

# BHARAT HEAVY ELECTRICALS LIMITED

HIGH PRESSURE BOILER PLANT, TIRUCHIRAPPALLI 620014.

CONTROLS AND INSTRUMENTATION/ FB



TECHNICAL SPECIFICATION OF

**ACOUSTIC PYROMETER**

FOR

NEYVELI NEW THERMAL POWER PROJECT(NNTPP)

2X500MW LIGNITE FIRED UNITS AT NEYVELI

REF: CI: 0683:AP:NLC

| REV NO. | DATE     | DESCRIPTION     | PREPARED<br>S RAJESWARI | CHECKED<br>M V RAMANA | APPROVED<br>A K PANDA |
|---------|----------|-----------------|-------------------------|-----------------------|-----------------------|
| 00      | 27.11.17 | INITIAL RELEASE | <i>S. Rajeswari</i>     | <i>Ramana</i>         | <i>A K Panda</i>      |

## 1.0 GENERAL INSTRUCTION:

The specification covers briefly the requirement of Acoustic Pyrometer.

Nothing in this specification shall be construed to relieve the vendor from his responsibility. It is the responsibility of the vendor to take care of other basic and essential requirements for the offered system.

In the event of order, the entire specification will form part of purchase order for compliance during execution.

## 2.0 PRE-QUALIFICATION REQUIREMENT

The offered system shall be of proven design and shall be in successful operation for a period of 1 year in any utility boiler.

Vendor to provide performance certificates / authentication letters in favour of OEM from any end user certifying the same.

Vendor to arrange for a site visit for a BHEL Engineer anywhere in India where it has erected/commissioned a similar system.

## 3.0 SCOPE OF SUPPLY AND WORK

The scope of work includes design, engineering, manufacturing, fabrication, assembly, painting, inspection, Factory Acceptance Test, packing, supply, integrating the system at Project site (along with loose components / modules in case of loose supply of the same) with the supplied system peripherals, Erection, Commissioning (inclusive of Travel fares & accommodation of the engineers/ technicians), carrying out Site Acceptance Test and proving the performance of the system. The system shall fully comply with this specification for meeting the entire functional and operational requirement.

The scope of supply and work includes, but not limited to the following:

- a. Acoustic Trans-receivers along with all accessories to determine the average flue gas temperatures and complete flue gas temperature profile based on proven technology shall be provided **at Furnace Exit plane (8 no.) and Economizer outlet plane (8 no.) per Boiler /Steam Generator**
- b. To Mount Acoustic Trans receivers (Sensors) 170mm diameter opening will be provided 4 No. on Right side and 4 No. on Left side of the Boiler/Steam Generator at elevation 75910mm (Furnace Exit Plane -FEP) and 109900 (Economiser Outlet Plane-EOP). Vendor shall consider 25meter cable length from Sensor to field JB and 250-meter cable length from Field JB to CER (Control Equipment Room) approx.
- c. The input power supply source of 230VAC, Single phase, 50 Hz at single point (control Room) will be provided. Further distribution of power is in vendor scope. Vendor shall indicate the power required (in wattage) for the system. Instrument air will be provided at single point near each plane with 2 inch tapping. Further distribution of air is in vendor scope.
- d. Any modifications required for installing vendor's equipment in the existing to be in vendor's scope.



- e. Necessary control cabinet, isolation valves, solenoid valves, root valves, piping, tubing, instruments, hoses, Junction boxes and erection material for field JB etc. as required shall be provided by the vendor.
- f. Vendor shall supply all the necessary hardware, cables, cable gland and connectors for the subject package & associated system in their scope. This includes supply of all power cables (for internal distribution), All required interconnecting cables from sensor to field cabinet, field cabinet to control cabinet and control cabinet to DCS.
- g. Each temperature measurement plane/section shall have its own independent signal processor unit (server if applicable), PC based complete system with all required software and interface unit along with all accessories etc.
- h. Vendor shall also include in his proposal and shall furnish all equipment, devices and services which may not be specifically stated in the specification but are needed for completeness of the equipment/systems furnished by the vendor and for meeting the intent and requirements of the specification.
- i. This work shall be consistent with modern power plant practices and shall be in compliance with all applicable codes, standards, guides, statutory regulations and safety requirements in force.
- j. If any up-gradation of the offered system is envisaged before completion of the job to meet the specified requirements, the same shall be incorporated in the system, with the approval of the Purchaser (BHEL) without any additional cost.
- k. Proving and fulfilling the functional requirements of the system solely rests with the vendor.
- l. Authorization-to-ship-test (ATST) or Factory Acceptance Test (FAT) to be carried out in vendor works shall include all required tests to fully demonstrate to BHEL's satisfaction that each equipment/sub-system/system as well as software modules furnished as per this specification fully meets the functional requirements of this specification and BHEL approved drawings/documents/test procedures.
- m. Commissioning Spares required for successful commissioning and handing over of the system shall be included in the offer.
- n. The Complete responsibility of erection and commissioning of the system lies with the vendor.
- o. Any spare parts / items required for the system during commissioning shall be provided by the vendor. Vendor's engineer shall bring adequate spares for commissioning of the system and non-availability of any item shall not hold up the progress of commissioning of the system in any way. Vendor shall also furnish list of spares required for successful commissioning of the system.
- p. After Commissioning of the system, Vendor's Engineer shall get the Final Acceptance Protocols signed by the BHEL's site Engineer and furnish the signed copies to BHEL Trichy. Without this document, Vendor's responsibility for completion of the system and handing it over to Owner is not deemed to have been completed. Charges for vendor's visit to site towards commissioning and handing over of the system shall be included in the PO. This shall be valid for the entire period of the contract.



## 4.0 FUNCTIONAL REQUIREMENTS

### 4.1 System requirements

- a. Acoustic pyrometers shall determine the average flue gas temperatures and complete flue gas temperature profile at the required plane with **minimum 8 no.s of trans-receivers per plane**.
- b. The measuring range should be sufficient to cover the entire regime of boiler operation and shall not be less than 1900°C. The mean temperature and profile temperature accuracy shall be  $\pm 2\%$ , &  $\pm 4\%$  of reading respectively or better. The system should provide 4-20mA DC (measuring range) for each path and the same shall be connected to plant DCS.
- c. A temperature profile should be determined and displayed in a full colour display unit by analysing the mean temperature across every transit section using deconvolution technique. The time interval for a complete cycle to take readings from eight transceivers should be less than one minute.
- d. The system shall be able to eliminate the varying high noise environment both in and out of an operating boiler.

### 4.2 HMI

- a. Each temperature measurement plane/section shall have its own independent signal processor unit (server if applicable), PC based complete system with all required software and interface unit along with accessories etc. All software & interface hardware required for presenting visual information on real time or historical gas temperatures including spatial temperature distribution profiles individual path temperatures, temperature trends & average gas temperature within defined area.
- b. The HMI shall consist of an Industrial grade PC (Latest Intel processor i7 or better), 21" Colour monitor, 500 GB hard disk, CD/DVD drive, I/O cards, key board, mouse and printer interfaces. The PC shall have effective protection from malware, virus, etc. by using state-of-art software. The Operating System, Application Software, Anti-virus software etc. shall have a full license and there shall be no recurring costs towards the software for upgrade or repair installations.
- c. Detailed specification of the HMI system shall be furnished along with the offer.

### 4.3 Junction box / Panel.

- a. All system modules, power supply components, other control devices (except field mounted sensors/transmitters) which are required for completeness of the system shall be housed in Panel and the same shall be mounted in CER. Vendor to furnish the dimensional details of JB/Panel.
- b. Vendor shall furnish the internal layouts of CER JB's/Panel and field JB's wiring terminal details.
- c. The installation work at project site for field JB's should involve mounting JB to column and cable interconnections.



- d. Field JB's shall be totally enclosed with IP 65 constructed with minimum 2mm thick stainless steel suitable for wall/column/structure mounting.
- e. CER Panel shall be totally enclosed with IP 44 constructed with minimum 2mm thick CRCA Steel suitable for wall/floor mount (if floor mount panel height shall be 2200mm + plinth 100mm+ anti vibration pad 15mm) Exterior colour: RAL7035 and Interior colour: Brilliant white.
- f. CER Panel door latches shall be of three-point type to assure tight closing with locking, lighting and lifting arrangement.
- g. Foundation bolts (if floor mount)/Wall mount accessories (if wall mount), double compression weather proof type cable glands for cables, cable lugs shall be supplied along with panel as loose supply items. This shall be listed separately in the packing list.

#### **4.4 Cable**

- a. Field cables shall be Galvanised steel wire armoured type confirming to IS-3975, IS1554.

#### **5.0 SPECIAL INSTRUCTIONS:**

- a. Vendor shall make visits to BHEL-Trichy for detailed engineering/discussion.
- b. Vendor to supply the O & M manual.
- c. The entire system shall not contain any asbestos material.

#### **6.0 TRAINING**

- a. Training on the entire Software and Hardware of the offered Acoustic Pyrometer shall be provided for a period not less than 5 man-days. Vendor shall clearly indicate the Training Schedule and Course contents for the above duration indicated, covering all the special components of the System, Application Software, System Software, Programming, and special care to be taken care during Erection of the system.

#### **7.0 DOCUMENTATION**

Following document shall be submitted along with the offer

- a. Filled in technical datasheets, Schematic wiring drawing, general arrangement & Internal General Arrangement drawing of control panels. Signal exchange scheme with DDCMIS etc.
- b. Detailed system description/configuration/arrangement drawing, operational write-up with working principles, bill of materials, drawings, datasheets, information, technical catalogues, test certificates, material certificate, guarantee certificate, calibration certificate and other detail as required to fully establish the capability and performance of the equipment and systems offered.
- c. Complete BOM for the offered system. The BOM submitted shall contain the make, model number, rating of the item. The import and indigenous content shall be indicated in the offer.



- d. Power requirements, Air requirements (in Nm<sup>3</sup>/hr), details of accessories etc. required to establish product quality and scope of supply.
- e. Bill of materials for special cable and cable accessories (if any).
- f. Filled in "Deviation format" with reason / justification for the deviations taken.
- g. Separate offer for recommended spares for two years Operation and Maintenance which shall be valid throughout the contract period.
- h. List of Commissioning Spares required for successful commissioning.
- i. List of reference of similar system already in service.
- j. All other documents not specifically mentioned here but required for completion of engineering work and proper coordination shall be unit wise.
- k. Procedure for Factory acceptance test and Site acceptance test for purchaser's (BHEL) approval.
- l. Training schedule and course content.

**Offer without the above documents will be considered as incomplete / non-responsive and liable for rejection.**

**Following documents shall be submitted after PO.**

- a. Vendor shall furnish a detailed list of documents along with the schedule for ~~submission, after Letter of Intent (LOI) is awarded. This list shall be furnished along~~ with the offer.
- b. System OGA drawing, Bill of materials with make, model nos. and applicable literature/catalogues have to be furnished within 2 weeks from the date of LOI for Purchaser's (BHEL) Approval. All drawings for approval shall be submitted.
- c. All final documents like GA drawing, data sheets of all components, internal arrangement drawings etc., shall be submitted.
- d. After commissioning, if submitted drawings undergo any change, the same shall be revised suitably. The revised drawings referred to as 'AS BUILT' drawings shall be submitted.

**O&M Manuals:**

- a. 2 sets of Operation & Maintenance manuals in softcopy shall be submitted.
- b. The O&M manuals shall be with sufficient detail to enable the user to maintain, dismantle, reassemble and adjust all parts of the equipment. Step by step procedure for all operations likely to be carried out during the life of the equipment including erection, testing, commissioning, operation, maintenance, dismantling and repair.
- c. The O&M manual shall be specifically compiled for this project.

***The O&M manual shall contain complete details about the system including the following:***

- a. Each manual shall include a complete set of approved drawings together with performance/ rating curves of the equipment and test certificates wherever applicable. Operations and maintenance procedures separately for each equipment.
- b. Relevant catalogues of all the modules / components used in the system
- c. Complete spare parts list, including ordering procedure and complete address of spare part supplier(s).
- d. Storage instruction of components.
- e. Do's and Don'ts
- f. Testing and troubleshooting instructions.
- g. Programming manuals

#### **8.0 QUALITY ASSURANCE PROGRAM, INSPECTION**

a. Quality Plan:

- The vendor shall submit the vendor quality plan along with offer for BHEL approval. The same shall be followed.

b. Inspection:

- The complete system has to be offered for inspection by BHEL (wherever applicable) and the vendor shall give 30 days' advance notice for arranging the inspection after the system is fully tested and ready.
- After Inspection, the equipment can be despatched only after obtaining the MDCC from customer. No material shall be despatched without MDCC.

#### **9.0 PACKING:**

- a. The system should be packed with sea worthy packing.
- b. Vendor shall be solely responsible for packing and marking of CARGO with respect to handling, transport, and storage at plant site. Vendor shall be fully liable for proper, sufficient and adequate packing, completeness of contents, protection of contents for a storage time of minimum 2 years, and correct preparation of the packing list. All damage and costs whatsoever resulting from inadequate or insufficient packing shall be fully charged to vendor.
- c. Packing and conservation of goods shall be sufficient to protect them from damage during transit from point of manufacturer and storage at job SITE under conditions which may involve multiple handling, extended storage, exposure to moisture and the possibility of pilferage.



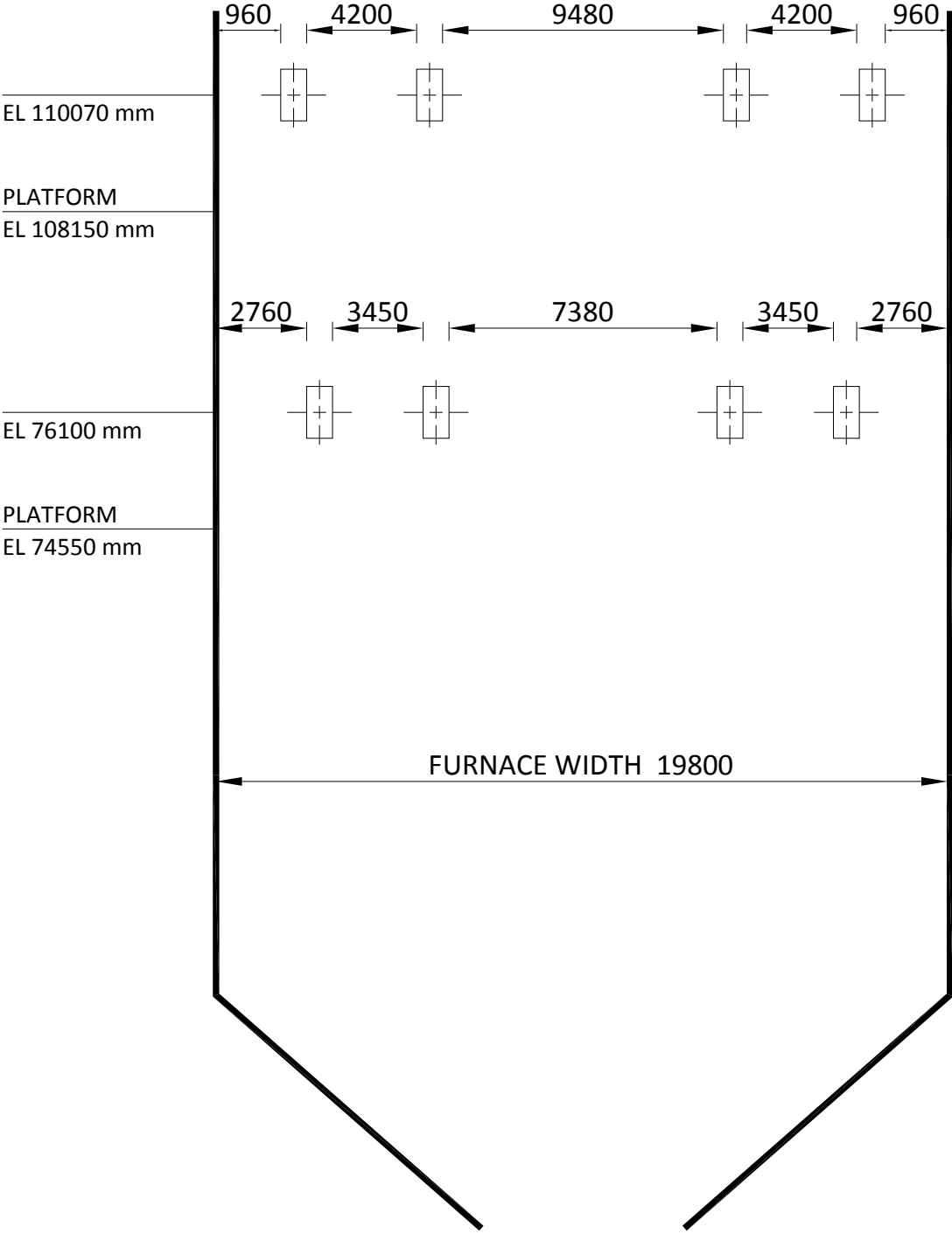
**ANNEXURE-A:**

| Sl.No | Description                        | Elevation<br>(mm) | Quantity<br>Nos.       |                        | Flue Gas Temperature |
|-------|------------------------------------|-------------------|------------------------|------------------------|----------------------|
| 1     | Plane -1<br>Below Superheater zone | 75910             | 4 No<br>(Boiler Left ) | 4 No<br>(Boiler Right) | Max Temp: 1200°C     |
| 2     | Plane -2<br>Above Economizer zone  | 110070            | 4 No<br>(Boiler Left ) | 4 No<br>(Boiler Right) | Max Temp: 410 °C     |

- Furnace Width: 19800mm
- Furnace depth: 19800mm
- Furnace opening to mount Acoustic pyrometer sensor diameter: 170mm



ANNEXURE - B



EL 110070 mm

PLATFORM  
EL 108150 mm

EL 76100 mm

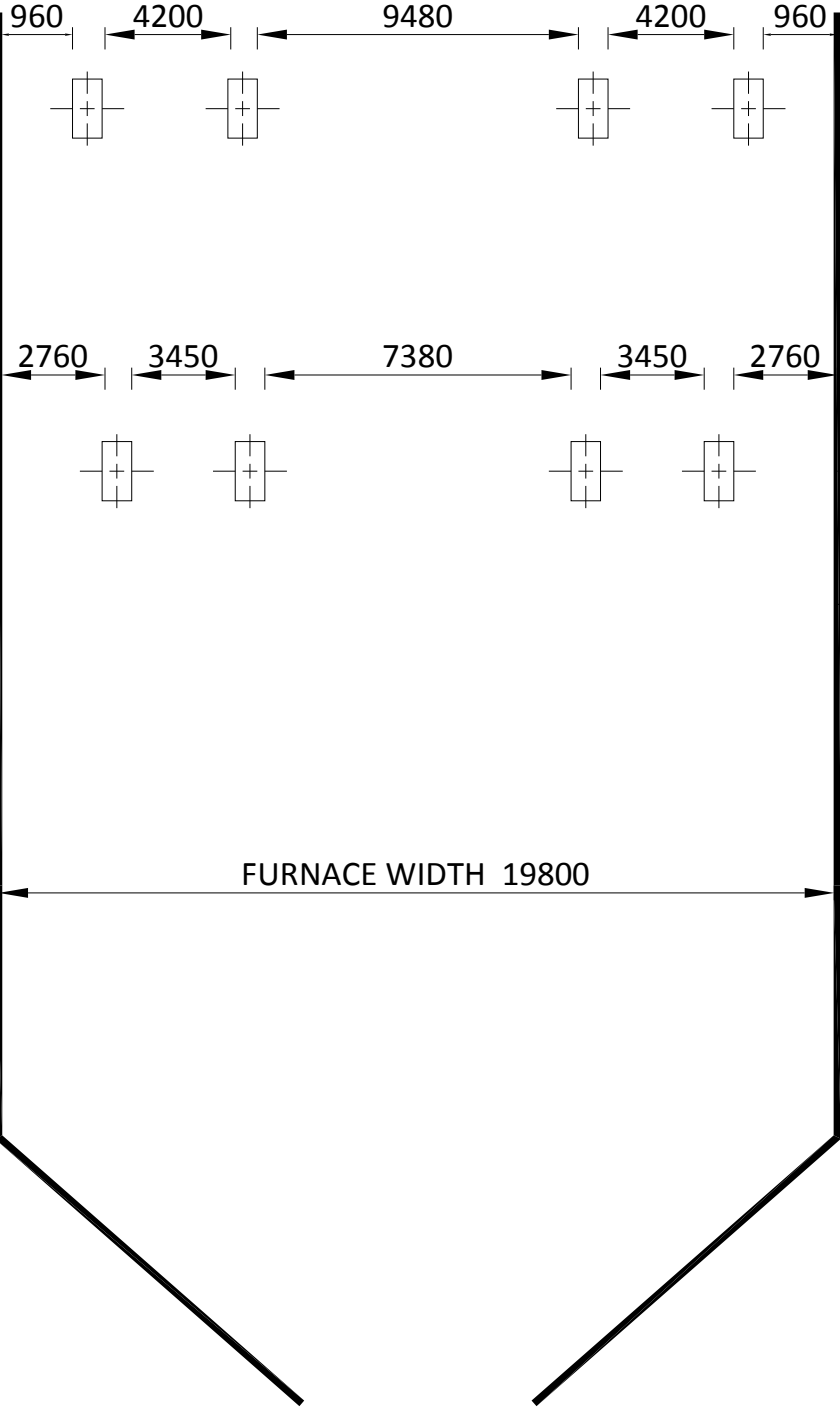
PLATFORM  
EL 74550 mm

FURNACE WIDTH 19800

RIGHT SIDE WALL SEEN FROM OUTSIDE

ECONOMISER PLANE

ECONOMISER PLANE



EL 110070 mm

PLATFORM  
EL 108150 mm

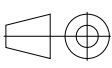
EL 76100 mm

PLATFORM  
EL 74550 mm

FURNACE WIDTH 19800

LEFT SIDE WALL SEEN FROM OUTSIDE

 - ACOUSTIC PYROMETER OPENING

|     |      |              |                                                                                                                                                            |                                                |                           |                                                                                       |                                   |                                                                                                    |                  |              |
|-----|------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|---------------------------|---------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------|------------------|--------------|
|     |      |              | <div><div>बी एच ई एल</div><div></div><div>TIRUCHIRAPPALLI</div></div> | NEYVELI LIGNITE CORPORATION LIMITED            |                           | DRN.                                                                                  | NAME<br>A.ThambuRaj               | SIGNATURE<br> | DATE<br>23-12-17 | SCALE<br>NTS |
| REV | DATE | ALTERED :    | NEYVELI NEW THERMAL POWER PROJECT ( N N T P P )                                                                                                            |                                                | CHD.                      | M.Venkataramana                                                                       |                                   | 06-01-18                                                                                           |                  |              |
|     |      | CHD./APPD. : | 2 x 500 MW LIGNITE FIRED UNITS, Customer No. 0683 & 0684                                                                                                   |                                                | APPD.                     | A.K.Panda                                                                             |                                   | 06-01-18                                                                                           |                  |              |
|     |      |              | DEPT. : C & I                                                                                                                                              | TITLE<br><br>LOCATION OF<br>ACOUSTIC PYROMETER | SHEET<br>NO.<br><br>01/01 |  | DRAWING NO:<br><br>3-97-584-23786 |                                                                                                    | REV              |              |
|     |      |              | CODE : 392                                                                                                                                                 |                                                |                           |                                                                                       |                                   |                                                                                                    | 00               |              |