

**THE WEST BENGAL POWER DEVELOPMENT CORPORATION LIMITED**

**2X500 MW SAGARDIGHI TPP PHASE-2  
EXTENSION UNITS # 3 & 4**

**VOLUME IIB**

**TECHNICAL SPECIFICATION FOR  
PUBLIC ADDRESS SYSTEM**

**DOC. NO. PE-TS-373-557-E001, REV 00**



**BHARAT HEAVY ELECTRICALS LIMITED**

**POWER SECTOR**

**PROJECT ENGINEERING MANAGEMENT**

**NOIDA, INDIA**



TECHNICAL SPECIFICATION FOR  
PUBLIC ADDRESS SYSTEM

2X500 MW SAGARDIGHI TPP PH-II  
EXTENSION UNIT-3 & 4

SPECIFICATION NO. PE-TS-373-557-E001

VOLUME II B

SECTION

REVISION 0 DATE 06.02.2014

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| <b>TOTAL NO. OF SHEETS<br/>(INCLUDING COVER/SEPARATOR SHEETS)</b> |                                                 | <b>= 60</b>   |



# TECHNICAL SPECIFICATION FOR PUBLIC ADDRESS SYSTEM

2X500 MW SAGARDIGHI TPP PH-II  
EXTENSION UNIT-3 & 4

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VOLUME II B

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## **PREAMBLE**

1 The Tender documents contain three (3) volumes. The bidder shall meet the requirements of all three volumes.

### 1.1 **VOLUME - I** CONDITIONS OF CONTRACT

This consists of four parts as below:

**Volume – IA** This part contains Instructions to bidders for making bids to BHEL.

**Volume – IB** This part contains General Commercial Conditions of the Tender & includes provision that vendor shall be responsible for the quality of item supplied by their sub-vendors.

**Volume – IC** This part contains Special Conditions of Contract.

**Volume – ID** This part contains Commercial Conditions for Erection & Commissioning site work, as applicable.

### 1.2 **VOLUME – II** TECHNICAL SPECIFICATIONS

Technical requirements are stipulated in Volume – II, which comprises of:-

**Volume – IIA** General Technical Conditions.

**Volume – IIB** Technical Specification including Drawings, if any.

### 1.3 **VOLUME – IIB**

This volume is sub-divided in to following sections:-

**Section – A:** This section outlines the Intent of Specification.

**Section – B:** This section provides “Projection Information”.

**Section – C:** This section indicates Technical Requirements specific to Contract, not covered in Section – D.

**Data Sheet-A:** Specific data and other requirements pertaining to the equipments.

**Data sheet-C:** Indicates data / documents to be furnished after the award of Contract as per agreed schedule by the vendor (as applicable)



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**SPECIFICATION NO. PE-TS-373-557-E001**

**VOLUME II B**


**SECTION A**

**REVISION 0** | **DATE 06.02.2014**

**SHEET 1 OF 2**

**SECTION – ‘A’**

**SCOPE OF ENQUIRY**

|                                                                                   |                                                                   |                                             |                        |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------|------------------------|
|  | <b>TECHNICAL SPECIFICATION FOR<br/>PUBLIC ADDRESS SYSTEM</b>      | <b>SPECIFICATION NO. PE-TS-373-557-E001</b> |                        |
|                                                                                   |                                                                   | <b>VOLUME II B</b>                          |                        |
|                                                                                   |                                                                   | <b>SECTION A</b>                            |                        |
|                                                                                   | <b>2X500 MW SAGARDIGHI TPP PH-II<br/>EXTENSION UNIT 3 &amp; 4</b> | <b>REVISION 0</b>                           | <b>DATE 06.02.2014</b> |
|                                                                                   |                                                                   | <b>SHEET 2 OF 2</b>                         |                        |

## **SCOPE OF ENQUIRY**

1. This specification covers engineering, design, manufacture, assembly, inspection & testing at manufacturer's works, proper packing, delivery to **Sagardighi (Unit 3 & 4)** site, site unloading/handling, system engineering and erection & commission & trouble free operation of Public Address System as mentioned in different sections of this specification, complete with all accessories for efficient and trouble-free operation of project.
2. It is not the intent to specify completely herein all details of the design and manufacture. However, the equipment shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing in continuous commercial operation up to bidder's guarantee.
3. The general terms and conditions, instruction to bidders and other attachment referred to elsewhere are hereby made part of the Technical Specification.
4. The Bidder shall be responsible for and governed by all requirements stipulated hereinafter.
5. Review of the bidder's documents by the purchaser shall not relieve the bidder from his responsibility for the design and supply
6. The offer should be complete with technical data, catalogue, brochures and drawings as applicable.
7. Qualification data: In order to be able to present to the client the proven-ness of the equipment offered, the bidder is required to elaborate details of experience, capabilities, reference list etc. in the offer.
8. The documents shall be in English language and MKS system of units.
9. Bidder shall quote for all type of PA system items as per specification, failing which their offer shall be rejected.
10. For every shipment made to site, a shipping list containing item reference (item no. & description as per specification Bill of material of package drawing) and quantity of the same (nos.) shall be provided by the vendor at the time of dispatch of material to site.



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**SECTION A**

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**SHEET 1 OF 2**

**SECTION – ‘B’**

**PROJECT INFORMATION**



## TECHNICAL SPECIFICATION FOR PUBLIC ADDRESS SYSTEM

**2x500 MW SAGARDIGHI TPP PH-II  
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**SPECIFICATION NO. PE-TS-373-557-E001**

**VOLUME II B**

**SECTION A**

**REVISION 0** | **DATE 06.02.2014**

**SHEET 2 OF 2**

### 1. SOURCE OF COAL

The Power Station has been linked to Jhanjra, Chitra and Sarpi mines of Eastern Coal fields (ECL) and Panchwara & Damagoria for extension units.

Coal will be transported on broad-gauge line of Eastern Railways from the coal fields to the Power station in BOBRN rake loads.

Fuel oil (HFO/LDO) will normally be transported by railway oil tankers from nearest oil depot.

### 2. SOURCE OF WATER

The water requirement for the Power station will be met by drawing water from river Bhagirathi at a distance of 6 KM east of project site.

The Power station will operate on closed cooling system using Natural Draft Cooling Towers. In addition, all water conservation and recycling measures will be adopted to minimize requirement of makeup water.

### 3. ASH DISPOSAL AREA

The ash disposal area for the station is located about 1 Km from the plant site.

The Site Location Plan will give an idea of the locations of the site, colony, ash disposal area and rail and road connections.

### 4. SALIENT CLIMATOLOGICAL AND DESIGN DATA

Unless otherwise specified, the following design conditions shall be considered for the equipment offered:

- Design ambient dry bulb : 50 °C maximum, 5 °C minimum temperature
- Maximum relative humidity : 84%
- Average relative humidity : 73%
- Highest wet bulb temp. : 26.9 °C
- Average annual rainfall : 1389 MM
- Seismic zone : Zone-III as per IS-1893 latest revision
- Wind load : In accordance with IS-875 for a basic wind speed of 47 m/sec upto a height of 10 metres above mean ground level. For further details refer Volume II-G of this specification.
- Altitude : 34M above MSL.



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**VOLUME II B**

**SECTION A**

**REVISION 0** **DATE 06.02.2014**

**SHEET OF**

**SECTION – ‘C’**

**SPECIFIC TECHNICAL REQUIREMENT**



## SECTION-C

### PUBLIC ADDRESS (PA) SYSTEM

#### 1.00.00 INTENT OF SPECIFICATION

- 1.00.01 This specification is intended to cover the design, manufacture, assembly, testing at manufacturer's works, supply & delivery of IP based PA/Paging Systems, complete with all accessories for efficient and trouble-free operation for Sagardighi Thermal Power Project, Extension Units 3 & 4 (2 x 500 MW) of The West Bengal Power Development Corporation Limited. The duty of services as specified below and in other drawings forming part of this specification are as required for safe, reliable, trouble free and efficient operation with adequate maintenance facilities as per modern power station practices and as per terms and conditions enumerated in this specification.
- 1.00.02 The technical specifications that follow serve as the guide specification for the PA Systems.
- 1.00.03 In conformity with the guidelines provided in the specification, the scope of works shall completely cover all the PA Systems, functions, activities and documentation specified under the accompanying Technical Specifications. It will include but not limited to the following:
- a) Detailed design and engineering of the manufactured equipment; system integration and system engineering
  - b) Complete manufacture including shop testing.
  - c) Specifying, procurement, quality inspection of bought-out items from sub-suppliers. Design co-ordination for and integration with bought-out items with sub-suppliers.
  - d) Providing engineering drawings, documents, licensed copy of software and developmental tools, data, instruction, operation and maintenance manual etc. for Owner's review/ approval / record.
  - e) Arranging for Owner's inspection and testing of manufactured as well as bought-out items at the respective works.
  - f) Packing and transportation of instruments, equipment, accessories and erection hardware from the manufacturer's works to the site, including transit insurance.
  - g) Opening of site office at location provided by Owner.
  - h) Receipt, storage, preservation and conservation of instruments, equipment and erection hardware at the site.
  - i) Fabrication of site-constructed items.

- j) Pre-assembly (if any), erection, testing and commissioning of all the equipment and instruments in totality (including erection hardware, accessories/devices etc).
- k) Performing availability tests and Performance and Guarantee tests on completion of commissioning.
- l) Prepare and submit all approved and as-built drawings both in hard and soft copies.
- m) Furnishing of spares, tools and tackle, test instruments.
- n) Fulfilling post-commissioning liabilities.
- o) Arranging for training of Owner's personnel of different categories.
- p) Other activities detailed in the previous and subsequent clauses of the Specification.
- q) Any other activity, not mentioned explicitly, but felt essential by Bidder for successful completion of work.

1.00.04 The requirements enumerated in this specification are based on typical configuration of the plant for bidding purpose. It shall be the responsibility of Bidder to interact with other agencies and package vendors during the time of detail engineering and installation and offer the IP PA Systems to meet the actual functional requirements of the plant.

1.00.05 It is not the intent to completely specify all details of design and construction features herein. Nevertheless, the equipment and their installation shall conform to high standards of engineering design and workmanship in all respects.

1.00.06 In case of any conflict or contradiction between any two or more clauses of this specification the more stringent condition shall generally be applicable. Owner, however, reserves the right to relax this condition at his discretion.

## 2.00.00 SCOPE OF WORK

### 2.01.00 SCOPE OF SUPPLY

2.01.01 The equipment and materials shall include but not be limited to :

#### PUBLIC ADDRESS (PA) SYSTEM

This system is for the entire BTG Plant and Balance of Plants (BOP) like Ash Handling Plant, Plant Water System, CW System etc. The PA Equipment and materials included in this system are as follows but shall not be limited to these only :

- a) Master Control Station, subscriber handsets and loudspeaker stations, Control Box for speaker, amplifiers etc. each complete with its own preamplifier, signal processing and power amplifier and interface module for connectivity to Plant Telephone (EPABX) System and interface module for **seamlessly integration to IP PA system (from our other BOP area contractor) over an industry standard open channel (SIP channel being the first choice).**

- b) Cables, Wires, splicing/termination/connection accessories.
- c) Conduits and accessories, junction and pull boxes, terminal blocks, sockets.
- d) Above Grounding materials and connections.
- e) All fittings, supports, brackets, clamps and connectors.

2.01.02 All relevant drawings, data and instruction manuals.

#### 2.02.00 SCOPE OF SERVICE

2.02.01 Carrying out detail engineering, preparation and submission of all drawings as specified elsewhere in this specification including preparation and submission of area wise bill of materials, layout and erection drawings showing location of all system equipment and components, cable tray/rack and conduit routing.

2.02.02 Installation and Commissioning of the PA system including laying of the cables, furnishing of all labour, skilled and unskilled, supervisory personnel, erection tools and tackles, testing equipment, implements, supplies, consumables & hardware and transport for timely and efficient execution of the contract work. **The Plot Plan (Annexure 5) shall be studied for estimation of cables like Fibre Optic Cable or any other special cables etc required for the completeness of system.** Training to be provided to Owner's personnel for maintenance.

2.02.03 **Bidder shall develop detailed Block diagram indicating number of Handsets, loud speakers, FCSs, etc in line with the table shown in Annexure A and Building Area shown in Plot Plan. Accordingly cable quantity, size and type shall be worked out which shall match with quoted BOQ.**

#### 3.00.00 GENERAL REQUIREMENTS

##### 3.01.00 CODES AND STANDARDS

3.01.01 All equipment and materials shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS), Indian Post & Telegraph Departments Standards (ITD) except where modified and/or supplemented by this specification.

3.01.02 Major standards, which shall be followed, are listed below. Other applicable Indian standards for any component part, even if not covered in the listed standards, shall be followed :

- IS : 9302
- IS : 7741
- IS : 2147
- IS : 8130
- IS : 5831
- IS : 3975
- IS : 694
- IS : 1554
- IS : 3961
- IS : 9537
- IS : 10426

- IEC 268 & CCITT standard

Indian Post & Telegraph Departments Standards (ITD) except where modified and/or supplemented by this specification.

#### **4.00.00 DESIGN CRITERIA**

##### **4.01.00 DESIGN BASIS**

- 4.01.01 The system provides for quick and reliable communication between plant personnel located in different areas.
- 4.01.02 The system will be installed in an adverse industrial environment. Equipment in some areas will be subject to vibration, dust, oil/water vapours as prevalent in thermal generating plant.
- 4.01.03 The design shall be such as to provide highly intelligible two-channel voice communication even in areas of high background noise (50 db to 100 db).
- 4.01.04 The System characteristic shall be such as to cover the entire audio range and the speech band, particularly over frequency range of 500 Hz to 5000 Hz and dynamic range of 40 db to 80 db.
- 4.01.05 The system shall be distributed amplifier type with provision for easy future extension. Each station shall be complete with its own pre-amplifier, signal processing and power amplifier.
- 4.01.06 The PA/GA system shall be capable of broadcasting Speech and Alarms. Speech broadcasts shall be limited to areas within buildings and on their external walls. General alarm broadcasts shall also be broadcast from the same loudspeakers.
- 4.01.07 Equipment shall be self-protecting against transients in the input A.C. supply and against failure of any component or cable in the entire communication system. The In-Plant Paging System shall consist of providing Operator call stations connected to a remote node. The remote nodes shall interconnect via the switch based fibre optic dual ring topology that provides a robust and efficient cable system with inbuilt redundancy. The In-Plant Paging system shall provide zoned and plant-wide paging together with a minimum of 5 multi-party communication channels within each zone or plant area and allowing four (4) min. simultaneous conversations within the area (zone) and at least one site-wide channel
- 4.01.08
  - i) The carrier system shall be based on Voice Over IP or Similar Technology extended to provide digital communications between the Remote node control unit and Field Stations, the connections to Call Back Units and Speaker System shall be by single twisted pair cable for communications and appropriate power connections where required.
  - ii) The Field Call Stations shall operate on IP switching basis whereas the speakers need not be individually IP switchable but work as analog device.
  - iii) The Field Call station can selectively call another field call station without manual intervention of any other equipment.
- 4.01.09 Required functions for individual stations shall be programmable and configurable through pre-loaded software that permits local changes to the configuration. Levels of system access and privileges shall only be assignable to selected individuals.
- 4.01.10 The PA/GA system shall be capable of providing at least required separate zones that allow routine speech, emergency speech, alarm tone initiation and cancel from suitably equipped control and access panels

## SECTION-C

- 4.01.11 The PA/GA system shall be expandable to cater for future expansion phases in terms of additional nodes, zone expansion and additional control and access panels.
- 4.01.12 The system shall be specifically designed for life safety application and shall be of proven design. The equipment shall comply with latest electromagnetic compatibility directives 89/336 EEC and shall also comply with the low voltage directive. The equipment shall be manufactured by a BSI accredited ISO 9001 certified company.
- 4.02.00 SYSTEM CONCEPT
- 4.02.01 The system shall comprise five (5) nos. separate and independent groups of communication systems namely :
- BTG Unit#3
  - BTG Unit#4
  - Plant Water System
  - Ash Handling Plant
  - Common Services
- 4.02.02 Each group shall have one (1) Group Master Control Station which is a Field Call Station only and a number of subscriber stations.
- 4.02.03 In addition, there shall be one (1) Overall Master Control Station for the entire network, interconnecting all the Group Master Control stations. The Group Master for common facilities shall be configured as Overall Master Station.
- 4.02.04 Communication between groups shall be limited only to those between the group masters.
- 4.02.05 Supply and installation of the subscriber handset stations with all other accessories, for efficient and trouble free operation of the inter communication system for all the areas within as stated above shall also be under the scope of this package. Further, Contractor shall supply and install the necessary cables, conduits and other accessories as required.
- 4.02.06 Each overall and group master control stations shall have the provision for connection to 20% additional subscriber handset stations which may come into in future under unitized and common facility systems.
- 4.02.07 Contractor shall supply and install the necessary cables, conduits and other accessories as required to run the system successfully.
- 4.03.00 LOCATION OF MASTER CONTROL STATION (MCS)
- 4.03.01 The Overall Master Control Station shall be located at Shift in-Charge Engineer's Room.
- 4.03.02 The Group Master Control Station for Power House Building shall be stationed at Central Control Room in the operating floor of the Power House Building.

4.03.03 The Group Master Control Station for Plant Water System shall be located in Raw WT Plant Control Room.

4.03.04 The Group Master Control Station for common services shall be located in Service Building.

4.03.05 The Group Master Control Station at Plant entry shall be located in Administrative Building.

4.03.06 The group master control station for ash handling system shall be located in fly ash equipment building.

#### 4.04.00 FUNCTIONAL REQUIREMENTS

4.04.01 The system provides two independent and simultaneous channels of communication, viz. page channel and party channel.

4.04.02 The selection of the channel is through a "press to page switch" at the handset.

4.04.03 Page channel is for making any announcement over the system loudspeakers. If possible a call attention gong tone shall automatically precede all paging announcements.

4.04.04 Party channel is for holding conversation, including conference, between two or more stations without being heard over the loudspeakers.

4.04.05 Master Control Station shall have facility for generating and introducing the siren tone in the page channel.

4.04.06 Master Control Station can override the other's announcement or conversation and make a broadcast announcement to all groups.

#### 4.05.00 AREAS TO BE COVERED UNDER INTER COMMUNICATION SYSTEM

4.05.01 Inter-communication facilities for different areas shall include but not be limited to the following areas. The areas listed are indicative only. The areas to be communicated shall be decided as per finalized layout, as approved by the Owner/Owner's Consultant during detailed engineering stage.

##### a) **Power House Building**

- A.C. Plant Area.
- Boiler Feed Pumps Area.
- Condenser Area.
- Switchyard and transformer yard.
- Cable Spreader Rooms.
- Unit and Station Switchgear Rooms.
- Station Battery Charger Rooms.
- Power House Mezzanine Floor.
- Control Equipment Room.
- T.G. Hall

## SECTION-C

- MCC. Rooms.
- All miscellaneous floors like Tripper Conveyor Floor, Deaerator Floor, Coal Feeder Floor.
- Firing Floor.
- Chemical Feed Station.
- P.A. Fan and F.D. Fan Areas.
- Boiler Platforms (at Burner Floors, Platform near Drum and other strategic locations)
- Mill Bay Area.
- I.D. Fans Area.
- ESP. Platforms.
- ESP. and Fly Ash Handling Control Room.
- Central Analyser Room and Laboratory
- SWAS Room
- Main Control Room and existing control room.
- D.G. Plant , its electrical switchgear room and control room.
- Compressed Air Plant.
- Fuel Oil Pressurising Pump House and its MCC /Control rooms.
- 400 kV Switchyard Control room
- Ash Area
- Condensate Transfer Pump Area.
- Conveying Compressor Building. Plant room, Switchgear room and Control room.
- Fly Ash Equipment Building, its switchgear room and control room.

### b) ***Plant Water System***

- Clarified Water Pump House, its associated Switchgear room, control room.
- Chemical House, Chlorination Building, associated MCC /control rooms.
- D.M. Plant Building, its Switchgear room, control room.
- Raw Water Pump House, its associated Switchgear room, control room.
- Fire Water Pump House
- Gravity filter water pump house and MCC/control room
- Sludge pump house.
- CW pump house and its associated switchgear room.

### c) ***Coal Handling Plant***

- Cable spreader room

- Control room at Main CHP Substation
- PMCC room in Bunker Area

Note : Provision shall be kept for interconnection with CHP paging system.

**d) Service Building**

- Service Building
- Stores.
- Weigh Bridge
- Fire Station Building
- Workshop

**e) Administrative Building**

- Administrative Building
- Gate Office.
- Security Office
- Car Parking Area

**f) Ash Handling Plant**

- ESP Platforms
- ESP and Fly Ash Handling Control Room
- Bottom Ash Hopper Area
- Fly Ash hopper Area
- Fly Ash equipment Building, its switchgear and control room,
- Platforms of fly ash surge tank
- Platforms of Ash silo and its associated electrical room

**5.00.00 SPECIFIC REQUIREMENTS - SUPPLY**

**5.01.00 CONSTRUCTION**

5.01.01 Equipment shall be sturdy, impact resistant, dust and damp-proof, generally conforming to:

For all indoor installations, Ingress Protection shall be minimum IP-32

For all outdoor installation (speakers, Field Call Stations) Ingress of Protection shall be minimum IP-65 protection.

5.01.02 All equipment and accessories shall be given tropical protection involving special treatment of metal and insulation against fungus, insects and corrosion.

5.01.03 Equipment shall be made tamper proof by use of non-standard screws, which can be opened only by means of special keys.

5.01.04 Handset stations located at isolated places as Field Call Station (FCS) shall be pilferage proof. Pilfer proof station shall have built-in microphone and speaker.



Further all components on the front panel shall be so mounted that they cannot be removed unless special keys are used to open up the station first.

5.01.05 Handset stations/ JB's/ Loud Speakers located at hazardous areas shall be flame proof.

5.01.06 Handset stations located in noisy environment such as mill area, turbine floor, boiler feed ump area etc., shall be provided with suitable acoustic enclosure for undisturbed audio communication.

#### 5.02.00 HANDSET STATION

5.02.01 All handset stations shall be designed so that maximum safety and isolation from live circuits are provided for the operator under all conditions. The said handset stations shall be used as Field Call Station (FCS) which shall be used to respond to the specific call from the PA System over party channel.

5.02.02 Handset shall be conventional telephone type with sensitive dynamic microphone/earpiece and at least 2 metre of coiled-cord retractable cable.

5.02.03 The Field call stations both indoor and outdoor shall have integral section/ dialling buttons and integral processor section. Also IP Protection shall be applicable for the call stations itself. Any assembly of equipment consisting of call station, separate dialling/ selection buttons, external casing shall not be acceptable. Any conversion of analog field call station to IP mode by separate attachment of intelligent module/ unit shall not be acceptable.

5.02.04 Handset shall be provided with proper noise cancelling feature and anti-side tone control. Performance of handset shall be satisfactory without using acoustic booth even in high noise level areas.

5.02.05 Handset shall be mounted on or within control box complete with all electronics, switches, indications and controls.

5.02.06 Each handset station shall be provided with junction-box which shall be located below for looping in and out of the cables.

5.02.07 Each handset station shall have rugged and corrosion proof enclosure fabricated from 2 mm. thick mild steel sheet. All outdoor stations apart from having the above features shall have weatherproof construction. Necessary cable gland, lugs, earthing terminal etc. shall be provided.

#### 5.03.00 LOUDSPEAKERS

##### 5.03.01 Re-entrant

Re-entrant horn type speakers shall have material as per bidder standard specification (e.g. made of ABS, die cast aluminium horn, etc), integrally mounted driver unit and mounting bracket for adjustment of speaker orientation in all directions.

5.03.02 All speaker stations shall have volume and tone controls. All handset stations and control box for extension amplifier shall have tone and volume controls.

#### 5.04.00 CABLES

##### 5.04.01 Void

5.04.02 Cables shall be installed as follows;

- a) Above ground in plant areas when suitable tray or cable racking exists.
- b) Direct buried through flexible HDPE pipe in all areas of the Site where no tray or cable racking exists.

5.04.03 Cable protection and sheathing shall be suitable for the location they are installed in.

5.04.04 In general OFC cable shall be used from Exchange to starting point (MCS/ FCS/SDF/JP/Ethernet switch) of a particular zone and from there to a station, Ethernet cable/ AWG stranded/ any other special cable as per bidder standard specification shall be used.

5.04.05 All intercommunication cables like signal, loudspeaker and control cables shall generally be flexible stranded annealed tinned electrolytic copper conductor, PVC insulated, colour coded, twisted into pairs laid up, individual and overall shielded with Aluminium tape, PVC inner sheathed, galvanised round steel wire armoured and extruded FRLS type PVC overall sheathed generally conforming to IS 1554 as revised and amended up-to-date. However

5.04.06 Power cable (Mains cable) shall be generally heavy duty 1100 V grade, multicore stranded copper conductor, PVC insulated, PVC inner sheathed, galvanized round steel wire armoured and extruded FRLS type PVC overall sheathed generally conforming to IS 1554 as revised and amended up to date.

5.04.07 Type of cable, conductor size and no. of pairs/cores shall be chosen to suit the application.

#### 5.04.08 **Technical Requirements - Fibre Optic Cable**

The Fibre Optic Cable Network is a multi-purpose Network carrying Telecommunications In Plant Paging & PA is terminated the termination in each building shall be on patch panels using FC/PC connectors.

#### 5.04.09 **Fibre Optic Cable**

Fibre installed meet or exceed the following specifications:

##### **Cable Specification**

- a) Certificate of conformance to Quality assurance system ISO 9001.
- b) Fibres shall conform to ITU-T G.652 or G.655 recommendation for Single Mode Fiber Optic Cable.
- c) Fibres shall conform to ITU-T G.651 or G.651.1 recommendation for Multi Mode Fiber Optic Cable.

#### **Specifications of FO Cable**

## SECTION-C

| PARAMETER |                                                                                             | SPECIFICATION                             |
|-----------|---------------------------------------------------------------------------------------------|-------------------------------------------|
| 01.       | Nominal Cable Size                                                                          | 70 mm <sup>2</sup> to 100 mm <sup>2</sup> |
| 02.       | Fiber Count                                                                                 | 12 to 144                                 |
| 03.       | Core Covering                                                                               | Non-hygroscopic tape                      |
| 04.       | Water blocking compound                                                                     | Moisture resistant filling compound       |
| 05.       | Armour Material                                                                             | Corrugated Steel Tape                     |
| 06.       | Armour Thickness                                                                            | 18 mm                                     |
| 07.       | Temperature Range                                                                           | -10° to + 80° C                           |
| 08.       | Nominal Delivery Length                                                                     | 3-5 kilo meter / Reel or Drum             |
| 09.       | Numerical Aperture                                                                          | 200 mm                                    |
| 10.       | Cut off wavelength of cabled fiber                                                          | < 1270 nm                                 |
| 11.       | Dispersion at 1270 nm – 1550 nm                                                             | ≤ 3.5 ps/nm. Km                           |
| 12.       | Attenuation at 1300 nm on reel at works or at site before installation                      | Max. 0.35 dB/Km                           |
| 13.       | Attenuation at 1300 nm on reel at works or at site after installation including splice loss | Max.0.4 dB/Km                             |
| 14.       | Difference in attenuation coefficient when measured from both ends                          | < 0.05 dB                                 |
| 15.       | Voltage withstand between armor and ground for 1 min                                        | 10 KV DC                                  |
| 16.       | Marking along cable length every 1 m                                                        | Yes                                       |
| 17.       | Splice Type                                                                                 | Contractor to indicate                    |
| 18.       | Maximum Splice Loss                                                                         | 0.05 dB                                   |
| 19.       | Connector Type                                                                              | Contractor to indicate                    |
| 20.       | Maximum Connector Loss                                                                      | 0.3 dB                                    |

### 5.04.10 **20/10/2 Pair Twisted Pair Cable**

This cable will be used to provide connections to small out buildings which do not require a range of services such as remote guard house, shelter or small stores building to the closest building containing PA Speakers

## SECTION-C

### **Cable Specification**

- a) Certificate of conformance to Quality assurance system ISO 9001.
- b) Unarmored cables shall conform to CW1128.
- c) Armored cables shall conform to CW1128/1198.
- d) Solid annealed copper conductor.
- e) Conductor size 1/0.9.
- f) 80 degrees C (198 degrees F) drip-proof filling compound.
- g) CW1128D colour coded insulation.
- h) Operating temperature of 0 to +60 °C.

#### **5.04.11 Fibre Optic Cable Splicing**

- a) Splicing of fibre optic cables shall be done by arc fusion method using a latest model, fusion splicer. GTE splicing specifications shall be used. The cable shall be tested and records be made of losses of all splices as they (splices) are being done using an Optical Time Domain Reflectometre (OTDR) or an approved attenuation test set. The average splice loss shall be 0.05 dB or less. No single splice shall have a loss greater than 0.10 dB.
- b) The splicing equipment shall be automatic, high-resolution fibre alignment technology; based on pre-splice least-loss criteria established by the machine itself.
- c) The splice machine(s) shall have a visual monitor by microscope or miniature CRT / LCD viewing screen, and shall provide a read-out estimate of the splice loss.
- d) The fusion machine must have the latest version of software available and be able to distinguish and identify between the G 652 and G.655 fibre.
- e) On completion of FO backbone cabling, an audit has to be performed on whole FO network to establish conformity with standard acceptable ranges of losses, if any.

#### **5.04.12 Cable Handling**

- a) Cable drums shall not be dropped or jolted. To avoid excessive rolling, the drums shall be transported using a cable trailer or a truck with a crane suitable for the size and weight of the cable reel. If rolling cannot be avoided, the drum must be rolled in the direction indicated on the cable drum. Drum battens are not to be removed until the drum has been set up for installation. If only part of a drum or cable is used, and the drum moved to another site, the cable end of the drum must be completely sealed and secured on the inside of the flange as soon as possible after the cable has been cut and the battens replaced to protect the cable.
- b) The cable must not be trampled upon, run over by vehicles, pulled along the ground, over fences, rocks or asphalt. Each cable drum shall be inspected for cuts, kinks or other damage.

c) The cable must be treated with care and precautions taken to prevent moisture ingress and physical damage to the outer sheath and inner components.

d) All cable shall be sealed and water tight at all stages of use. Sealing must be performed immediately after a length of cable has been cut from a drum or opened up for any purpose. Any cable to be placed in trench shall be unrolled promptly into the trench and not allowed to lay unrolled beside the trench for an extended period.

#### 5.05.00 CONDUITS

5.05.01 Conduits shall be rigid steel, hot dip galvanized; minimum size of conduits shall be limited to 20 mm.

5.05.02 Each standard length (5 M) of conduit shall be threaded at both ends.

5.05.03 Each piece of conduit shall be straight, free from blister and other defects and covered with capped bushing at both ends.

#### 5.06.00 SDF, JUNCTION BOXES AND ENCLOSURES,

5.06.01 SDF/ Junction boxes shall be of die cast aluminium alloy or 16 SWG sheet steel hot-dip galvanized, dust and damp proof, generally conforming to IP-55.

5.06.02 SDF/ Junction boxes shall be complete with gasketed inspection cover, conduit knockouts/threaded hubs and terminal blocks.

5.06.03 SDF/ Junction boxes for outdoor use shall be weatherproof and those for hazardous areas shall be flameproof type.

5.06.04 All FO Cables will be terminated at Wall/Floor mounted enclosures. Standard Structured Cabling System methodology should be followed in terminating Fibre and UTP cables like provisioning of LIU (Lightguide Interface Unit) boxes and Patch Panels etc

#### 6.00.00 SPECIFIC REQUIREMENTS - SERVICES

##### 6.01.00 O & M SPARES, CONSUMABLE AND HARDWARE

6.01.01 Contractor is required to submit a list of mandatory spares for further action by Owner.

6.01.02 Contractor shall furnish all consumables, hardware and erection materials as required for the completed installation.

6.01.03 These materials shall include but not limited to :

|                 |                                                                                                                    |
|-----------------|--------------------------------------------------------------------------------------------------------------------|
| a) Consumables: | Welding rods & gas, oil & grease, cleaning fluids, paints, cotton waste, electrical tape, soldering materials etc. |
|-----------------|--------------------------------------------------------------------------------------------------------------------|

## SECTION-C

- b) Hardware : Bolts, nuts, washers, screws, brackets, supports, hangers, saddles, cleats, clamps etc.
- c) Materials : Conduits & accessories, junction boxes terminal blocks, connections, lugs, ferrules, brass glands, ground wires, sockets etc.

### 6.02.00 METHODS AND MATERIALS

6.02.01 All work shall be installed in a first-class, neat and workmanlike manner by mechanics/electricians skilled in the trade involved.

6.02.02 All materials shall be new, of best quality and standard products of reputed makes. Such materials shall be got inspected and approved by Owner before their use.

6.02.03 All equipment and connections shall be installed in such a manner as to preserve access to any other equipment installed.

### 6.03.00 PROTECTION OF WORK

Contractor shall effectively protect, at his own expense, such of his work, equipment or materials as is liable to theft, damage or tampering.

### 6.04.00 SAFETY MEASURES

All safety rules and codes applicable to the work shall be followed without exception.

### 6.05.00 CO-OPERATION

Contractor shall at all times work in close co-ordination with Owner's supervising personnel and afford them every facility to become familiar with erection and maintenance of the equipment.

### 6.06.00 ERECTION PROGRAMME

6.06.01 Contractor shall submit in advance his erection programme clearly indicating items of work, their sequence and estimated completion time for each item.

6.06.02 Contractor shall start erection only after obtaining Engineer's approval of his programme and shall adhere to this approved programme as far as practicable.

6.06.03 If for any reason the work is held up, Contractor shall bring it to the attention of Owner in writing without any delay.

6.06.04 To ensure completion within stipulated time, Owner shall have the right to instruct Contractor to increase manpower and/or working hours per day and/or tools & tackles, and Contractor shall comply with such instruction forthwith.

### 6.07.00 CABLE/WIRING

6.07.01 Cable shall be generally laid on ladder type trays, available in trenches or within buildings, and clamped at an interval of 300 mm.

## SECTION-C

- 6.07.02 When such trays are not available, Contractor shall make his own arrangement by drawing the cables through flexible HDPE pipes fixed along wall/column or bottom floor slab.
- 6.07.03 Conduits shall be installed as per relevant IS code. All conduits, junction/pull boxes shall securely fixed and grounded.
- 6.07.04 Directly buried cables shall be laid and covered with sand or riddle earth, and protected from damage by brick barrier at sides and precast concrete slab on top.
- 6.08.00 GROUNDING
- 6.08.01 All metal enclosures, conduits, junction/pull boxes shall be grounded in compliance with I.E. rules.
- 6.08.02 Contractor shall provide required number of earthing pits and shall run # 8 SWG G.I. wires from these pits for grounding.
- 6.09.00 COMPLETION OF THE WORK
- 6.09.01 All equipment shall be complete and operative in all details and shall be left in satisfactory working conditions.
- 6.09.02 All details of the installation shall be electrically and mechanically correct.
- 6.09.03 Contractor shall remove all rubbish, scaffolding, surplus materials etc. to leave the premises clean and fit for use.
- 6.09.04 If any opening or cutting of the building construction is necessary, the same shall be remade to match the original work.
- 6.10.00 INSPECTION AND TESTING
- 6.10.01 On completion of erection work, Contractor shall request Owner for inspection and tests.
- 6.10.02 Owner shall arrange for joint inspection of the installation for completeness and correctness of the work. Any defect pointed out during such inspection shall be promptly rectified by Contractor.
- 6.10.03 The installation shall be then tested and commissioned in presence of Owner and put on trial run for stipulated contract period.
- 6.10.04 All rectification, repair or adjustment work found necessary during inspection, testing, commissioning and trial run shall be carried out by Contractor without any extra cost.
- 6.11.00 TAKING OVER OF INSTALLATION
- 6.11.01 On successful testing, commissioning and trial run, Contractor shall request Owner in writing for taking over the installation.
- 6.11.02 Owner, on receipt of the request, shall arrange to take over the installation either wholly or in part as the case may be after a final inspection.

6.11.03 Till such taking over, Contractor shall be held responsible for all equipment or materials against any theft or damage.

#### 7.00.00 TESTS

##### 7.01.00 SHOP TESTS

All equipment shall be completely assembled, wired, adjusted and routine tested as per relevant standards at manufacturer's works in presence of Owner or Owner's nominated representative.

##### 7.02.00 SITE TESTS

7.02.01 Contractor shall thoroughly test and meggar all cables, wires and equipment to prove that the same are free from ground or short circuit.

7.02.02 If any ground or short circuit is found, the fault shall be rectified or the equipment/cable replaced.

7.02.03 All equipment shall be demonstrated to operate in accordance with the requirements of this specification.

7.02.04 Noise level test during commissioning is to be carried out.

7.02.05 Type test certificate on any equipment shall be furnished. Otherwise the equipment shall have to be type tested, free of charge, to prove the design.

7.02.06 QP enclosed with the specification shall be stamped and signed as token of acceptance. The QP shall be submitted at contract stage for customer approval without any commercial implication to BHEL.

#### 8.00.00 DRAWINGS, DATA AND MANUALS

##### 8.01.00 TO BE SUBMITTED WITH THE BID

8.01.01 A block diagram of each system offered with a brief write-up on operation including hook-up arrangement with existing system.

8.01.02 Bill of Materials.

8.01.03 Typical general arrangement drawings of various handset and speaker stations.

8.01.04 Schematic diagram of each type of station.

8.01.05 Cable connection diagram for various type of stations, clearly indicating cable size, no. of pairs/cores etc.

8.01.06 Technical leaflets on each piece of equipment viz handset, speaker etc.

##### 8.02.00 TO BE SUBMITTED AFTER AWARD OF CONTRACT

8.02.01 Dimensional General Arrangement Drawings of all system components, such as handset stations, speaker stations, junction boxes, earthing pits etc.

8.02.02 Consolidated Bill of Materials.

8.02.03 Schematic diagram of each station.



8.02.04 Connection diagram of the whole system.

8.02.05 Erection drawings of cable and conduit routing.

8.02.06 Data Sheet and technical leaflets on each piece of equipment furnished.

8.02.07 "AS BUILT" intercommunication layout, erection drawings and distribution schemes after installation, properly incorporating the changes/alterations/field modifications, if any, as carried out at field.

8.02.08 Instruction, Operation & Maintenance Manual for the Complete System The manual shall clearly indicate the salient features of the system furnished, installation method, check-up and tests to be carried out prior to commissioning and system operation and maintenance.

8.03.00 Bidder may note that the drawings, data and manuals listed are minimum requirement only. Bidder shall ensure that all other necessary write-ups, drawings, curves and information required to fully describe the equipment offered are submitted with the bid.

#### 9.00.00 SPARES

##### 9.01.00 GENERAL REQUIREMENT OF SPARES

9.01.01 All spares required for operation / maintenance by Owner shall be delivered in unused new condition.

9.01.02 Spares shall be interchangeable with the parts for which they are intended for replacement.

9.01.03 Supplier shall indicate the service expectancy period for spares under normal operating conditions after which replacement will be necessary.

9.01.04 Spares shall be properly packed for long storage under the prevailing site condition.

9.01.05 Spares cards/modules, components etc shall be offered for 10% of total nos. used in the system or minimum 1 (one) no. whichever is more.

##### 9.02.00 O & M SPARES

Vendor shall quote the essential cards and modules like power supply, controller card, communication module, power amplifier module etc 10% of total nos. used in the system or minimum 1 (one) no. whichever is more for each type of equipment.

##### 9.03.00 RECOMMENDED SPARES


The supply of Spare parts as necessary and recommended by the manufacturer for three (3) years' reliable operation and maintenance of the equipment shall be under the scope of this specification.

## SECTION-C

### 9.04.00 **START-UP AND COMMISSIONING SPARES**

Spares, which may be required during tests, trial and commissioning, shall be arranged separately. Supplier shall replace spares, which will be used for this purpose, within reasonable period of time.

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## 10. ADDITIONAL SPECIFIC REQUIREMENTS- SUPPLY

### 10.1 GENERAL

10.1.1 The Bidder shall guarantee satisfactory performance of the equipment under stipulated variations of voltage and frequency. The design and manufacture shall be such that equipments/components of same type and rating shall be interchangeable.

10.1.2 Exclusions:,  
Civil foundations of central exchange, main distribution frames, main distribution boards & civil works like foundations and cable trenches are excluded from the scope of bidder.

### 10.2 DESIGN REQUIREMENTS (CONCEPTUAL VIEW)

Communication within a zone:

It shall be possible to make a paging call by lifting the hand set hook switch / hand free mode by pressing the page switch on all call / selected group basis. This shall initiate a call attention tone to be transmitted to all the speakers and gets off automatically after a preset time. The paging message shall then be transmitted over all the loudspeakers when the paging person shall speak in the microphone of the handset. While paging under this channel it shall be possible to mute the loudspeaker near the paging handset to eliminate the acoustic feed back. The page switch shall then be released to allow the paged person to come to the nearest hand set station. After lifting the handset off the hook of the nearest handset station it shall be possible for the paged persons to carry on the conversation on the private mode with the party. The system shall have the conference facility in either of the channels by any no. of persons by simply lifting the handset off the hook and selecting the required channel .

Interzone Communication

It shall be possible to communicate from a station in one zone to another station of different zone through a master control unit.

### 10.2 GROUNDING

10.2.1 All panels, desks, cabinet shall be provided with a continuous bare copper ground bus. The ground bus shall be bolted / welded to the panel structure and efficiently ground the entire structure.

10.2.2 If microprocessor control, monitoring and information system or backup control system requires its own unique and isolated grounding requirements, then these requirement should be clearly stated and shall be

provided, so as to ensure proper operation of the above mentioned system.


### 10.3 SYSTEM DESIGN ENGINEERING

10.3.1 ENGINEERING INPUTS: Complete engineering shall be done by the vendor on the basis of following documents to be furnished by purchaser:

- Area wise allocation of handsets & loudspeakers and their type.
- Layout drawings of areas.

10.3.2 ENGINEERING OUTPUTS: Vendor shall prepare and submit following documents and drawings for purchaser's approval:

- Technical write-up (system Description).
- Bill of quantities for all items.
- GA drawing cum technical datasheet of all the equipments as per BOQ.

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- d) Mounting arrangement drawings.
- e) Interconnection diagram showing the interconnection among Main Distribution Box, Master Handset Station, JBS, Handsets, Loud Speakers and also covering the sizes of cable.
- f) Conductor sizes of cables and wires with voltage drop calculations.
- g) Cable schedule.
- h) Testing and commissioning guidelines
- i) O& M Manuals
- j) Type test report
- k) Test procedure if required

#### 10.4 CONSTRUCTIONAL FEATURES

Public Address system shall comprise of central exchange, Handset stations, master control stations along with their associated distributed amplifier and loud speakers, Main distribution box/Junction box, a number of communication handset stations along with their associated loud speakers and other associated equipment. Details of each of these and other items required to make the system complete.

##### 10.4.1 CENTRAL EXCHANGE

Microprocessor controlled electronic exchange unit is using Time Division Multiplexing (TDM).

The electronic exchange is a central control unit (CCU) comprising of rack, power supply arrangement, and control processors with control wiring. In the CCU, microprocessor controls the operation and power supplies of the system. Central Exchange shall have modular type construction for the purpose of easy expansion, maintenance, operation and fault detection. The racks are the modular mechanical structures mounted in a cabinet.

Further, all the programming tools that will be required to program/reprogram the system shall also be provided.

Main Distribution Frame (MDF) if applicable, shall form part of the central exchange cabinet.

##### 10.4.2 MAIN DISTRIBUTION FRAME (MDF)

The main distribution frame (MDF) if applicable, for termination of cables from Exchange to Master Station/ Field Call Station.

##### 10.4.3 LOUD SPEAKERS


###### Cone Type

- a) Permanent magnet, cone type speaker with line matching transformer shall be housed in a sturdy metal cabinet suitable for wall/ column or ceiling mounting as specified in the schedules and drawings.
- b) For distributed system, volume level adjustment will be provided at handset if the line-matching transformer is not provided.
- c) The cabinet shall have grilled metal faceplate to diffuse high frequencies and prevent damage to the speaker. Housing shall be treated with acoustic under-coats to prevent resonance.

##### 10.4.5 JUNCTION BOXES

###### Type of Junction Boxes

- a) Power Junction Box: If required, this type of junction box shall be used for looping of incoming and outgoing

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power cables for handset stations.

- b) Signal Junction Box/ Sub Distribution Frame: If required, this type of junction box shall be used for looping of incoming and outgoing signal cables for Desktop Stations/ Master Control Stations.

It shall be possible to isolate any part of the circuit during maintenance/ testing without affecting the other circuits.

#### 10.4.6 POWER DISTRIBUTION BOARD

If required, Power distribution board shall be used for distribution of incoming power supply to different loops. DOP & Construction of main distribution board shall be similar to other junction boxes. PDB shall be wall/column mounted. Necessary glands required for cable entry shall be provided along with PDB.

#### 10.4.7 WEATHER PROTECTING CANOPY / ACOUSTIC HOOD

##### A) WEATHER PROTECTING CANOPY

If required, weather protecting canopy shall be provided for outdoor field call station to meet the DOP IP-65 for outdoor area.


- B) **ACOUSTIC BOOTH:** Sound protecting Industrial type free standing booth Floor mounted Acoustic booth shall be 850(L) X 700(W) X 2200(H) mm and made of MS 1.6mm thick/ FRP material 4mm thick. The degree of protection for acoustic booth shall be IP -55. Hinged door entry shall be provided. Suitable table /Mounting arrangement shall be provided inside the booth for mounting the handset.

#### 10.4.8 OTHER

- Bidder shall furnish separately the power supply requirements (in watts) for both central exchanges along with different stations attached to each exchange to decide the feeder size.
- Makes of equipment/ components shall be subject to purchaser's approval during detailed engineering. However, bidder shall furnish the list of makes along with the offer.
- Three sets of hard as well soft copies (in pdf form) of dwg/ documents will be required for the purchaser's review/ approval.
- After completion of work at site, bidder shall prepare "AS BUILT DRAWINGS" and "O&M Manuals" as per distribution list enclosed with Section – C.

#### 10.4.9 COMMON REQUIREMENTS OF VARIOUS EQUIPMENT OF SUPPLY

- The supply and installation of all earthing wires, earthing plates and other materials for earthing the entire PA System shall be under the scope of the Contractor. The Contractor shall properly earth the system so that there is no interference in the communication system due to electromagnetic noise.
- Packing**  
The material shall be packed as per manufacturer's standard to ensure the protection against mechanical damage, jerks, rain etc. during transit and for a prolonged period of storage. Packing procedure shall be subject to the purchaser's approval.

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## 10.5 PRICES

- 10.5.1 The bidder shall quote his prices for equipment of complete Public Address System, supply, as per BOQ format enclosed with Section – C.
- 10.5.2 Purchaser reserves the right to delete/add any equipment or services from the bidder's scope and, for price adjustment in such cases, unit prices quoted by the bidder will be considered.
- 10.5.3 The bidder shall furnish unpriced "Price Schedule" of all equipment and services, as per BOQ along with the technical bid.
- 10.5.4 Bidder to note that the price for System Engineering Design shall form part of main equipment and will not vary with the change in scope of supply of equipment.

## 10.6 PERFORMANCE GUARANTEES

Bidder shall guarantee that the system offered shall meet the requirement as indicated in this specification and as confirmed by them in various clauses of technical data sheets. If it is proved that the system doesn't conform to performance guarantee, the bidder shall be ready to replace the faulty equipment/ components at site without any extra cost.

## 10.7 INSTALLATION AND MAINTENANCE MANUAL

- 10.7.1 Instruction manuals for the installation, operation and maintenance of PA System shall be furnished before despatch of the equipment.
- 10.7.2 Draft manual shall first be submitted for Purchaser's approval. The manual shall contain minimum following details:
- General description of equipment
  - Brief system description for which equipment is meant
  - Technical data
  - Salient constructional details
  - Technical leaflets of important components used in the system
  - All drawings
  - Type and routine test certificates
  - Instructions to be followed on receipt of equipment at site and for storage
  - Material handling instructions
  - Erection procedure and checks
  - Pre-commissioning checks
  - Commissioning procedures
  - Operation instructions
  - Maintenance instructions
  - Trouble shooting
  - Safety instructions

## 10.8 DOCUMENTATION

### 10.8.1 DOCUMENTS TO BE FURNISHED WITH THE BID



TITLE

# Technical Specification for PUBLIC ADDRESS SYSTEM

SPECIFICATION NO. PE-SS-999-557-E001

VOLUME II B

SECTION C

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## a) Brief System Description.

### 10.8.2 DOCUMENTS TO BE FURNISHED BY THE VENDOR DURING DETAILED ENGINEERING STAGE

- a) Full description and design of the equipment and its operation.
- b) General arrangement drawings cum Technical Datasheet for various equipment as per drawing list.
- c) Detailed write up on the method of testing.
- d) Interconnection diagram showing the interconnection between main distribution board, master station(s), JB's, handsets, loud speakers covering the size of cable.
- e) Cable schedule
- f) Operation and maintenance (O&M) manual.
- g) Signed and stamped Standard Quality Plan.
- h) Minimum 3 copies of all test certificates for the tests actually conducted on the equipment

## 11. ADDITIONAL SPECIFIC REQUIREMENTS- E&C


### 11.1 GENERAL

Unit prices listed out in this clause shall be applicable for payment to the contractor for activities covered under this specification. The following shall be kept in consideration while quoting the prices:

### 11.2 UNIT PRICES OF INSTALLATION WORK

Detailed requirement for all the items are given in the specifications, Data Sheet A and Annexures.

- a) Unit price of installation shall include transportation of materials from Vendor's/ Owner's storage yard to work site, handling, testing before erection, testing after erection and commissioning of materials including supply and installation of all associated materials (including support materials) and consumables, carrying out of all associated minor civil works and furnishing of all skilled/ unskilled labour, supervisory and commissioning staff.
- b) Price of earth connections are to be included in the erection price of equipment as above.
- c) No separate prices shall be applicable for termination of cables. Cable termination shall include drilling of gland plates, fixing of glands, ferrules and lugs and connection to the equipment.
- d) Purchaser reserves the right to delete/ add any of the equipment or services from the bidder's scope of work.
- e) The unit prices quoted shall be for supply and/ or installation as explained in detail in the clauses in subsequent paragraphs. No other prices shall be applicable for the purpose of payment.
- f) While quoting the prices for installation, the following shall be considered as part of job:
  - i. Cable glands and lugs
  - ii. Clamps, ferrules, aluminium/ stainless steel tags as per the project requirements
  - iii. Fasteners like nuts, bolts, washers, spring washers, rawl plugs, anchoring bolts and lugs etc.
  - iv. Conduit plugs, gaskets, couplers, and insulated bushings
  - iv. Sealing compounds for wall and floor openings
  - v. Consumables like enamels, cold zinc paint, electrodes for welding etc.
  - vi. Materials for minor civil works
- g) The following shall be arranged by the contractor at no extra cost:
  - i. All unskilled and skilled labour
  - ii. All supervisory and commissioning staff
  - iii. All facilities/ equipment for site fabrication such as cutting, bending and drilling equipment
  - iv. Welding set(s)
  - v. Material handling equipment

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vi. All special tools and tackles for erection

i. All testing equipment

h) Requirement of Quality Plan and Field Quality Plan shall be considered in the quoted prices.

i) E & C spares required shall be part of E & C charges.

j) Instruments required for testing & commissioning shall be arranged by the contractor and shall be taken back after E & C.

k) Fabrication and painting of support structures of various equipments shall be in contractor's scope. However structural steel shall be free issue by BHEL.



# ANNEXURE - A

## DISTRIBUTION OF HANDSET STATIONS

| SR. No. | AREA / LOCATION                        | LOUDSPEAKER | FCS<br>(ALL TYPES) | MCS |
|---------|----------------------------------------|-------------|--------------------|-----|
| 1.      | Power House Building Unit#3            | 20          | 10                 | 1   |
| 2.      | Power House Building Unit#4            | 20          | 10                 |     |
| 3.      | Boiler Area Unit#3                     | 20          | 5                  |     |
| 4.      | Boiler Area Unit#4                     | 20          | 5                  |     |
| 5.      | ESP Area Unit#3                        | 3           | 3                  |     |
| 6.      | ESP Area Unit #4                       | 3           | 3                  |     |
| 7.      | ESP Control Building                   | 2           | 2                  |     |
| 8.      | Mill Bay Area , Unit # 3               | 2           | 2                  |     |
| 9.      | Mill Bay Area , Unit # 4               | 2           | 2                  |     |
| 10.     | FD/PA/ID Fan Area, Unit # 3            | 3           | 1                  |     |
| 11.     | FD/PA/ID Fan Area, Unit # 4            | 3           | 1                  |     |
| 12.     | 400Kv Switchyard                       | 4           | 0                  |     |
| 13.     | Switchyard Control Room                | 1           | 1                  |     |
| 14.     | DG Area                                | 1           | 1                  |     |
| 15.     | Fuel Oil Handling Area                 | 3           | 1                  |     |
| 16.     | Administration Building                | 8           | 4                  |     |
| 17.     | CW Pump House                          | 2           | 1                  |     |
| 18.     | CW Treatment Building                  | 2           | 1                  |     |
| 19.     | CW Chlorination Building               | 2           | 1                  |     |
| 20.     | Clarified Water Reservoir & Pump House | 2           | 1                  |     |
| 21.     | Effluent Treatment Plant               | 2           | 1                  |     |
| 22.     | Remote Silo Utility Building           | 2           | 1                  |     |
| 23.     | Chemical House                         | 2           | 1                  |     |
| 24.     | Ash Water Pump House                   | 2           | 1                  |     |
| 25.     | Ash Slurry Pump House                  | 2           | 1                  |     |
| 26.     | CPU Regeneration Building              | 2           | 1                  |     |
| 27.     | Raw Water Pump House                   | 2           | 1                  |     |
| 28.     | Pre Treatment Area                     | 2           | 1                  |     |

## ANNEXURE - A

| SR. No. | AREA / LOCATION           | LOUDSPEAKER | FCS<br>(ALL TYPES) | MCS      |
|---------|---------------------------|-------------|--------------------|----------|
| 29.     | Weigh Bridge              | 1           | 0                  |          |
| 30.     | SWAS Room                 | 2           | 1                  |          |
| 31.     | Compressor House          | 2           | 1                  |          |
| 32.     | Security Post             | 4           | 4                  |          |
| 33.     | Hydrogen Generation Plant | 1           | 1                  |          |
|         | <b>Total</b>              | <b>149</b>  | <b>70</b>          | <b>1</b> |



TITLE

## PUBLIC ADDRESS SYSTEM

SPECIFICATION NO. PE-TS-373-557-E001

VOLUME IIB

SECTION C

REV 0

DATE 06.02.2014

SHEET OF

**Annexure –1****DOCUMENTS/ DRAWINGS DISTRIBUTION SCHEDULE**

| S.No. | DESCRIPTION                                                               | No. hard prints/copies | No. of CD-ROMs | REMARKS |
|-------|---------------------------------------------------------------------------|------------------------|----------------|---------|
| 1     | Master List of Drgs./ Docs.                                               | 10 Copies              |                |         |
| 2     | Docs. /drgs. submission schedule for approval                             | 10 Copies              |                |         |
| 3     | Approved Docs. /Drgs. submission schedule for distribution                | 25 Copies              | 4 CD-ROMS      |         |
| 4     | Docs. /drgs. for approval (First submission)                              | 10 copies              | 4 CD-ROMS      |         |
| 5     | Drgs. / docs. for approval (Second & subsequent submission till approval) | 10 copies              | 4 CD-ROMS      |         |
| 6     | Final approval drgs. / docs. for Distribution                             | 25 Copies              | 4 CD-ROMS      |         |
| 7     | Operation & Maintenance manual for approval                               | 10 Copies              |                |         |
| 8     | Approved Operation & Maintenance Manual for distribution                  | 25 Copies              | 4 CD-ROMS      |         |
| 9     | Type Test Certificates/ Reports                                           | 10 Copies              |                |         |

## ANNEXURE-2

# SALIENT TECHNICAL PARTICULARS:

### Special Features related to Paging system

#### 1) **Digital Audio Matrix**

- a) Digital Intercom Matrices should be scalable and backwards compatible line of intercoms. It should support 8 to 1000+ users per system.
- b) It should grow linearly utilizing Time Division Multiplex (TDM) technique as users are added; the system should come as a standard with redundant power supplies, and redundant Ethernet master controllers, allowing for automatic change-over in the event of failure. The master controller should allow Ethernet connectivity between intercom and a PC running the programming software. It should support 32 simultaneous edit sessions via Ethernet and 3 sessions via serial. It should have the provision of variety of interface card as well as cabling options.
- c) It should have following Features
  - Individual cross-point level controls
  - Non-volatile configuration and cross point memory
  - Real-time, online configuration and monitoring
  - User Programmable Language for custom system configurations via pull down menus.
  - 8 GPIOs standard per frame, may be increased up to 256.
  - Multi-level IFB, ISO, Party-Lines, Groups, and GPI's all STANDARD.
  - Dual purpose ports support BOTH key panel and 4-wire audio.
  - Sizes from 8 to 1,000+ users
  - Integrated support for Intelligent Trunking of 31 matrices .
  - Supports custom cards for widely used industry interface
- d) Technical Features
  - Matrix Size: 8 - 272 ports, 4 frames cascadable
  - Matrix Type: Digital Audio,
  - TDM Bus Signal Format: 44.1 KHz, 24-bit
  - Audio Levels: +8 dBu nominal, +20 dBu max (adjustable  $\pm 20$  dB by user)

- Frequency Response at 20 dBu: Within  $\pm 1$ dB from 15Hz to 20KHz
- S/N Ratio: >85 dB A-weighted at 22dBu
- THD+N<0.005% at 22dBu, 1 KHz (unweighted)
- Trunking: Intelligent Trunking
- Input Impedance: 22K $\Omega$  Output
- Impedance: 600 $\Omega$
- Operating Temp Range: 0°C to +70°C
- Storage Temperature Range: -50°C to + 125°C
- Redundancy Power / Control Functionality
- Matrix Frame: 12¼" high, 19" EIA Rack, 20" deep
- Power: 230V  $\pm 10\%$ , 50/60 Hz, 1000VA maximum.

## **2) 4-Position Wall-Mounted Key panel**

It should have following Features

- a) Perfect for use in industrial environment especially in dust prone zones. Flush mounted into consoles, custom enclosures and walls.
- b) Compatible with Digital Intercom Matrices.
- c) Full-function intercom keys with LED indicators.
- d) Alphanumeric call waiting display with response key.
- e) Access to intercom key and setup page assignments, if required.
- f) Four-wire balanced audio input and output.
- g) Power supply- Provision should be given for 230 V AC, 50 Hz as well as 15-24 VDC, 1 amp, regulated power source.

## **3) 16-Position Color display desktop Keypanel for Main Control Room**

It should have following Features

- a) Perfect for use in industrial environment.
- b) Compatible with Digital Intercom Matrices.
- c) Full-function intercom keys with full color graphic interface.
- d) USB Port, two user-programmable buttons, one touch listen volume adjustment, backlit keypad.
- e) Full color LCD Displays and it should indicate different keypanel functions in different colors.
- f) Front panel should be flush mounted and back panel has to be optimized for future expansion.
- g) Multidirectional keys for talk, listen and emulation of traditional level control function.
- h) Allow auxiliary inputs, relays, independent digital gain control for microphone sources, configurable audio routing.

- i) The DSP Processing provision for Acoustic Echo Cancellation, Equalisation, Mixing, Filtering and metering
- j) Power supply- Provision should be given for 230 V AC, 50 Hz as well as 15-24 VDC, 1 amp, regulated power source.

#### **4) 4-Position Desktop Keypanel for other Control Room**

It should have following Features

- a) Perfect for use in industrial environment.
- b) Compatible with Digital Intercom Matrices.
- c) The unit includes built-in speaker and has to be housed in a rugged aluminum enclosure.
- d) Full-function intercom keys with LED indicators.
- e) Alphanumeric call waiting display with response key.
- f) Access to intercom key and setup page assignments, if required.
- g) Power supply- Provision should be given for 230 V AC, 50 Hz as well as 15-24 VDC, 1 amp, regulated power source.

#### **5) Interface cards**

It should have following cards:

- a) Ethernet master controller card,
- b) 16-port Analog I/O card
- c) Digital Audio Interface card
- d) Bus expander cards (Triple & Double)
- e) 16 port VoIP card
- f) 8 port VoIP Analog Interface card

#### **6) Special Software**

- a) Matrix control software,
- b) Access Management Software
- c) Configuration software
- d) Trunk edit software
- e) Trunk supervisor software
- f) Virtual key panel (should run in windows platform)

\*\*\*\*\*



TITLE

## PUBLIC ADDRESS SYSTEM

SPECIFICATION NO. PE-TS-373-557-E001

VOLUME IIB

SECTION C

REV 0

DATE 06.02.2014

SHEET OF

## ANNEXURE-3

## PA SYSTEM [LIST OF DOCUMENTS &amp; NUMBERING]

| Sl.No | BHEL DRAWING NO.   | TITLE                                             |
|-------|--------------------|---------------------------------------------------|
| 1     | PE-V0-373-557-E001 | DATA SHEET FOR PA SYSTEM                          |
| 2     | PE-V0-373-557-E002 | QUALITY PLAN FOR PA SYSTEM                        |
| 3     | PE-V0-373-557-E003 | SYSTEM DESCRIPTION WITH CABLES & EARTHING DETAILS |
| 4     | PE-V0-373-557-E004 | TEST PROCEDURES FOR PA SYSTEM                     |
| 5     | PE-V0-373-557-E005 | TYPE TEST REPORTS FOR PA SYSTEM                   |
| 6     | PE-V0-373-557-E006 | PA SYSTEM O&M MANUAL                              |
|       |                    |                                                   |
| 1     | PE-V0-373-557-E101 | GA OF CENTRAL EXCHANGE                            |
| 2     | PE-V0-373-557-E102 | GA OF MASTER CONTROL STATION                      |
| 3     | PE-V0-373-557-E103 | GA OF DESKTOP STATION                             |
| 4     | PE-V0-373-557-E104 | GA OF FIELD CALL STATION                          |
| 5     | PE-V0-373-557-E105 | GA OF PORTABLE STATION                            |
| 6     | PE-V0-373-557-E106 | GA OF 6W CONE TYPE LOUD SPEAKER                   |
| 7     | PE-V0-373-557-E107 | GA OF 15W HORN TYPE LOUD SPEAKER                  |
| 8     | PE-V0-373-557-E108 | GA OF MAIN DISTRIBUTION FRAME (MDF) 200 PAIRS     |
| 9     | PE-V0-373-557-E109 | GA OF SUB DISTRIBUTION FRAME (SDF) 20 PAIRS       |
| 10    | PE-V0-373-557-E110 | GA OF EXTENSION AMPLIFIER                         |
| 11    | PE-V0-373-557-E111 | GA OF SOUND PROTECTING (ACOUSTIC) HOOD            |
| 12    | PE-V0-373-557-E112 | GA OF CANOPY FOR FIELD STATION                    |
| 13    | PE-V0-373-557-E113 | GA OF POWER DISTRIBUTION BOX                      |
| 14    | PE-V0-373-557-E114 | GA OF POWER JUNCTION BOX                          |
| 15    | PE-V0-373-557-E115 | GA OF SIGNAL JUNCTION BOX                         |
| 16    | PE-V0-373-557-E116 | GA OF LOUDSPEAKER JUNCTION BOX                    |
| 17    | PE-V0-373-557-E117 | GA OF SOCKET FOR PORTABLE STATION                 |
|       |                    |                                                   |
| 1     | PE-V0-373-557-E301 | INTERCONNECTION DIAGRAM FOR PA SYSTEM             |
| 2     | PE-V0-373-557-E303 | CABLE LISTING FOR PA SYSTEM                       |
| 3     | PE-V0-373-557-E304 | CABLE INTERCONNECTION DETAILS FOR PA SYSTEM       |

**2x500 MW SAGARDHIGI TPP PH-II (UNIT-3&4)**  
**BOQ CUM PRICE SCHEDULE FOR PA SYSTEM**

**ANNEXURE-4(A)**

| Sl. No.               | Item Code   | Item Name                                                                                                       | UOM | Quantity | REMARKS                                                                                                                       | Unit Price (Rs)<br>(Ex-works) | Total Price (Rs) (Ex<br>Works) |
|-----------------------|-------------|-----------------------------------------------------------------------------------------------------------------|-----|----------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------|--------------------------------|
| <b>(A) MAIN ITEMS</b> |             |                                                                                                                 |     |          |                                                                                                                               |                               |                                |
| (i)                   | 557-11002-A | ACOUSTIC HOOD: FLOOR MOUNTED                                                                                    | NOS | 20       |                                                                                                                               |                               |                                |
| (ii)                  | 557-11007-A | CENTRAL EXCHANGE                                                                                                | NOS | 1        | Microprocessor controlled, digital, programmable central control unit (CCU) with PCM/TDM technology equipped for 88 stations. |                               |                                |
| (iii)                 | 557-11009-A | CONE TYPE SPEAKER - 6W                                                                                          | NOS | 25       |                                                                                                                               |                               |                                |
| (iv)                  | 557-11011-A | DESKTOP STATION (DTS)                                                                                           | NOS | 10       | Built in mic LCD display, handset, 4 LED indicators & 18 nos key board switches                                               |                               |                                |
| (v)                   | 557-11014-A | EXTENSION AMPLIFIER FOR MCS, FMS & DTS                                                                          | NOS | 16       |                                                                                                                               |                               |                                |
| (vi)                  | 557-11015-A | FIELD CALL STATION (FCS)                                                                                        | NOS | 21       |                                                                                                                               |                               |                                |
| (vii)                 | 557-11027-A | PILFERPROOF HANDSET STATION                                                                                     | NOS | 36       |                                                                                                                               |                               |                                |
| (viii)                | 557-11019-A | HORN TYPE SPEAKER - 15W                                                                                         | NOS | 128      |                                                                                                                               |                               |                                |
| (ix)                  | 557-11025-A | MASTER CONTROL STATION (MCS)                                                                                    | NOS | 6        | Built in mic LCD display, handset, 4 LED indicators & 18 nos key board switches                                               |                               |                                |
| (x)                   | 557-11029-A | POWER DISTRIBUTION BOX                                                                                          | NOS | 1        |                                                                                                                               |                               |                                |
| (xi)                  | 557-11030-A | POWER JUNCTION BOX                                                                                              | NOS | 140      |                                                                                                                               |                               |                                |
| (xii)                 | 557-11031-A | SIGNAL JUNCTION BOX                                                                                             | NOS | 9        |                                                                                                                               |                               |                                |
| (xiii)                | 557-11044-A | SUB-DISTRIBUTION FRAME (SDF) 20 PAIRS                                                                           | NOS | 7        |                                                                                                                               |                               |                                |
| (xiv)                 | 557-11042-A | WEATHER PROTECTING CANOPY FOR FCS                                                                               | NOS | 8        |                                                                                                                               |                               |                                |
| (xv)                  | 557-11016-A | FLAMEPROOF HANDSET STATION                                                                                      | NOS | 2        |                                                                                                                               |                               |                                |
| (xvi)                 | 557-11043-A | FLAMEPROOF HORN TYPE SPEAKER                                                                                    | NOS | 4        |                                                                                                                               |                               |                                |
| (xvii)                | 557-11017-A | FLAMEPROOF JUNCTION BOX                                                                                         | NOS | 4        |                                                                                                                               |                               |                                |
| (xviii)               | 557-11039-A | SPECIAL TOOLS & TACKLES (Bidder to furnish detailed list)                                                       | SET | 1        |                                                                                                                               |                               |                                |
| (xix)                 | 557-11013-A | E&C Spare (Bidder to furnish detailed list)                                                                     | SET | 1        |                                                                                                                               |                               |                                |
| (xx)                  | 557-11026-A | O&M Spare & Recommended Spare (Bidder to furnish detail list)                                                   | SET | 1        |                                                                                                                               |                               |                                |
| (xxi)                 | 557-11049-A | PA system cable (like Optic Fibre Cable or any other special cable required for the completeness of the system) | LOT | 1        |                                                                                                                               |                               |                                |
| (xxii)                | 557-11048-A | Additional item, required for completeness of system                                                            | LOT | 1        |                                                                                                                               |                               |                                |
|                       |             |                                                                                                                 |     |          |                                                                                                                               |                               |                                |
| Sl. No.               | Item Code   | Item Name                                                                                                       | UOM | Quantity |                                                                                                                               | Unit Price (Rs)               | Total Price (Rs)               |
| <b>(B) E &amp; C</b>  |             |                                                                                                                 |     |          |                                                                                                                               |                               |                                |
| (i)                   | 557-11002-C | ACOUSTIC HOOD: FLOOR MOUNTED                                                                                    | NOS | 20       |                                                                                                                               |                               |                                |
| (ii)                  | 557-11007-C | CENTRAL EXCH (MAIN) WITH INTEGRATED MDF                                                                         | NOS | 1        |                                                                                                                               |                               |                                |
| (iii)                 | 557-11009-C | CONE TYPE SPEAKER - 6W                                                                                          | NOS | 25       |                                                                                                                               |                               |                                |
| (iv)                  | 557-11011-C | DESKTOP STATION (DTS)                                                                                           | NOS | 10       |                                                                                                                               |                               |                                |
| (v)                   | 557-11014-C | EXTENSION AMPLIFIER FOR MCS, FMS & DTS                                                                          | NOS | 16       |                                                                                                                               |                               |                                |
| (vi)                  | 557-11015-C | FIELD CALL STATION (FCS)                                                                                        | NOS | 21       |                                                                                                                               |                               |                                |
| (vii)                 | 557-11027-C | PILFERPROOF HANDSET STATION                                                                                     | NOS | 36       |                                                                                                                               |                               |                                |
| (viii)                | 557-11019-C | HORN TYPE SPEAKER - 15W                                                                                         | NOS | 128      |                                                                                                                               |                               |                                |
| (ix)                  | 557-11025-C | MASTER CONTROL STATION (MCS)                                                                                    | NOS | 6        |                                                                                                                               |                               |                                |
| (x)                   | 557-11029-C | POWER DISTRIBUTION BOX                                                                                          | NOS | 1        |                                                                                                                               |                               |                                |
| (xi)                  | 557-11030-C | POWER JUNCTION BOX                                                                                              | NOS | 140      |                                                                                                                               |                               |                                |
| (xii)                 | 557-11031-C | SIGNAL JUNCTION BOX                                                                                             | NOS | 9        |                                                                                                                               |                               |                                |
| (xiii)                | 557-11044-C | SUB-DISTRIBUTION FRAME (SDF) 20 PAIRS                                                                           | NOS | 7        |                                                                                                                               |                               |                                |
| (xiv)                 | 557-11042-C | WEATHER PROTECTING CANOPY FOR FCS                                                                               | NOS | 8        |                                                                                                                               |                               |                                |
| (xv)                  | 557-11016-C | FLAMEPROOF HANDSET STATION                                                                                      | NOS | 2        |                                                                                                                               |                               |                                |



|         |             |                                                                                                                 |     |   |  |  |  |
|---------|-------------|-----------------------------------------------------------------------------------------------------------------|-----|---|--|--|--|
| (xvi)   | 557-11043-C | FLAMEPROOF HORN TYPE SPEAKER                                                                                    | NOS | 4 |  |  |  |
| (xvii)  | 557-11017-C | FLAMEPROOF JUNCTION BOX                                                                                         | NOS | 4 |  |  |  |
| (xviii) | 557-11049-C | PA system cable (like Optic Fibre Cable or any other special cable required for the completeness of the system) | LOT | 1 |  |  |  |
| (xix)   | 557-11048-C | Additional item, required for completeness of system                                                            | LOT | 1 |  |  |  |

**Notes:**

1. The unit rates of supply for all equipments quoted by the bidder shall be firm for a variation of quantities limited to:
  - a)  $\pm 20\%$  of total order value till finalization of engineering details & BOQ.
  - b)  $\pm 10\%$  of the total order value in addition to (a) above, till the completion of the job.
2. Main equipment items, which are not applicable for their system, bidder to mention in "Remarks" column and same shall appear in the unpriced copy of the bid also.
3. Design & Engineering charges shall form part of main equipment.
4. Valid reports of Type tests as applicable as per relevant standards shall be furnished, otherwise the equipment shall be type tested free of charge.
5. Bidder must indicate the make and model number for each item.
6. The unit rates of installation (E & C) for all equipments quoted by the bidder shall be firm for a variation of quantities limited to  $\pm 30\%$  of total order value till the completion of job at site.
7. Supply fabrication & painting of support structure for PA system equipment shall be in bidder's scope.
8. Supply, termination & laying of any cables (E.g Fibre Optic, Control Cable, ethernet cable, etc) required for the PA system shall be in bidder's scope.
9. Bidder to furnish under Sl. No (A) (xxi) & (B) (xviii) of the BOQ, the list of type of cables for PA system like Fibre Optic Cable, control cable or any other cable required for the completeness of the system and quantity of the same shall be worked out using the plot plan (refer Annexure-5) and accordingly lump sum amount shall be quoted against the same. No additional amount shall be paid to bidder for any further additional requirement of cable by bidder.
10. Bidder to furnish under Sl. No (A) (xxii) & (B) (xix) of the BOQ, list of additional item required for the completeness of the system and accordingly lump sum amount shall be quoted against the same. No additional amount shall be paid to bidder for any further additional requirement.
11. Instruments required for testing & commissioning shall be arranged by the bidder & shall be taken back after completion of E&C
12. Supply & installation of external equipment earthing shall be in BHEL scope.
13. Bidder to furnish list of following items along with unit price of each item with their bid
  - a E&C Spare
  - b O&M Spare (Recommended Spare)
  - c Special Tools & Tackles









|       |                                                         |  |  |                   |                    |                 |
|-------|---------------------------------------------------------|--|--|-------------------|--------------------|-----------------|
| TITLE | Technical Specification<br>for<br>PUBLIC ADDRESS SYSTEM |  |  | SPECIFICATION NO. | PE-SS-999-557-E001 |                 |
|       |                                                         |  |  | VOLUME            | II B               |                 |
|       |                                                         |  |  | SECTION           | D                  |                 |
|       |                                                         |  |  | REV               | 1                  | DATE 06/02/2014 |
|       |                                                         |  |  | SHEET             | 1                  | OF 26           |

*PUBLIC ADDRESS SYSTEM*

*SPECIFICATION NO. PE-TS-999-557-E001, Rev. 1*

## Datasheet A

### RATINGS & REQUIREMENTS

#### 1.0 AMPLIFIER

|     |                    |   |                                                 |
|-----|--------------------|---|-------------------------------------------------|
| 1.1 | Frequency response | : | 200 - 8000 Hz $\pm$ 3 db                        |
| 1.2 | Hum & noise level  | : | - 50 db                                         |
| 1.3 | Control provisions |   |                                                 |
|     | Power amplifier    | : | Volume & tone                                   |
|     | Pre-amplifier      | : | Transmit/receive volume & antiside tone control |

#### 2.0 RE-ENTRANT SPEAKER

|     |                         |   |                          |
|-----|-------------------------|---|--------------------------|
| 2.1 | Bell diameter           | : | 250 mm                   |
| 2.2 | Power handling capacity |   |                          |
|     | a) RMS                  | : | 15 W                     |
|     | b) Peak                 | : | 25 W                     |
| 2.3 | SPL at 1 kHz & 1 m      | : | 107 db/W                 |
| 2.4 | Frequency response      | : | 300 - 5000 Hz $\pm$ 3 db |

#### 3.0 CONE TYPE SPEAKER

|     |                         |   |                           |
|-----|-------------------------|---|---------------------------|
| 3.1 | Bell diameter           | : | 150 mm                    |
| 3.2 | Power handling capacity |   |                           |
|     | a) RMS                  | : | 6 W                       |
|     | b) Peak                 | : | 15 W                      |
| 3.3 | SPL at 1 kHz & 1 m      | : | 80 db/W                   |
| 3.4 | Frequency response      | : | 100 - 10000 Hz $\pm$ 3 db |

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## Datasheet A

### POWER SUPPLY

#### 1.0 SYSTEM VOLTAGE

Communication system shall be designed for satisfactory operation from the following power supply :

Normal A.C. Supply : 415 Volt, 3 Phase, 50 Hz, 4 wire effectively grounded system.

UPS Supply : 240 Volt, 1 Phase, 50 Hz.

#### 2.0 PERMISSIBLE VARIATION

Communication equipment and accessories shall be suitable for operation over the entire range of voltage/frequency variation as listed below :

Normal A.C. Supply/ : Voltage $\pm$  10%  
UPS Supply  
Frequency $\pm$  5%  
Combined  
Volt + Freq. 10% (absolute sum)

#### 3.0 SUPPLY POINT

2.1 These Power supplies are to be made available by Contractor at Master Control Station. The Master Control Station shall be provided with necessary arrangements by Contractor for automatic changeover from normal AC to UPS Supply, in case of normal AC supply failure and vice versa after restoration of normal AC supply.

2.2 Necessary contacts shall be provided and wired up to terminal blocks at Master Control Station for "PA System AC Supply Normal" and "PA system supply changeover Operated" alarm.

2.3 There should be common and dedicated power supply for the power source of the entire communication system distributed through fuse isolations in grouped routes. This is required to avoid outage of the entire system in case of fault in a particular power cable route.

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TITLE

## PUBLIC ADDRESS SYSTEM

SPECIFICATION NO. PE-TS-373-557-E001

VOLUME IIB

SECTION C

REV 0

DATE 06.02.2014

SHEET 1 OF 10

**DATA SHEET - C**

| S.NO. | DESCRIPTION                                                                                                   | UNIT              | PARTICULARS                                                            |
|-------|---------------------------------------------------------------------------------------------------------------|-------------------|------------------------------------------------------------------------|
| 1.0   | SYSTEM DESIGN DATA                                                                                            |                   |                                                                        |
| 1.1   | Design ambient temperature :                                                                                  | °C                |                                                                        |
| 2.0   | APPLICABLE STANDARDS                                                                                          |                   |                                                                        |
| 2.1   | Whether all standards specified in Annexure I of Data Sheet A followed :                                      |                   | <input type="checkbox"/> Yes <input type="checkbox"/> No               |
| 3.0   | COMPLETE SYSTEM REQUIREMENTS                                                                                  |                   |                                                                        |
| a)    | Frequency response :                                                                                          | Hz                |                                                                        |
| b)    | Hum & noise level or signal to noise level :                                                                  |                   |                                                                        |
| 4.0   | SCOPE OF SYSTEM DESIGN ENGINEERING :                                                                          |                   | <input type="checkbox"/> Included<br><input type="checkbox"/> Excluded |
| 5.0   | POWER SUPPLY                                                                                                  |                   |                                                                        |
| 5.1   | Whether the system suitable for operation for power supply details given in specification and Data Sheet A. : |                   | <input type="checkbox"/> Yes <input type="checkbox"/> No               |
| 5.2   | Power supply requirement at : 240V AC                                                                         | kVA               |                                                                        |
| 6.0   | CONSTRUCTIONAL REQUIREMENTS                                                                                   |                   |                                                                        |
| 6.1   | AMPLIFIERS :<br>Speaker<br>(To be furnished separately for each type of amplifier)                            | Pre-<br>Amplifier | Line<br>Amplifier<br>Loud<br>Amplifier                                 |
| a)    | Name of the manufacturer :                                                                                    |                   |                                                                        |
| b)    | Type and manufacturer's catalogue no. :                                                                       |                   |                                                                        |
| c)    | Power supply details :                                                                                        |                   |                                                                        |



TITLE

## PUBLIC ADDRESS SYSTEM

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- d) Full load consumption(VA) :
- e) Rated load/ (W/Ohm):  
output impedance
- f) Max. ambient conditions :
- g) Output voltage (V) :
- h) Frequency response (Hz) :
- i) Total harmonic (%):
- j) Noise level (db) :
- k) Power band width (Hz):
- l) Construction :
- m) Controls provided
- i. Cont. variable : ☐ Yes ☐ No  
volume control
- ii. Standby and idle : ☐ Yes ☐ No  
time power supply  
cut-off arrangement  
arrangement
- iii. Bass & treble : ☐ Yes ☐ No  
control
- n) Sensitivity w.r.t. (mV):  
nominal output
- o) Output connections :
- p) Indications :

## 6.2 HANDSETS

## 6.2.1 Master Handset Station(s)

- a) Name of the manufacturer :
- b) Type and manufacturer's :  
catalogue no.
- c) Material :
- d) Degree of protection :
- e) Surface treatment :



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- f) Whether all features : ☐ Yes ☐ No  
provided on master  
handset station as per  
specification requirements
- g) Type of circuit :  
protection
- h) Mounting arrangement :
- i) Dimensions (L\*D\*H) : mm
- j) Weight : kg

6.2.2 HANDSETS (To be furnished  
separately for each type)

Outdoor/ Indoor  
Indoor desk mtd.  
Wall mtd.

- a) Name of the manufacturer :
- b) Type and manufacturer's :  
catalogue no.
- c) Material :
- d) Impedance of the : Ohm  
transmitter
- e) Frequency response of : Hz  
the transmitter
- f) Impedance of the receiver : Ohm
- g) Receiver output : mV
- h) Receiver frequency : Hz  
response
- i) Details of provision for :  
noise cancellation features
- j) Details of provision for :  
directional features
- k) Whether all features : ☐ Yes ☐ No  
provided on handset  
station as per  
specification requirements
- l) Degree of protection :
- m) Surface treatment :





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n) Mounting :

o) Dimension with control box (L\*D\*H) : mm

p) Weight : kg

## 6.3 LOUDSPEAKERS (To be furnished separately for each type)

Reentrant Cone

a) Name of the manufacturer :

b) Type and manufacturer's catalogue no. :

c) Material :

d) Degree of protection :

e) Surface treatment

i. Exterior surface :

ii. Interior surface :

f) Impedance matching volts (Transformer details) : Ohm

g) Output power

i. rms : Watt

ii. Peak : Watt

h) Frequency response : Hz

i) Cut-off frequency : Hz

j) Sound level at 1000 Hz db/watt mtr. distance :

k) Controls provided :

l) Bell diameter : mm

m) Acoustic length : mm

n) Dispersion angle : Deg.

o) Speaker diameter : mm



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p) Weight : kg

## 6.4 MAIN DISTRIBUTION BOX

- a) Name of the manufacturer :
- b) Type :
- c) Construction :
- d) Material :
- e) Sheet steel thickness : mm
- f) Number of ways :
- g) Degree of protection :
- h) Surface treatment :
- i) Dimensions (L\*D\*H) : mm

## 6.5 JUNCTION BOX (to be furnished separately for each type)

JB-1 JB-2 JB-3

- a) Name of the manufacturer :
- b) Type :
- c) Construction :
- d) Material :
- e) Sheet steel thickness : mm
- f) Number of ways :
- g) Degree of protection :
- h) Surface treatment :
- i) Dimensions (L\*D\*H) : mm

## 6.6 COMMON REQUIREMENTS OF VARIOUS EQUIPMENTS

## 6.6.1 Surface Treatment

- a) If painted;
  - i. Application :



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ii. Colour of paint

1. Inside :

2. Outside :

iii. Minimum thickness : microns

b) If galvanized;

i. Method :

ii. Applicable Standard :

iii. Minimum thickness : microns  
of zinc deposit on  
all pointsiv. Weight of zinc :  $g/m^2$ 

## 6.6.2 Labels

a) Material : ☐ Anodised Aluminium  
☐ Stainless Steel

## 6.6.3 Earthing

a) Name of the manufacturer :

b) Type :

c) Size : mm

d) Details of earthing arrangement :

## 7.0 OTHER MAJOR EQUIPMENTS OF SUPPLY

7.1 CABLES (To be furnished  
separately for each type of  
cable)

7.1.1 Applicable Standard

IS:1554 Part 1 & IS:694 :  
(In general)☐ Yes ☐ No

7.1.2 Name of the manufacturer for

a) Power cable :



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- b) Signal cable :
- c) Loud Speaker cable :

## 7.1.3 Whether FRLS type cable provided for

- a) Power cable : ☐ Yes ☐ No
- b) Signal & loud speaker: cable ☐ Yes ☐ No

## 7.1.4 Voltage Grade for

- a) Power cable : Volts
- b) Signal & loud speaker: cable Volts

## 7.1.5 Conductor

- a) Material
  - i. Power cable :
  - ii. Signal & loud : speaker cable
- b) No. of pairs/cores, conductor cross sectional area, no. of strands and dia. of each strand for
  - i. Power cable :
  - ii. Signal cable :
  - iii. Loud Speaker cable :

## 7.1.6 Insulation

- a) Material :
- b) Application :
- c) Volume resistivity :

## 7.1.7 Identification of cores/pairs

- a) Power cables, Control cables upto 5 core &



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## Paired cables

- b) Control cables above :  
5 core

## 7.1.8 Paired cables

- a) Min. number of twists per :  
metre for paired cables

## 7.1.9 Inner sheath

- a) Material : ☐ Type ST1  
☐ Type ST2
- b) Whether FRLS : ☐ Yes ☐ No
- c) Fillers provided :
- d) Material of filler :
- e) Method of application
- i. with fillers : ☐ Pressure Extruded  
☐ Vacuum Extruded
- ii. without fillers :

## 7.1.10 Armour :

## 7.1.11 Outer sheath

- a) Material : ☐ Type ST1  
☐ Type ST2
- b) Application :
- c) Colour :

## 7.1.12 Characteristics of FRLS sheath

- a) Oxygen index (min.) :
- b) Temp. index (min.) :
- c) Acid gas generation :  
(max.)
- d) Smoke density rating :  
(max.)

7.1.13 Progressive sequential length : ☐ Yes ☐ No



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marking provided on outer  
sheath

## 7.2 CONDUITS

- a) Name of the manufacturer :
- b) Type :
- c) Gauge :
- d) Size : mm

## 7.3 ITEMS OF SUPPLY FOR CABLING INSTALLATION WORK

## 7.3.1 Cable Glands

- a) Type : ☐ Single compression  
☐ Double compression
- b) Whether Nickel plating done : ☐ Yes ☐ No

## 8.0 LIST OF SPARES (Bidder to furnish the lists)

- a) Start Up Spares list enclosed : ☐ Yes ☐ No
- b) O&M Spares list enclosed : ☐ Yes ☐ No

## 9.0 DOCUMENTATION

Whether following documents enclosed :

- a) Full description and design of the equipment: ☐ Yes ☐ No and its operation.
- b) Dimensional and mounting details of all equipments. : ☐ Yes ☐ No
- c) General arrangement drawings for handset : ☐ Yes ☐ No station (all types), loud speakers (all types), JB's, Auto changeover Box, distribution box etc.
- d) Auto changeover switching scheme. : ☐ Yes ☐ No
- e) Bill of quantities of cables, JB boxes, : ☐ Yes ☐ No



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conduits etc.

- f) Detailed write up on the method of testing. : ☐ Yes ☐ No
- g) Copies as specified in Section C of all test certificates for the tests actually conducted on the equipment. : ☐ Yes ☐ No
- h) Final Quality Plan (enclosed in Vol III) : ☐ Yes ☐ No
- i) Field quality plan : ☐ Yes ☐ No



**TECHNICAL SPECIFICATION FOR  
PUBLIC ADDRESS SYSTEM**

**1X250 MW DURGAPUR UNIT-8 EXTN.**

**SPECIFICATION NO. PE-TS-360-557-E001**


**VOLUME II B**


**SECTION**


**REVISION 0    DATE 06.02.2014**

**QUALITY PLAN**



|  |                              | ANNEXURE-I                                                                                                                                                      |             | CUSTOMER:              |                 | PROJECT :                                         |                              |                  | SPECIFICATION : PE-TS-373-557-E001                            |   |            |                                                          |                |  |
|-----------------------------------------------------------------------------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------|-----------------|---------------------------------------------------|------------------------------|------------------|---------------------------------------------------------------|---|------------|----------------------------------------------------------|----------------|--|
|                                                                                   |                              | QUALITY PLAN                                                                                                                                                    |             | BIDDER/ :              |                 | TITLE                                             |                              |                  | NUMBER :                                                      |   |            |                                                          |                |  |
|                                                                                   |                              | SHEET 1 OF 3                                                                                                                                                    |             | VENDOR                 |                 | QUALITY PLAN<br>NUMBER : PED-557-00-Q-001, REV 02 |                              |                  | SPECIFICATION: TECHNICAL SPECIFICATION FOR<br>TITLE PA SYSTEM |   |            |                                                          |                |  |
|                                                                                   |                              |                                                                                                                                                                 |             | SYSTEM : COMMUNICATION |                 | ITEM : PUBLIC ADDRESS SYSTEM                      |                              |                  | SECTION                                                       |   | VOLUME III |                                                          |                |  |
| SL. NO.                                                                           | COMPONENT/OPERATION          | CHARACTERISTICS CHECK                                                                                                                                           | CAT.        | TYPE/METHOD OF CHECK   | EXTENT OF CHECK | REFERENCE DOCUMENT                                | ACCEPTANCE NORM              | FORMAT OF RECORD | AGENCY                                                        |   |            | REMARKS                                                  |                |  |
| 1                                                                                 | 2                            | 3                                                                                                                                                               | 4           | 5                      | 6               | 7                                                 | 8                            | 9                | 10                                                            | P | W          | V                                                        | 11             |  |
| 1.0                                                                               | CENTRAL EXCHANGE             | 1. AESTHETIC                                                                                                                                                    | MA          | VISUAL                 | 100%            | APPD. DWG.                                        | APPD. DWG.<br>INSP. REPT.    | INSP. REPT.      | 3/2                                                           | 1 | 1          | BHEL witness voltage level at minimum 5 points randomly. |                |  |
|                                                                                   |                              | 2. MECHANICAL                                                                                                                                                   | MA          | DIMENSION              | 100%            | APPD. DWG.                                        | APPD. DWG.<br>INSP. REPT.    | INSP. REPT.      | 3/2                                                           | 1 | 1          |                                                          |                |  |
|                                                                                   |                              | 3. ELECTRICAL<br>-Rated input voltage<br>-Rated output voltage                                                                                                  | MA          | ELECTRICAL             | 100%            | APPD. TTP                                         | APPD. TTP                    | INSP. REPT.      | 3/2                                                           | 1 | 1          |                                                          |                |  |
|                                                                                   | ELECTRONIC MODULE            | 4. Burn in test at 50 °C for 48 hours in energised condition.                                                                                                   | MA          | ELECTRICAL             | 100%            | APPD. TTP                                         | APPD. TTP                    | INSP. REPT.      | 3/2                                                           | 1 | 1          |                                                          |                |  |
| 2.0                                                                               | MASTER CONTROL STATION (MCS) | 1. AESTHETIC                                                                                                                                                    | MA          | VISUAL                 | 100%            | APPD. DWG.                                        | APPD. DWG.<br>INSP. REPT.    | INSP. REPT.      | 3/2                                                           | 1 | 1          |                                                          |                |  |
|                                                                                   |                              | 2. MECHANICAL                                                                                                                                                   | MA          | DIMENSION              | 100%            | APPD. DWG.                                        | APPD. DWG.<br>INSP. REPT.    | INSP. REPT.      | 3/2                                                           | 1 | 1          |                                                          |                |  |
|                                                                                   |                              | 3. ELECTRICAL<br>-Input sensitivity at 1KHz<br>-Rated input voltage<br>-Rated output voltage<br>-THD at 1 KHz.<br>-Frequency Response<br>-Signal to Noise Ratio | MA          | ELECTRICAL             | 100%            | APPD. TTP<br>APPD. DATASHEET                      | APPD. TTP<br>APPD. DATASHEET | INSP. REPT.      | 3/2                                                           | 1 | 1          |                                                          |                |  |
|                                                                                   | ELECTRONIC MODULE            | 4. Burn in test at 50 °C for 48 hours in energised condition.                                                                                                   | MA          | ELECTRICAL             | 100%            | APPD. TTP                                         | APPD. TTP                    | INSP. REPT.      | 3/2                                                           | 2 | 1          |                                                          |                |  |
| BHEL                                                                              |                              |                                                                                                                                                                 | PARTICULARS |                        |                 | BIDDER/VENDOR                                     |                              |                  | 1: BHEL and / or Customer                                     |   |            |                                                          | P:Perform      |  |
|                                                                                   |                              |                                                                                                                                                                 | NAME        |                        |                 |                                                   |                              |                  | 2: Vendor                                                     |   |            |                                                          | W:Witness      |  |
|                                                                                   |                              |                                                                                                                                                                 | SIGNATURE   |                        |                 |                                                   |                              |                  | 3: Sub-vendor of vendor                                       |   |            |                                                          | V:Verification |  |
|                                                                                   |                              |                                                                                                                                                                 | DATE        |                        |                 | BIDDER'S/VENDORS COMPANY SEAL                     |                              |                  |                                                               |   |            |                                                          |                |  |

|                                                                                   |                                      |                                                                                                                                                           |             |                        |                 |                               |                            |                  |                                    |   |   |                                                                    |
|-----------------------------------------------------------------------------------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------|-----------------|-------------------------------|----------------------------|------------------|------------------------------------|---|---|--------------------------------------------------------------------|
|  |                                      | ANNEXURE-I                                                                                                                                                |             | CUSTOMER:              |                 | PROJECT :                     |                            |                  | SPECIFICATION : PE-TS-373-557-E001 |   |   |                                                                    |
|                                                                                   |                                      | QUALITY PLAN                                                                                                                                              |             | BIDDER/ :              |                 | TITLE                         |                            |                  | NUMBER :                           |   |   |                                                                    |
|                                                                                   |                                      | SHEET 2 OF 3                                                                                                                                              |             | SYSTEM : COMMUNICATION |                 | ITEM : PUBLIC ADDRESS SYSTEM  |                            |                  | SECTION                            |   |   |                                                                    |
|                                                                                   |                                      |                                                                                                                                                           |             |                        |                 |                               |                            |                  | VOLUME III                         |   |   |                                                                    |
| SL. NO.                                                                           | COMPONENT/OPERATION                  | CHARACTERISTICS CHECK                                                                                                                                     | CAT.        | TYPE/METHOD OF CHECK   | EXTENT OF CHECK | REFERENCE DOCUMENT            | ACCEPTANCE NORM            | FORMAT OF RECORD | AGENCY                             |   |   | REMARKS                                                            |
|                                                                                   |                                      |                                                                                                                                                           |             |                        |                 |                               |                            |                  | P                                  | W | V |                                                                    |
| 1                                                                                 | 2                                    | 3                                                                                                                                                         | 4           | 5                      | 6               | 7                             | 8                          | 9                | 10                                 |   |   | 11                                                                 |
| 3.0                                                                               | CONE TYPE SPEAKER, HORN LOUD SPEAKER | 1. AESTHETIC                                                                                                                                              | MA          | VISUAL                 | 100%            | APPD. DWG.                    | APPD. DWG. INSP. REPT.     | INSP. REPT.      | 3/2                                | 1 | 1 | BHEL witness on 5 sample selected at random of each type per Lot.  |
|                                                                                   |                                      | 2. MECHANICAL                                                                                                                                             | MA          | DIM.                   | 100%            | APPD. DWG.                    | APPD. DWG. INSP. REPT.     | INSP. REPT.      | 3/2                                | 1 | 1 |                                                                    |
|                                                                                   |                                      | 3. ELECTRICAL -DC Resistance                                                                                                                              | MA          | ELECTRICAL             | 100%            | IS 9302 Part IV APPD. TTP     | APPD. DATA SHEET APPD. TTP | INSP. REPT.      | 3/2                                | 1 | 1 |                                                                    |
|                                                                                   |                                      | 4. FUNCTIONAL TEST - SPL at rated output - Sweep test response                                                                                            | MA          | ELECTRICAL             | 100%            | IS 9302 Part IV APPD. TTP     | APPD. DATA SHEET APPD. TTP | INSP. REPT.      | 3/2                                | 1 | 1 |                                                                    |
| 4.0                                                                               | HANDSET AND DESKTOP STATION          | 1. AESTHETIC                                                                                                                                              | MA          | VISUAL                 | 100%            | APPD. DWG.                    | APPD. DWG. INSP. REPT.     | INSP. REPT.      | 3/2                                | 1 | 1 | BHEL witness on 5 samples selected at random of each type per Lot. |
|                                                                                   |                                      | 2. MECHANICAL                                                                                                                                             | MA          | DIM.                   | 100%            | APPD. DWG.                    | APPD. DWG. INSP. REPT.     | INSP. REPT.      | 3/2                                | 1 | 1 |                                                                    |
|                                                                                   |                                      | 3. ELECTRICAL -Rated input voltage -Rated output voltage -THD at 1 KHz. -Frequency Response -Signal to Noise Ratio -Input impd. at 1 KHz                  | MA          | ELECTRICAL             | 100%            | APPD. DATASHEET APPD. TTP     | APPD. DATA SHEET APPD. TTP | INSP. REPT.      | 3/2                                | 1 | 1 |                                                                    |
| 5.0                                                                               | EXTENSION AMPLIFIER                  | 1. AESTHETIC                                                                                                                                              | MA          | VISUAL                 | 100%            | APPD. DWG.                    | APPD. DWG. INSP. REPT.     | INSP. REPT.      | 3/2                                | 1 | 1 | BHEL witness on 3 samples selected at random.                      |
|                                                                                   |                                      | 2. MECHANICAL                                                                                                                                             | MA          | DIMENSION              | 100%            | APPD. DWG.                    | APPD. DWG. INSP. REPT.     | INSP. REPT.      | 3/2                                | 1 | 1 |                                                                    |
|                                                                                   |                                      | 3. ELECTRICAL -Input sensitivity at 1KHz -Rated output power -THD at 1 KHz -Frequency Response -Signal to Noise Ratio -Input impd. at 1 KHz -IR & HV Test | MA          | ELECTRICAL             | 100%            | IS(9302) Part II APPD. TTP    | APPD. DATA SHEET APPD. TTP | INSP. REPT.      | 3/2                                | 1 | 1 |                                                                    |
| BHEL                                                                              |                                      |                                                                                                                                                           | PARTICULARS |                        |                 | BIDDER/VENDOR                 |                            |                  | 1: BHEL and / or Customer          |   |   | P:Perform                                                          |
|                                                                                   |                                      |                                                                                                                                                           | NAME        |                        |                 |                               |                            |                  | 2: Vendor                          |   |   | W:Witness                                                          |
|                                                                                   |                                      |                                                                                                                                                           | SIGNATURE   |                        |                 |                               |                            |                  | 3: Sub-vendor of vendor            |   |   | V:Verification                                                     |
|                                                                                   |                                      |                                                                                                                                                           | DATE        |                        |                 | BIDDER'S/VENDORS COMPANY SEAL |                            |                  |                                    |   |   |                                                                    |

|                                                     |                                                                                                                                                            | ANNEXURE-I                                                           |                        | CUSTOMER:                            |                              |                                                             | PROJECT :                                                                                       |                                                   |                           | SPECIFICATION : PE-TS-373-557-E001                            |                     |                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------|--------------------------------------|------------------------------|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------|---------------------------|---------------------------------------------------------------|---------------------|------------------------------------------------------------------------------|
|                                                                                                                                      |                                                                                                                                                            | QUALITY PLAN                                                         |                        | BIDDER/ :                            |                              |                                                             | TITLE                                                                                           |                                                   |                           | NUMBER :                                                      |                     |                                                                              |
|                                                                                                                                      |                                                                                                                                                            | SHEET 3 OF 3                                                         |                        | VENDOR                               |                              |                                                             | QUALITY PLAN<br>NUMBER : PED-557-00-Q-001, REV 02                                               |                                                   |                           | SPECIFICATION: TECHNICAL SPECIFICATION FOR<br>TITLE PA SYSTEM |                     |                                                                              |
|                                                                                                                                      |                                                                                                                                                            | SYSTEM : COMMUNICATION                                               |                        |                                      | ITEM : PUBLIC ADDRESS SYSTEM |                                                             |                                                                                                 | SECTION                                           |                           |                                                               | VOLUME III          |                                                                              |
| SL. NO.                                                                                                                              | COMPONENT/OPERATION                                                                                                                                        | CHARACTERISTICS CHECK                                                | CAT.                   | TYPE/<br>METHOD OF CHECK             | EXTENT OF CHECK              | REFERENCE DOCUMENT                                          | ACCEPTANCE NORM                                                                                 | FORMAT OF RECORD                                  | AGENCY                    |                                                               |                     | REMARKS                                                                      |
|                                                                                                                                      |                                                                                                                                                            |                                                                      |                        |                                      |                              |                                                             |                                                                                                 |                                                   | P                         | W                                                             | V                   |                                                                              |
| 1                                                                                                                                    | 2                                                                                                                                                          | 3                                                                    | 4                      | 5                                    | 6                            | 7                                                           | 8                                                                                               | 9                                                 | 10                        |                                                               |                     | 11                                                                           |
| 6.0                                                                                                                                  | POWER DISTRIBUTION BOX, LOUD SPEAKER JB, POWER JB, SIGNAL JB, MAIN DISTRIBUTION FRAME (MDF), SUB DISTRIBUTION FRAME (SDF), SOCKET BOX FOR PORTABLE STATION | 1. AESTHETIC<br><br>2. MECHANICAL<br><br>3. HV / IR                  | MA<br><br>MA<br><br>MA | VISUAL<br><br>DIM.<br><br>ELECTRICAL | 100%<br><br>100%<br><br>100% | APPD. DWG.<br><br>APPD. DWG.<br><br>APPD. DWG.<br>APPD. TTP | APPD. DWG.<br>INSP. REPT.<br><br>APPD. DWG.<br>INSP. REPT.<br><br>APPD. DATA SHEET<br>APPD. TTP | INSP. REPT.<br><br>INSP. REPT.<br><br>INSP. REPT. | 3/2<br><br>3/2<br><br>3/2 | 1<br><br>1<br><br>1                                           | 1<br><br>1<br><br>1 | BHEL witness on 5% sample selected at random of each type per Lot.           |
| 7.0                                                                                                                                  | WEATHER PROTECTING CANOPY& SOUND PROTECTING HOOD                                                                                                           | 1. AESTHETIC<br><br>2. MECHANICAL                                    | MA<br><br>MA           | VISUAL<br><br>DIM.                   | 100%<br><br>100%             | APPD. DWG.<br><br>APPD. DWG.                                | APPD. DWG.<br><br>APPD. DWG.                                                                    | INSP. REPT.<br><br>INSP. REPT.                    | 3/2<br><br>3/2            | 1<br><br>1                                                    | 1<br><br>1          | BHEL witness on 3 sample selected at random of each type per Lot.            |
| 8.0                                                                                                                                  | INTEGRATED TESTING ON PA SYSTEM                                                                                                                            | FUNCTION<br>-Party call<br>-Paging call<br>-Busy tone<br>-Alert tone | MA                     | VISUAL                               | 100%                         | APPD. TTP                                                   | APPD. TTP                                                                                       | INSP. REPT.                                       | 3/2                       | 1                                                             | 1                   | BHEL to witness on 5 no. of stations or min 5% connected to central exchange |
| 9.0                                                                                                                                  | TYPE TEST                                                                                                                                                  |                                                                      |                        |                                      |                              |                                                             |                                                                                                 | REPORT                                            |                           |                                                               |                     | Enclosed as Annexure-A                                                       |
| NOTE: CONDUCTION OF TYPE TEST/ SUBMISSION OF AVAILABLE VALID TYPE TEST REPORTS ON PA SYSTEM EQUIPMENT SHALL BE AS PER SPECIFICATION. |                                                                                                                                                            |                                                                      |                        |                                      |                              |                                                             |                                                                                                 |                                                   |                           |                                                               |                     |                                                                              |
|                                                                                                                                      |                                                                                                                                                            |                                                                      | PARTICULARS            |                                      |                              | BIDDER/VENDOR                                               |                                                                                                 |                                                   | 1: BHEL and / or Customer |                                                               |                     | P:Perform                                                                    |
| BHEL                                                                                                                                 |                                                                                                                                                            |                                                                      | NAME                   |                                      |                              |                                                             |                                                                                                 |                                                   | 2: Vendor                 |                                                               |                     | W:Witness                                                                    |
|                                                                                                                                      |                                                                                                                                                            |                                                                      | SIGNATURE              |                                      |                              |                                                             |                                                                                                 |                                                   | 3: Sub-vendor of vendor   |                                                               |                     | V:Verification                                                               |
|                                                                                                                                      |                                                                                                                                                            |                                                                      | DATE                   |                                      |                              | BIDDER'S/VENDORS COMPANY SEAL                               |                                                                                                 |                                                   |                           |                                                               |                     |                                                                              |

LIST OF TYPE TEST FOR PUBLIC ADDRESS SYSTEM

| S No | Equipment                            | Type test description                                                                                                                                                 | Referred standard              |
|------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| 1    | Central Exchange                     | • High frequency radiated magnetic field test                                                                                                                         | IEC 61000-4-3                  |
|      |                                      | • Electrostatic discharge test                                                                                                                                        | IEC 61000-4-2                  |
|      |                                      | • Susceptibility test                                                                                                                                                 | IEC 61000-4-6                  |
|      |                                      | • Vibration test                                                                                                                                                      | IEC 68-2-6                     |
|      |                                      | • Dry heat & damp heat test                                                                                                                                           | IEC 68-2-2                     |
|      |                                      | • Surge protection test                                                                                                                                               | IEC 61000-4-5                  |
| 2    | Field call stations,<br>Junction box | DOP test (dust test & water test)                                                                                                                                     | IS: 13947                      |
| 3    | Cone type speaker                    | Sound pressure level (SPL) before & after DOP test (dust test & water test)                                                                                           | IS: 13947                      |
| 4    | Horn type speaker                    | • Sound pressure level (SPL) before & after DOP test (dust test & water test)                                                                                         | IS: 13947                      |
|      |                                      | • Frequency response test<br>• Sound pressure level (SPL) test<br>• Impedance test<br>• Dry heat & damp heat test                                                     | IS: 9302 Part-IV               |
| 5    | Industrial station                   | • Dry heat & damp heat test<br>• Vibration test<br>• Electrostatic discharge test<br>• Electromagnetic immunity test<br>• Surge protection test<br>• RF immunity test | AS PER<br>RELEVANT<br>STANDARD |
| 6    | Amplifier                            | • Frequency response test<br>• Power output test<br>• Signal to noise ratio test<br>• Distortion test<br>• Surge protection test                                      | IS: 9302 Part-II               |