges.

#### 8.13.5

It shall be the responsibility of contractor to obtain license from chief electrical inspector, Maharashtra for carrying out high voltage work. Contractor shall also comply with the provisions of the latest Electricity Act, including the amendments thereof.

#### 8.13.6

The contractors shall pay all fees connected with testing of his welders/workers and testing, inspection & calibration of his MMD and T&P.

#### 8.14.0

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.

#### 8.15.0 Field Quality Assurance

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 endeavor 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

Bharat Heavy Electricals Ltd, PSWR, Nagpur  
Tender Specification No : BHE/PW/PUR/SLT-CNI/556

- 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 administrators 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**

### **9.2.4.3.1**

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.

### **9.2.4.3.2**

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

### **9.2.4.3.3**

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

### **9.2.4.3.4**

All disposal of wastes generated during construction shall be in accordance with all relevant legislation.

### **9.2.4.3.5**

Acid and alkali cleaning wastes shall be neutralized to acceptable norms before disposal to the designated area.

### **9.2.4.3.6**

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 Sliding 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**

Bharat Heavy Electricals Ltd, PSWR, Nagpur  
Tender Specification No : BHE/PW/PUR/SLT-CNI/556

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 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 SEWAGE SYSTEM

IS No	YEAR	Amd upto	DESCRIPTION
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 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 No	YEAR	Amd upto	DESCRIPTION
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 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 No	YEAR	Amd upto	DESCRIPTION
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.

##### 10.6

In case of any conflict between general instructions to tenderness, general conditions of contract contained in sections 1 & 2 respectively and special conditions of contract contained in sections 4 to 15 and appendices, provisions contained in special conditions of contract in sections 4 to 15 and appendices shall prevail.

##### 10.7

In case of discrepancy between quoted item rate and corresponding amount in the rate schedule, the **quoted item rates shall be reckoned as correct and amount recalculated**. Quoted item rates shall also prevail for arriving at the total price quoted for offer evaluation. Offers will be evaluated on the total amount for the entire Rate Schedule and the work will be awarded without splitting the scope.

##### 10.8

Bank Guarantees to be furnished by the contractor towards Security Deposit and Performance Guarantee (last 5% payment against workmanship warranty/defect liability) shall have a claim period of six months over and above the validity period required for the respective cases. BG for advance payment shall be kept valid for a period of two more months beyond the recovery period of the advance with interest thereof.

# Special Conditions of Contract

## Section-11

### 11.0 Time schedule - Contract Variation - Progress 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 work **within two weeks** from the date of fax Letter of Intent (LOI) 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:

SN	Activity	Tentative schedule unit -3	Tentative schedule unit -4
01	Mobilisation Of Contractor	MAR 08	-
02	Boiler Hydro Test	FEB,08	JUNE,08
03	Boiler light up and ABO	JULY,08	NOV,08
04	Turbine box-up	MAR,08	JULY,08
05	Steam blowing of completion	SEPT,08	JAN, 09
06	Turbine Oil flushing completion	MAY , 08	AUG ,08
07	Synchronisation and coal firing	SEPT,08	JAN, 09
08	Trial Operation	NOV,08	MAR,09
09	PG test	FEB, 09	JUNE,09
10	Completion of works	MAR, 09	JUNE,09

##### 11.1.1 Contract Period

**The contract period shall be 15 months** from the start of work. Erection, testing, calibration and commissioning of permanent equipments required for completion of system shall be completed within the time schedule given above. Permanent erection of the first major equipment such as panels etc. shall be considered as the start of contract period for this contract.

**BHEL, owing to its commitment to their customer, may ask contractor to compress the schedule to the possible extent for advancement of various milestones. Contractor shall plan his activities and mobilise additional resources accordingly to the satisfaction of BHEL engineer within the quoted rates.**

#### **11.1.2 Grace period**

Grace Period of **3 months** will be allowed at BHEL's discretion.

#### **11.2**

The contractor should reach site and establish his site office and mobilise to commence the work as per directions of BHEL engineer. The date of starting the work at site shall be fixed in consultation with BHEL's engineer and the same will be recorded in measurement book while entering the first RA bill.

#### **11.3**

Subject to availability of materials and other inputs, it is the responsibility of the contractor to carry out work to achieve the monthly progress and keep up the schedules.

#### **11.4**

Contractor shall draw the monthly erection programme along with BHEL engineer indicating the work to be achieved and event to be completed as per clause 11.1. Once the programme is drawn, he shall adhere to the same. Contractor shall plan and erect the materials as it is received at site. The monthly planned percentage shall take into consideration the material available at site before the start of the month and also any material received during the month. Contractor shall mobilise his resources required to achieve the monthly programmes.

#### **11.5 Progress and monitoring of work**

##### **11.5.1**

It is the responsibility of the contractor to provide all the relevant information on a regular basis regarding erection progress, welding progress, labour availability, equipment deployment, consumption of electrodes, gases, down time of measuring test equipment etc.

##### **11.5.2**

The contractor shall submit daily, weekly and monthly progress reports, manpower reports, material reports, equipment reports etc. as per formats specified by BHEL. The progress reports shall indicate the progress achieved against planned with reasons indicating the delays, if any. The report shall also give the remedial actions that the contractor intends to make good the slippage or lost time so that further works can proceed as per the original programme and the slippage do not accumulate and affect the overall programme.

##### **11.5.3**

Any other information required for decision-making, planning and action taking, the contractor shall furnish the same, other reports and daily/weekly/monthly erection progress shall be furnished in the format prescribed by BHEL.

##### **11.5.4**

Contractor shall work out tentative programmes of erection, commissioning to match the schedules indicated in clause 11.1 and should submit along with his offer the month-wise calibration, erection and testing and commissioning programme area-wise.

## **11.6.0 Quantity Variation**

### **11.6.1**

***The quantities shown in rate schedule are only estimated and the payment will be made on the actual quantity executed on unit rate basis. Variation in quantities upto  $\pm 40\%$  in case of the cable quantities and about  $\pm 25\%$  for other items to be considered while quoting. Agreed rates shall remain firm for any upward and downward variation.***

## **11.7.0 Price Variation**

### **11.7.1**

The rates quoted by the contractor shall remain firm throughout the contract period, grace period and extensions if any. Provisions of clause no. 2.16 of General Conditions of Contract shall not be applicable to this contract.

## **11.8.0 Extension of Contract Period**

### **11.8.1**

BHEL at its discretion may extend the contract beyond the end of grace period for further required period depending upon the quantum of work left out at the end of grace period. If the completion of work gets delayed for reasons other than attributable to the contractor or force-majeure condition, the contractor will be compensated by way of Overrun Charges.

### **11.8.2**

Overrun period beyond the grace period shall be decided based on the performance of contractor during the normal completion period and shortfall if any shall be recorded under the following heads:-

- Erection/commissioning programme not achieved owing to non-availability of fronts.
- Erection/commissioning programme not achieved owing to non-availability of materials.
- Erection/commissioning programme not achieved owing to non-availability of tools and plants, manpower and consumables by the contractor.

### **11.8.3**

Total extension shall be apportioned between BHEL and contractor in the same proportion. Extension on account of delay attributable to contractor shall be exhaustive list.

### **11.8.4**

During the over-run period, contractor shall deploy necessary and adequate resources like engineers, supervisors, labours, T&P and consumable to complete the agreed programme in each month.

### **11.8.5**

Over-run compensation will be paid proportionate to the progress made during the corresponding month evaluation of progress of the achievements vis-à-vis programme drawn for respective month, shortfall will be apportioned accordingly between BHEL and contractor.

### **11.8.6 Overrun Charges**

If the contract is extended beyond the contract (including grace) period for any reason other than those attributable to the contractor or force majeure conditions, the contractor will be compensated by payment of overrun charges at the rate of Rs. 50,000/- per month (Rupees fifty thousand only). Overrun compensation will be paid for the extension attributable to bhel only. No overrun compensation will be payable for the extension on account of reasons attributable to contractor and/or force majeure conditions. Overrun compensation for eligible period shall be in proportion to the progress achieved against the plan for respective period.

### **11.9 Foreclosing of Contract**

#### **11.9.1**

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.

#### **11.9.2**

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.

#### **11.9.3**

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.

### **11.10**

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

### **11.11 INTEREST BEARING RECOVERABLE ADVANCE**

Interest bearing (rate of interest will be 1% per annum more than bank interest rate, on monthly reducing balance basis) recoverable advance limited to 5% of the contract value may be paid by BHEL at its discretion depending on the merit of the case against receipt & acceptance of bank guarantee from the contractor for the amount sought. This bank guarantee (BG) shall be valid at least for one year or the recovery duration. In case recovery of dues does not get completed within the aforesaid BG validity period, the contractor must renew the validity of BG or submit fresh BG for the outstanding amount and remaining recovery period. BHEL is entitled to make recovery of the entire outstanding amount in case the contractor fails to comply with the BG requirement as above.

**Recovery of dues will be made minimum @ 10% of the admitted gross running bill amount from the first applicable running bill onwards till entire due (principal plus interest) is recovered. In the event sufficient time duration is not left for recovery @10%, the rate of recovery shall be suitably enhanced so that entire due is recovered within the contract period (including extensions granted or foreclosure if any).**

### **11.12 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.

## SPECIAL CONDITIONS OF CONTRACT

### SECTION-12

#### 12.1 TERMS OF PAYMENT

##### 12.1.1

The contractor shall submit his monthly on account bills with all the details required by BHEL on specified date every month covering progress of work in all respects and areas from the 25<sup>th</sup> of previous calendar month to 24<sup>th</sup> of the current month.

##### 12.1.2

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

##### 12.1.3

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.

The 5% thus remaining shall be on account of workmanship guarantee of work executed. The same will be released after completion of the guarantee period of **12 months** from the date of completion of entire work as certified by BHEL.

However, on specific request of vendor, this amount may be released on pro rata basis for the value of work executed and accepted by BHEL, along with any RA Bill and onwards, subject to receipt and acceptance of bank guarantee of equal amount in BHEL's prescribed format. The BG shall be kept valid till completion of such guarantee period and an additional six months claim period. This is also subject to the condition that the contractor has started the work and also furnished/remitted the initial Security Deposit as per contract.

##### 12.1.4

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.

##### 12.1.5

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.

## 12.2 STAGES OF PROGRESSIVE PRO-RATA PAYMENTS

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

SN	Sections of Rate Schedule	Cali-bration	Erection	Testing & Commng	Final painting
1	A-1 to A-43	N.A.	55%	40%	5%
2	B-1 to B-16	N.A.	55%	45%	N.A.
3	C-1 to C-30	45%	55%	N.A.	N.A.
4	D-1 to D-10	N.A.	N.A.	100%	N.A.
5	E-1 to E-33	N.A.	100%	N.A.	N.A.
6	F-1 to F-36	N.A.	95%	N.A.	5%

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.

## 12.3 Payment for the Work Completed

### 12.3.1

The tenderer shall quote separate rates for each item as detailed in Rate Schedule. No other form of quoted price shall be acceptable and such offers shall be liable for rejection.

### 12.3.2 Measurement for Payment

### 12.3.3

In Rate Schedule, 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 verification. Physical verification/measurement shall be made by Contractor in presence of BHEL engineer. Contractor shall maintain records for system-wise utilization of material.

### 12.3.5

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

### 12.3.6

All the cables returned to stores should carry an aluminium tag indicating the size and type of cables. Cable of more than five-meter length 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.

## Section –13

### Special Conditions of Contract

#### 13.0 Extra Charges For Rectification And Modification

##### 13.1

If extra works (requiring less than **40 man-hours**) for modification, rework, revamping, in brief, any work done to change the state existing to a stage desired and also fabrication, all or any, are needed due to any change in or deviation from the drawings and design of equipment, operation/ maintenance requirements, mismatching, transit damages and other allied works which are not very specifically indicated in the drawings, but are found essential for satisfactory completion of the work, are done, no extra charges will be paid. The tenderers are requested to take this aspect into account and the quoted rate should include all such contingencies.

##### 13.2

It may also be noted that if any such said extra works arise on account of the contractor's fault it will have to be carried out by the contractor free of cost. Under such circumstances, any material and consumable required for this purpose will also have to be arranged by the contractor at his cost.

##### 13.3

However, BHEL may consider for payment as extra, for such of those works detailed in clause 13.1 which require more than **40 man-hours** and such payment will be regulated by the terms, conditions and stipulations contained in the clauses 13.4 to 13.8 and/or 14.2.1 to 14.2.10 as the case may be. It may be specifically noted that the decision of BHEL as to whether such payment is due shall be final and binding on the contractor. It may also be noted that only those works, which are identified as major and warrant extra payment and certified as such by the site engineer and accepted by the designers and/or competent authority of BHEL, will be considered for extra payment.

##### 13.4

For extra works arising out of transit, storage and erection damages, payment, if found due, will be regulated by clauses 14.2.1 to 14.2.10.

##### 13.5

All the extra work should be carried out by a separately identifiable gang, without affecting routine activities. Daily log sheets in the pro-forma prescribed by BHEL should be maintained and shall be signed by the contractor's representative and BHEL engineer. No claim for extra work will be considered/entertained in the absence of the said supporting documents ie. Daily log sheets. It may, however be noted that signing of log sheets by BHEL engineer does not mean the acceptance of such works as extra works. All admissible claims shall be submitted to BHEL

##### 13.6

BHEL retains the right to award or not to award any of the major repair/rework/modification/rectification/fabrication works under clauses 13.1 to 13.6 to the contractor, at their discretion without assigning any reason for the same.

13.7

Extra works that arise on account of contractor's fault will have to be carried out by the contractor free of cost including the supply of material and consumables

13.8

After eligibility of extra works is established and finally accepted by BHEL engineer/designer, payment will be released on competent authority's approval at the following rate.

**Man-day rate for eligible extra works :**

Single average man-day rate, including overtime if any, and other site expenses and incidentals, including consumables, tools and tackles, for carrying out rework / repairs / rectification / modification / fabrication for a man-day of 8 hours as may arise during the course of erection will be **Rs. 240/- (Rupees Two hundred and forty only)**

As mentioned above, no payment will be made if an item of work lasts less than 40 man-hours.

## **SECTION-14**

### **SPECIAL CONDITIONS OF CONTRACT**

#### **14.0 Insurance**

##### **14.1 Marine, Storage cum Erection (MCE) Insurance and Repairing Damages**

###### **14.1.1**

BHEL/client has an MCE insurance cover, inter-alia, for all the permanent project equipments/components supplied by BHEL under scope of this work by way of a transit and storage cum erection policy covering liability against damages/ losses etc.

##### **14.2 Reporting Damages and Carrying out Repairs**

###### **14.2.1**

Checking all components/equipments at siding/site and reporting to transporter and /or insurance authorities of any damages/losses will be done by BHEL.

###### **14.2.2**

Contractor shall render all help to BHEL in inspection including handling, re-stacking etc, assessing and preparing estimates for repairs of components damaged during transit, storage and erection, commissioning and preparing estimates for fabrication of materials lost/damaged during transit, storage and erection. Contractor shall help BHEL to furnish all the data required by railways, insurance company or their surveyors.

###### **14.2.3**

Contractor shall report to BHEL in writing any damages to equipments/components on receipt, storing, and during drawl of the materials from stores, in transit to site and unloading at place of work and during erection and commissioning. The above report shall be as prescribed by BHEL site management. Any consequential loss arising out of non-compliance of this stipulation will be borne by contractor.

###### **14.2.4**

Contractor shall carry out fabrication of any material lost/damaged as per instructions from BHEL engineer.

###### **14.2.5**

BHEL, however, retains the right to award or not to award to the contractor any of the rectification/rework/repairs of damages and also fabrication of components.

###### **14.2.6**

All the repairs/rectification/rework of damages and fabrication of materials lost, if any, shall be carried out by a separately identifiable gang for certification of man-hours. Daily log sheets should be maintained for each work separately and should be signed by contractor's representative and BHEL engineer. Signing of log sheets does not necessarily mean the acceptance of these as extra works.

#### 14.2.7

All rectification, repairs, rework and fabrication of components lost, which are minor and incidental to erection work (consuming not more than 100 man-hours on each occasion) shall be treated as part of work without any extra cost.

#### 14.2.8

Insurance cover under this policy will generally be as per clauses 2.10.1 to 2.10.4 of General Conditions of Contract unless and otherwise specified differently in the Special Conditions.

#### 14.2.9

In case the loss/damage is not attributable to the contractor, Payments of all extra works on account of repair / rectification / reworks of damages and fabrication of materials lost will be as per provisions of Section-13 of SCC.

#### 14.2.10

In case the repairs/rectification/rework and fabrication of materials lost, the work has been done by more than one agency including the contractor, the payment towards extra charges will be on pro-rata basis and the decision of BHEL in this regard is final and binding on the contractor.

#### 14.2.11

In case of theft / damage / loss of materials due to **repeated/continued instances of negligence/failure** attributable to the contractor, the expenses incurred on account of repair/ replacement of such components including BHEL's overhead expenses as applicable (presently @ 30%) in excess of the amount realized from the underwriters, if any, shall be recovered from the contractor. Recovery will be limited to Normal Deductible Franchise (DF)/Excess as per applicable Insurance (TAC) tariff guidelines for every incidence of loss/damage.

#### 14.2.12

In case any insurance claim does not become tenable due to **willful negligence/** damage/loss attributable to the contractor, the total cost of repair/replacement including BHEL overhead expenses shall be recovered from the contractor.

### 14.3 Insurance by the Contractor and Indemnification of BHEL

#### 14.3.1

BHEL has taken third party liability insurance, indicating in the proposal for such insurance that sub-contractors will be taking part in the erection work detailed in this tender specification. However, the bidder has to bear any expenses/consequences over and above the amount that may be reimbursed to BHEL by such coverage of third party liability insurance taken by BHEL.

Such additional liability will be to cover and indemnify BHEL and its customer of all liabilities which may come up and cause harm/damage to other contractors/customer/BHEL properties/ personnel or all or anybody rendering service to BHEL/ customer or is connected with BHEL/ customer's work in any manner whatsoever. The bidders' specific attention is also invited to clause 2.10 of General Conditions of Contract.

#### 14.3.2

Contractor shall obtain suitable statutory as well as non-statutory insurance policies for all the properties belonging to him and also for his personnel deployed at project for execution of the contract work.

## SECTION-15

### SPECIAL CONDITION OF CONTRACT

#### 15.0 EARNEST MONEY DEPOSIT & SECURITY DEPOSIT

##### 15.1 EARNEST MONEY DEPOSIT:

Earnest Money Deposit for this tender will be Rs. 2,00,000/- (Rupees two lacs only).

One time EMD will also be Rs. 2 lacs.

EMD shall be deposited in cash (as permissible under income tax act), pay order or demand draft (payable at Nagpur in favour of 'Bharat Heavy Electricals Limited') only. **No other form of EMD remittance shall be acceptable to BHEL.**

EMD by the tenderer will be forfeited as per tender documents if

- i) After opening the tender, the tenderer revokes his tender within the validity period or increases his earlier quoted rates.
- ii) The tenderer does not commence the work within the period as per loi / contract. In case the LOI / contract is silent in this regard then within 15 days after award of contract.

EMD shall not carry any interest.

**15.1.3** In the case of unsuccessful bidders, the Earnest Money will be refunded to them after acceptance of tender by successful bidder.

#### 15.2 Security Deposit

15.2.1 Security Deposit should be remitted by the successful tenderer. The rate of security deposit will be as below:

Sn	Contract value	Security deposit amount
1	Up to Rs. 10 lakhs	10% of contract value
2	Above Rs. 10 lakhs upto Rs. 50 lakhs	1 lakh + 7.5% of the contract value exceeding rs. 10 lakhs.
3	Above Rs. 50 lakhs	Rs 4 lakhs + 5% of the contract value exceeding rs. 50 lakhs.

**The Security Deposit shall be remitted before start of the work by the contractor in the manner specified as follows.**

Security Deposit may be furnished in any one of the following forms

- I) Cash (as permissible under the income tax act)
- II) Pay order, demand draft in favour of BHEL.
- III) Local cheques of scheduled banks, subject to realization.
- IV) Securities available from Post Offices such as National Savings Certificates, Kisan Vikas Patras etc.  
(Certificates should be held in the name of contractor furnishing the security and duly pledged in favour of BHEL and discharged on the back).

- V) Bank Guarantee from scheduled banks / public financial institutions as defined in the companies act subject to a **maximum of 50%** of the total security deposit value. The balance 50% has to be remitted either by cash or in the other form of security. The bank guarantee format should have the approval of BHEL.
- VI) Fixed deposit receipt issued by scheduled banks / public financial institutions as defined in the companies act. The FDR should be in the name of the contractor, a/c BHEL, duly discharged on the back.
- VII) Security deposit can also be recovered at the rate of 10% from the running bills. However in such cases at least 50% of the security deposit should be remitted (either by cash/DD or BG **for maximum 50%** of total SD) before start of the work and the balance 50% may be recovered from the running bills.
- VIII) EMD of the successful tenderer, excepting One Time EMD, shall be converted and adjusted against the security deposit or specific request by the contractor.
- IX) The Security Deposit shall not carry any interest.

**Note:** acceptance of security deposit against Sl. No. (IV) and (VI) above will be subject to hypothecation or endorsement on the documents in favour of BHEL. However, BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith.



## APPENDIX –I

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

### **Please Note:**

All the items in general are to be erected and commissioned by the contractor, unless specifically mentioned otherwise.

In such cases where systems are described with component quantities (viz., Vibration monitoring systems, Lube Oil skids, etc., etc.) lump sum 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.

The dimensions and weights mentioned are only approximate. No extra claims will be entertained due to change in dimensions/weight.

### **SI No A-1 to A-4: Control panels**

These are microprocessor based sophisticated electronic control panels in majority. Also includes 6 nos Gravimetric feeder panels, 1 No steam leak detector panel. Weights range from 400 to 1600 Kgs from A1 to A4 respectively.

### **SI No A-5: Electrical heat tracer panel**

Consists of panel (3000x900x2200, 1000Kgs, 2 nos), Power transformer 50KVA (Cast resin dry type, 250 Kgs, 2 nos), electrical heat tracers approx 1500 meters, Power and control JB's (25 nos approx), associated cabling etc.

Lumpsum rate to be quoted

### **SI No A-6: Unit Control panel**

Shipped in one or two sections. Pushbuttons, LEDs, console inserts, vertical indicators, recorders, digital indicators, analog indicators (about 100 nos), LED/PB stations (about 200 nos), etc, are located in these panels in suitable tiles. Alarm annunciation facia (about 70 nos) are also mounted. The individual items may come mounted or loose. Other than what is envisaged for certain items (viz., console inserts) in the rate schedule, no separate charges will be entertained. Erection, calibration (as the case may be) testing and commissioning of analog indicators and LED Pushbutton Stations located in these panels will be considered as a part of Unit control panel Erection and commissioning and no separate payment will be done for the same. Lumpsum price to be quoted.

### **SI No A-7: Electrical Control panel**

Dimension 3094 x 2354 x 1000 in one or two sections.

This panel houses the electrical mimic diagram of the plant and consists of various switches, indicators, semaphore indicators, digital indicators etc., in suitable tiles. The individual items may come mounted or loose. Other than what are envisaged in the rate schedule, no separate charges will be entertained. Lumpsum price to be quoted.

### **SI No A-10 and A11 : UPS, Battery, ACDB etc**

Both 415V UPS and 110V UPS is to be considered. Parallel Redundant UPS Power supply system with isolation transformer, inverter and SCVS, consisting of UPS panels, Oil cooled variac (app 250 Kg without oil), AC distribution boards, Battery of HDP tubular 550/600AH cells and charger. Scope includes laying and termination of copper / aluminium cable between the panels, battery banks etc

Erection supervision and commissioning in the scope of the supplier. Contractor to provide erection and commissioning support only. Lumpsum rate per set is to be quoted.

**SI No A-11: Vibration monitoring system for Fans and Blowers, Pump:**

The scope covers installation of equipment, integration of system, commissioning assistance etc. including drilling and tapping, welding of pads, etc. Vibration Monitoring System (VMS) for Fans , Blowers, Pumps etc consists of the following (approximate quantities):

3 Nos. of VMS Remote Cabinets, each of size 800 x 800 x 2415 mm and weight 500 kg.

72 Nos. of horizontal/ vertical velocity type pick ups with proximeters, 10 Mtr long pigtail noise proof cable and conduit upto local JB

16 Nos. of local junction boxes

Key phasor probes 9 nos

Mounting accessories etc.

Erection supervision and commissioning is in the scope of the supplier of the vibration monitoring system. Lumpsum rate to be quoted

**SI No A-12: Vibration Monitoring system for Main turbine per unit**

Vibration analysis system for Main turbine: 1 panel (122x800x1000 1000kg), 1 PC, 35 probes, 25 proximeters, 10 JB's, 2000m triad cable approx, for measurement of bearing vibration, shaft vibration, axial shift, differential expansion, speed, etc. Erection supervision and commissioning is by the supplier of the Vibration Monitoring system. Lumpsum rate per set is to be quoted.

**SI No A-14: DC motor starter box for scanner fan**

DC starter box for scanner fan dimension approx 900 x 1120 x 375 weight approx 100 KG.

**SI No A-17: Air Heater Rotor stoppage box**

Rotor Stoppage Alarm Box- including sensors (magnetic switch), timer relays, interconnecting cables etc. Lumpsum rate per set is to be quoted.

**SI No A-18: Condenser Vacuum Pump (CVP) system**

Removal, calibration and commissioning of CVP skid mounted instruments including CVP PLC and motor mounted on the skid. The approximate quantity of skid-mounted instruments shall be

Pressure Indicators – 2

Flow Switches – 2

Level Switches – 2

Pressure/DP – 3

Temp. Indicators – 2

Flow Indicators – 1

Lumpsum rate per set is to be quoted.

**SI No A-19 and A-20: LIRs and LIEs**

Local instrument racks are open type housing for field instruments. These have to be located in suitable places, impulse piping and cabling to be done. Number of instruments in each LIR will vary.

Local instrument enclosures are closed type housing for field instruments. These have to be located in suitable places, impulse piping and cabling to be done. Number of instruments in each LIE will vary.

Types of LIEs and LIRs with dimensions (in mms.). :

LIE - A+type 1850 x 800 x 2300

LIE - A type 1650 x 800 x 2300

LIE - B type 1300 x 800 x 2300

LIR - A type 1850 x 400 x 2200

LIR - B type 1350 x 400 x 2200

LIR - C type 1000 x 400 x 1500

**SI No A-21: Network panels**

These panels are used basically for housing Ethernet switches, which are to be wired up with various other max stations. Networking with remote PLCs such as CW / CT plant, FOPH, RAW water plant, Coal handling plant, DM Plant is envisaged. System interface network panels also house computer CPUs, monitors, etc

**SI No A-23: HART Management system**

Consists of panel (1200 x 800 x 2415) approx weight 500 Kgs. Also consists of PC, printer, Hart communicators for field use, etc. Erection supervision and commissioning is in the scope of the supplier. The Contractor to provide erection and commissioning support only.

**SI No A-26: Electronic water level indicator (EWLI)**

2 nos Electronic Water Level Indicator EWLI comprises of the following:

1 No. 16 Port pressure vessel & 1 No. 8 port pressure vessel with loose supplied electrodes (24 nos)

2 Nos. of Ascetor Units (Local) with Display, each of dimension: 600 x 350 x 600 mm; Weight: 25 kg each

2 Nos. of Remote Display Unit (100 x 90 x 234 mm)

Interconnecting cables between local panel and 24 electrodes (included in cabling BOM)

Display units (2 nos) to be mounted in backup desk

2 nos Electronic level detector in TG side consists of capacitance type probes, amplifier units etc.

Lumpsum rate per set is to be quoted.

**SI No A-28 to A-36: SWAS system**

The scope of work includes all equipments including recorders etc, which may be fitted in any of the panels.

SI No A-37: Furnace temperature probes

Consist of Type K thermocouple, advance/retract/park mechanism with limit switch tripping, pressure switch, solenoid valve, local pushbutton cum control box , remote control station at control room, etc. The temperature probes will be erected by mechanical agency. The local control box (800x800x400, 75 Kgs) shall be erected by the contractor.

Lumpsum rate per set is to be quoted.

**SI No A-39: Master and slave clock system**

This equipment consists of one control panel (900 x 600 x 2415) housing power supplies, clock modules etc. GPS antenna is also to be suitably located and cabled up under this scope. About 20 nos slave clocks will have to be installed at various locations throughout the plant. Commissioning supervision will be provided by the supplier of Master clock system.

**SI No B-1: Direct water level gauge**

Direct Water Level Gauge commissioning (consisting of illuminator assembly, fibre port system illuminator, transformer, lights, etc.). Lumpsum rate per set is to be quoted.

**SI No B-3: HEA Exciter System**

H.E.A. Excitor box along with retractor assembly, flexible spark rod, spark tip, flexible HT cable assembly, S.S. Hose (1 Mtr long, 6.35 mm ID), Air Filter Regulator, HEA Exciter transformer, limit switches etc. Lumpsum rate per set is to be quoted.

Bharat Heavy Electricals Ltd, PSWR, Nagpur

Tender Specification No : BHE/PW/PUR/SLT-CNI/556

**SI No B-4: Flame Scanner head assembly**

It includes erection of fibre optic cable of length 120", Lens Barrel Assembly, Miniature 6 way Junction Box etc. Lumpsum rate per set is to be quoted.

**SI No B-10: LVS**

Other than the LVS (67" diagonal) mentioned in the rate schedule, accessories like video switches, associated cabling (prefab and otherwise) etc are also included.

There are also 6 nos PCs for LVS control. Payment for these will be as per rates for PCs quoted elsewhere in the rate schedule.

LVS erection supervision and commissioning is in scope of other agency (supplier)

❖ SI No C-1: Console inserts

- Console inserts are to be mounted on the Backup desk. The console inserts consist of moving coil indicator modules, LED modules, pushbutton modules, blank plates, etc., which may or may not come assembled. No separate rates are payable for the individual components erection, testing and commissioning. However, cabling and termination will be paid as per rates for cables.

❖ SI No D-1: Fan Lube oil skid

The scope of work includes removal of instruments, calibration, refixing, checking cable connection from JB to instruments, motor connection, meggering and improving IR value of motor etc. and commissioning the skid

Lumpsum rate per set is to be quoted.

❖ SI No D-2: Rack mounted Instruments commissioning

Involves removal, calibration and refixing of rack mounted instruments, checking solenoid valves, drives, including wiring on the rack etc.

- LP Bypass rack –1 set consisting of
  - ♦ Pressure Gauges: 11 Nos, Pressure Switches: 1 Nos
- EHG Rack –1 set consisting of
  - ♦ Pressure Gauges: 10 Nos, Pressure Switches: 4 Nos
- Supply Unit Racks for HPV-1, HPV-2, IPV-1&2 - 1 set consisting of
  - ♦ Pressure Gauges: 17 Nos, Pressure/DP Switches: 15 Nos

Lumpsum rate per set is to be quoted.

❖ SI No D-6: ERV Controller

The controller box to be erected near the ERV and impulse piping to be done. It has 220V DC rated pressure switches inside which are to be calibrated. Dimension: 350 x 290 x 180 mm; weight: 5 kg each. Remote console is to be mounted at control room backup desk. Lumpsum rate per set is to be quoted.

❖ SI No F-1 to F-4: Assembly of JB mounting frames:

Galvanised members will be supplied. These are to be assembled as per drawings. Some frames are suitable for one side JB mounting and others are suitable for JB mounting on both sides. Rate quoted should include assembly and installation.

❖ SI No F-33: Plant Control Desk

- To be erected in the PCR (Plant Control Room).
- This consists of seven computer tables (app dim 1200x1400x1000), integrated into a single curved Operator control desk. Relevant CPUs will be housed inside.

Lumpsum rate to be quoted.

❖ SI No F-34: Computer furniture 9lumpsum rate to be quoted)

- Computer table 10 nos, printer tables 10 nos, chairs 18 nos approx.
- The furniture will be delivered in knocked down condition and will have to be assembled at site by contractor.

## Appendix-IIA

List of **T&P** to be made available **by BHEL** free of hire charges (on sharing basis).

01	EOT crane in TG hall shall be made available on sharing basis for handling panels	1 no
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**Note:**

Above T&P will be provided for specific erection/commissioning activities wherein these equipment will be required. While taking delivery, contractor shall check for proper working of the equipment and the same shall be returned after the work is completed to BHEL stores in good working condition subject to normal wear and tear.

While all effort 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-II B**

### **CONSUMABLES/ITEMS TO BE PROVIDED BY BHEL FREE OF CHARGE**

01) CABLE GLANDS

02) LUGS BEYOND 4 sq. mm. SIZE.

## APPENDIX-III A

### List of major testing & measuring instrument/ tools and tackles to be arranged/ brought by contractor.

Sl. No.	Description	Quantity
<b>I. Instruments</b>		
01	Dead weight tester rated 400 Kg/cm <sup>2</sup> and with weights and test gauge facility. Make 'Budenberg or 'Ravika'	1 no.
02	Oil temperature bath suitable to calibrate the instruments range 0 – 200 deg. C with standard temperature gauges and thermostatic control	2 nos.
03	Muffle furnace – 800 deg. C with standard temperature gauges	1 no.
04	Standard gauges 12" dial size make "Budenberg" or "H Guru" or "Odin"	
	A) – 1-0 kg/cm <sup>2</sup> pressure gauge(vacuum gauge)	1 no.
	B) 0 – 5 or 6 kg/cm <sup>2</sup> pressure gauge	1 no.
	C) 0 – 10 kg/cm <sup>2</sup> – do –	1 no.
	D) 0 – 25 kg/cm <sup>2</sup> – do –	1 no.
	E) 0 – 60 kg/cm <sup>2</sup> – do –	1 no.
	F) 0 – 100 kg/cm <sup>2</sup> –do –	1 no.
	G) 0 – 250 kg/cm <sup>2</sup> – do –	1 no.
	H) 0 – 600 kg/cm <sup>2</sup> – do –	1 no.
	I) 0.2 to 1 kg -- do --	1 no.
05	Manometers (+/-) 1000 mm water column With hand bulb for lab and small manometers for field purpose.	2 nos.
06	Manometer (+/-) 500mm mercury column with hand bulb for lab and small manometer for field purpose.	1 no.
07	Inclined manometer (+/-) 300 mm water column	1 no.
08	Portable air compressor with drier and regulator make "Toshniwal" / "Khosla" rated for 7 to 10 kg/cm <sup>2</sup>	2 nos.
07	Soldering iron "Soldron" make 25 watt	3 nos.
09	Vacuum pump	1 no.
10	Multimeters	
A)	Digital, 3 1/2 digit Motwane/HIL/Fluke	10 nos
B)	Analog: Motwane make	2 nos.
C)	Digital, 4 1/2 digit Motwane/HIL/Fluke	2 nos.
11	Standard milliamps / millivolts source of reputed make. Range 0 to 50 ma and 0 to 100 mv	2 nos.
12	Insulation tester hand operated 250V / 500V / 1000V rated mains/battery operated	1 no. Each
13	DC power supply 0-50 VDC, 5 A make "Aplab" or equivalent (variable source)	2 nos
14	Single phase variac 250 V, 8 amp	1 no
15	3 phase variac rating 5 amps	1 no.

Sl. No.	Description	Quantity
16	Glass thermometer 0-120 deg. C, 0-200 deg.c and 0-600 deg.c	1 no. Each
17	Tong tester AC 5/10 and 25/60/300 amp of reputed make	1 no. Each
18	Tong tester DC 30/60/300 amp	1 no.
19	Secondary current injection kit upto 300 amp	1 no.
20	Tarpaulin fire proof	10 nos.
21	DC shunt 400 amp 75 mv	1 no.
22	Tachometer non-contact type 0 to 4000 rpm	1 no.
23	Industrial type vacuum cleaner	1 no.
24	RTD/Pt 100 source	2 nos.
25	Decade resistance box	2 sets.
26	Teletalk 2 wire system	6 sets
27	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.

Sl. No.	Description	Quantity
<b>II. Handling equipment</b>		
1	Turn buckles	As per reqmt
2	D-shackles	
3	Steel wire ropes	
4	Manila ropes	
5	Chain pulley block/turfer	
<b>III. Major T&amp;P</b>		
1	Pipe bending machine – 2” size	3 nos
2	Grinding machine	6 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	Die sets for threading upto 2” pipe.	2 nos
6	Spirit level	2 nos.
7	Tap sets for both BSP and NPT threads upto 1” each	1 set each
8	Measuring instruments like micrometers and callipers	1 set each
9	Welding generators	4 nos.
10	Welding transformer	4 nos.
11	TIG welding set	2 no.
12	Mechanical tool kit for fitters	6 sets.
13	Electrician tool kit including spanners, allen keys, etc	8 sets.



Sl. No.	Description	Quantity
14	Crimping tool	4 nos.
15	Flood light fittings	8 nos.
16	Fire extinguishers as required	1 set.
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 AC transformer & hand lamps	8 nos.
22	Ferrule printing machine	2 nos
23	Electrode drying ovens	As required
24	Personal computer and accessories, Printer	1 set

**Note:**

The list of instruments / equipments to be brought by the contractor as shown above is only indicative. Any other instruments / equipments required for the execution of the work is to be necessarily arranged by the contractor. The testing/calibration instruments which are used to be duly calibrated in the interval prescribed by BHEL engineer from the BHEL approved agencies. And test certificate to be furnished.

## Appendix-IIIB

The following materials/consumables are to be arranged by the contractor for erection and commissioning as part of the scope.

SN	Description
01.	Welding electrodes for welding AS/CS/SS pipe and other welding from BHEL approved vendors only
02.	Filler wire for argon welding
03.	Argon, oxygen and acetylene gas
04.	Provision for temporary scaffoldings.
05.	GI "U" clamps with nuts and washers for impulse and GI pipe clamping.
06.	Round aluminium tags (30mm dia x 3mm thick)
07.	Teflon tape and insulation tape.
08.	Hold tight / bitumen tape for GI pipe coupling.
09.	Required paints and primer from BHEL approved vendors only.
10.	Solder wire (60/40)
11.	Protocol/calibration report sheets as per BHEL format.
12.	Panel/JB sealing compound material (for cable entry from bottom/top of panel).
13.	PVC cable tie, aluminium strip and hardware for clamping of cables, copper tube, temperature gauge capillary.
14.	Copper lugs upto 4 sqmm, PVC sleeve of different size, PVC button & tape
15.	Ferrules (PVC) and ferrules suitable for ferrule printing
16.	Paints, primers consumables as required

PI note: The above list is only indicative. The contractor shall arrange consumables as required as per scope of contract.

## Appendix-IVA

**Month wise manpower deployment (number to be indicated category-wise in each month) by the Contractor .**

S.N.	Category	Months																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
01.	Resident manager																		
02.	Engineers																		
03.	Supervisors																		
04.	J) Mechanical K) Electrical L) Instrumentation D) Industrial relation/safety																		
05.	Riggers																		
06.	Fitters																		
07.	Cable jointers																		
08.	Struct. Welders																		
09.	Tig welders																		
10.	Electricians																		
11.	Instrument technicians																		
12.	Store keeper																		
13.	Semiskilled & unskilled workers																		
14.	Watchmen/security																		

Note:

01. Minimum number of persons to be indicated monthwise.
02. Above deployment plan will be discussed prior to award of work and necessary changes will have to be made by contractor as per discussion, if required. Any additional deployment required during execution of work will have to be made by contractor for meeting various schedules/targets set by BHEL without any additional compensation.

Date:

Signature of bidder with seal

## Appendix-IVB

Deployment plan for major tools and plants/instruments (monthwise quantity to be indicated for each category) by the contractor.

SN	Category	MONTHS																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
01	Welding generators																		
02	Welding transformer																		
03	Tig welding sets (air cooled)																		
04	Standard MA/MV source																		
05	Low pressure calibrator																		
06	Pipe bending machine																		
07	Grinding machines																		
08	Drilling machines 1/4", 1/2", 3/4", 1"																		
09	Dead weight tester																		
10	Oil temperature bath																		
11	Furnace 600 deg.c																		
12	Standard gauges 12" dia size																		
13	Manometers																		
14	Portable air compressor																		
15	Portable vacuum cleaner																		

**Note:**

Also, the list of other tools and plants to be deployed for this project may be indicated by the tenderers separately Above deployment plan will be discussed prior to award of work and necessary changes will have to be made by contractor as per discussion, if required. Any additional deployment required during execution of work will have to be made by contractor for meeting various schedules/targets set by BHEL without any additional compensation.

Date:

Signature of Bidders with seal

## Appendix-V

### Analysis of unit rate quoted

Sl. No.	Description	Percentage of unit rate quoted	Remarks if any
01	Site facilities viz., electricity, water, workshop and other infrastructure.		
02	Salary & wages		
03	Consumables		
04	Depreciation & maintenance for t&p/instruments and other items		
05	Establishment & administration expenses of site		
06	Retrenchment benefit		
07	Extra work incidental to erection		
08	Overheads		
09	Profit		
<b>Total</b>		<b>100%</b>	

Signature of the tenderer with seal

## APPENDIX-VI

### DETAILS OF SIMILAR WORK DONE DURING THE LAST SEVEN YEARS

BIDDERS SHALL ENCLOSE COPIES OF DETAILED WORK ORDER (GIVING BILL OF QUANTITIES AND SCOPE OF WORK) AND COMPLETION CERTIFICATE IN SUPPORT OF THIS STATEMENT.

SL. NO	FULL POSTAL ADDRESS OF CLIENT & NAME OF OFFICER IN CHARGE	DESCRIPTION OF WORK	VALUE OF CONTRACT	DATE OF AWARD OF WORK	DATE OF COMMENCEMENT OF WORK	ACTUAL COMPLETION TIME (MONTHS)	DATE OF ACTUAL COMPLETION OF WORK	REMARKS
1								
2								
3								
4								
5								

DATE

SIGNATURE OF TENDERER WITH SEAL

Bharat Heavy Electricals Ltd, PSWR, Nagpur

Tender Specification No : BHE/PW/PUR/SLT-CNI/556

Part-I: Technical Bid Specifications

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## APPENDIX –VII

### CURRENT COMMITMENTS OF THE TENDERER

SN	FULL POSTAL ADDRESS OF CLINT & NAME OF OFFICER IN CHARGE	DESCRIPTION OF WORK	VALUE OF CONTRACT	DATE OF COMMENCEMENT OF WORK	SCHEDULE OF COMPLETION	% OF WORK COMPLETED AS ON DATE	EXPECTED DATE OF COMPLETION	REMARKS
1								
2								
3								
4								
5								
6								

DATE

SIGNATURE OF TENDERER WITH SEAL

SIGNATURE OF TENDERER WITH SEAL

Bharat Heavy Electricals Ltd, PSWR, Nagpur  
Tender Specification No : BHE/PW/PUR/SLT-CNI/556  
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