

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 27.06.2012

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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.

Section – D: This section comprises of Technical Specifications of equipment complete with Data Sheet A and Data Sheet C.

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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SECTION – ‘A’

SCOPE OF ENQUIRY



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SCOPE OF ENQUIRY

1. This specification covers 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 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. The offer should be complete with technical data, catalogue, brochures and drawings as applicable.
6. 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.
7. The documents shall be in English language and MKS system of units.
8. Bidder shall quote for all type of PA system items as per specification, failing which their offer shall be rejected.
9. 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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PROJECT INFORMATION



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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:

- a) Design ambient dry bulb : 50 °C maximum, 5 °C minimum temperature
- b) Maximum relative humidity : 84%
- c) Average relative humidity : 73%
- d) Highest wet bulb temp. : 26.9 °C
- e) Average annual rainfall : 1389 MM
- f) Seismic zone : Zone-III as per IS-1893 latest revision
- g) 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.
- h) Altitude : 34M above MSL.



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SPECIFIC TECHNICAL REQUIREMENT

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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.

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- 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.

SECTION-C

- b) Cables, Wires, splicing/termination/connection accessories.
 - c) Conduits and accessories, junction and pull boxes, terminal blocks, sockets.
 - d) 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 shall be studied for estimation of cable etc for the system. Training to be provided to Owner's personnel for maintenance.
- 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

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- 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 in-built 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 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.
- 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.

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- 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.

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- 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. 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

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- 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

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- 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 IP-54.

Equipment for outdoor use shall be weatherproof type, conforming to IPW-55.

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.

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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 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 pump 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 Handset shall be provided with proper noise canceling feature and anti-side tone control. Performance of handset shall be satisfactory without using acoustic booth even in high noise level areas.
 - 5.02.04 Handset shall be mounted on or within control box complete with all electronics, switches, indications and controls.
 - 5.02.05 Each handset station shall be provided with junction-box which shall be located below for looping in and out of the cables.
 - 5.02.06 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 die cast aluminium horn, 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 The outside plant cabling shall consist of the following :
 - a. Single Mode Multi Core: 6 Strand Fibre Optic Cable.
 - b. 20/10/2 pair ,.6mm twisted pair telephone cable.
 - 5.04.02 Cables shall be installed as follows;

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- 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 all buildings will be fully interconnected with Single Mode and Multi Mode fibre optic cable.

5.04.05 All intercommunication cables like signal, loudspeaker and control cables shall 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 confirming to IS 1554 as revised and amended up-to-date.

5.04.06 Power cable (Mains cable) shall be 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 Conductor size and no. of pairs/cores shall be chosen to suit the application. However, minimum conductor size for main cable shall be 2.5 mm² stranded copper.

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 ***Fiber Optic Cable***

Fiber 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

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PARAMETER		SPECIFICATION
01.	Nominal Cable Size	70 mm ² to 100 mm ²
02.	Fiber Count	12 to 144
03.	Core Covering	Non-hygroscope 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

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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.

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- 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 JUNCTION BOXES AND ENCLOSURES,

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

5.06.03 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 MANDATORY 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.

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- 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.

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- 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.

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- 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, if so desired by Owner, shall be furnished. Otherwise the equipment shall have to be type tested, free of charge, to prove the design.

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.

SECTION-C

- 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 MANDATORY SPARES

Mandatory spares shall be supplied as per Schedule-I-F. (Owner to review & modify as required). 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.

ANNEXURE - A

DISTRIBUTION OF HANDSET STATIONS

SR. NO.	AREA / LOCATION	LOUDSPEAKER	FCS (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 (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	
	Total	149	70	1



TITLE

PUBLIC ADDRESS SYSTEM

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

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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 ± 20 dB by user)

- Frequency Response at 20 dBu: Within ± 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 Ω Output
- Impedance: 600 Ω
- 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

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ANNEXURE-3

PA SYSTEM [LIST OF DOCUMENTS & 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) (Ex-works)	Total Price (Rs) (Ex-Works)
(A)	MAIN ITEMS						
(i)	557-11002-A	ACOUSTIC HOOD: FLOOR MOUNTED	NOS	20			
(ii)	557-11007-A	CENTRAL EXCH (MAIN) WITH INTEGRATED MDF	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)	557-11047-A	Multistrand Fibre Optic Cable	Mtr.	8000			
(xxii)	----	Additional item, required for completeness of system	LOT	1			
Sl. No.	Item Code	Item Name	UOM	Quantity		Unit Price (Rs)	Total Price (Rs)
(B)	E & C						
(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)	557-11047-C	Multistrand Fibre Optic Cable	Mtr.	8000			
(xix)	----	Additional item, required for completeness of system	LOT	1			

	OPTIONAL ITEMS						
(C)	557-11041-A	TYPE TEST (As per Annexure-4B)	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) $+10\%$ 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. Type tests shall be carried out free of cost wherever required as per the specification.
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. Termination & laying of cable shall not be in bidder's scope except for local cable from junction box to station & all Fibre optic cables. However termination of cable on bidders equipment shall be on bidder's scope.
9. Instruments required for testing & commissioning shall be arranged by the bidder & shall be taken back after completion of E&C.
10. Supply & installation of external equipment earthing shall be in BHEL scope.
11. 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

ANNEXURE- 4 (B)
2X500 MW SAGARDIGHI (UNIT-3&4)
PRICE SCHEDULE-TYPE TEST (OPTIONAL)

Sr. No	Item Code	Item Description	Unit	Quantity	Unit Price (Rs) (Ex-works)	Total Price (Rs) (Ex-Works)
(C)	557-11041-A	TYPE TEST(OPTIONAL)				
(i)		Surge Protection Test	NOS	1		
(ii)		Dry Heat Test as per IEC-68-2-2	NOS	1		
(iii)		Damp Heat Test	NOS	1		
(iv)		Vibration Test	NOS	1		
(v)		Electrostatic discharge test as per IEC-801-2 or equivalent	NOS	1		
(vi)		Radio frequency immunity Test as per IEC-801-6 or equivalent	NOS	1		
(vii)		Electromagnetic immunity test as per IEC-801-3 or equivalent	NOS	1		



TITLE

Technical Specification
for
PUBLIC ADDRESS SYSTEM

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

VOLUME II B

SECTION D

REV 1 DATE 23/03/2012

SHEET 1 OF 26

PUBLIC ADDRESS SYSTEM

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



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Technical Specification
for
PUBLIC ADDRESS SYSTEM

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SUPPLY



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1.0 GENERAL

- 1.1 The scope of this specification covers engineering, design, manufacturing, inspection & testing at works, packing, supply, delivery, unloading and handling at site of Public Address System for efficient and trouble free operation after installing the same at site.
- 1.2 Engineering: The “Engineering” shall broadly cover the detailed design of PA System as per the requirements of this specification, selection of equipment, materials, estimation of quantities etc. and preparation of all drawings necessary for the erection of the system. Complete engineering shall be as per the guidelines of purchaser and shall be subject to the approval.
- 1.3 It is not the intent to specify complete details of design and construction of equipment. However, the equipment shall conform in all respects to acceptable standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to purchaser, who shall be entitled to reject any work or materials, which in his opinion is not in conformity with the duty requirements.
- 1.4 Review of the bidder’s documents by the purchaser shall not relieve the bidder from his responsibility for the design and supply.
- 1.5 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.
- 1.6 Bill of Quantities is enclosed in Section C.
- 1.7 Exclusions: Unless mentioned otherwise in Section C,
- 1.7.1 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.
 - 1.7.2 Supply of Armoured/ unarmoured power cables, screened control cables
 - 1.7.3 laying of cables, conduits and grounding materials
- 1.8 In case of any deviation, the bidder shall indicate the same clause-by-clause in the enclosed “Schedule of Deviations”. In the absence of duly filled schedule it will be construed that the bid conforms strictly to the specification.

2.0 CODES AND STANDARDS

- 2.1 The equipment covered under this specification shall be designed, constructed and tested in accordance with latest revisions of applicable codes/ standards.
- 2.2 The equipments furnished under this specification shall conform to the latest revisions of the following standards.
- | | |
|---------|--|
| IS10426 | PA System amplifiers-recommendations for minimum performance requirements and PA System amplifiers-recommendations for general requirements. |
| IS1882 | PA system-code of practice for out door installations. |
| IS1881 | Indoor amplifying and sound reinforcement system-code of practice for installation. |
| IS1031 | Method of measurements on loudspeaker and loud speakers systems. |
| IS2382 | Recommended mounting dimensions of loud speakers. |



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- IS9302 Characteristics and Methods of Measurement for sound System equipment.
- IS616 Code of safety requirement for mains operated electronic and related apparatus.
- IS7741 Specification for loudspeaker.
- IS13947 Degrees of protection provided by enclosures for low voltage switchgear and control gear.
- IS9537 Specification for conduits for Electrical (Part-I, II) installation/wiring

Equivalent IEC in lies of IS are also acceptable.

The system shall be adequately protected from signal and power line noise and meet the Surge Withstand Capability (SWC) requirements of ANSI C37.90 A/IEEE standard 472-1989 equivalent.

3.0 DESIGN REQUIREMENTS (CONCEPTUAL VIEW)

- 3.1 The PA system shall essentially comprise of a number of communication handset stations each of which will be provided with a telephone handset, amplifier, hook micro-switch (if provided, will be spring return to normal type), loudspeaker muting switch (spring return to normal or push button type Volume control, any other associated equipment and the loud speaker.
- 3.2 The PA system shall be of two channel open type having facilities for simultaneous communication on two modes namely 'PAGING' and 'PRIVATE' without any interference.
- 3.3 On the PAGING MODE, conversation shall be heard over the loud speakers for all to hear and this shall normally be used to locate people and also to convey messages of general nature.
- 3.4 On the PRIVATE MODE, conversation shall not be heard over the loud speakers, but it shall be carried over the telephone handsets. This mode shall be used for actual conversation, exchange of information and issue of specific instructions.

3.5 ZONE WISE DISTRIBUTION OF SYSTEM

The central exchange type PA system shall comprise of a number of separate zones as specified in section-C. The various zones shall be connected with a central exchange to be located In Control room/Control Equipment room. There will be a corresponding number of master control stations. Each zone shall have number of subscriber stations. Each station can do conversation with other stations and with master control station.

3.6 Communication within a zone

- 3.6.1 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 _



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3.6.2 The system shall have minimum following features:

- Normal call- Communication between two handsets within(ref S.N. 3.4 Above)
- Paging-Ref S.N. 3.3 above
- All call- All the field stations terminated on the MCD can be contacted by using this feature. Group call- More than two handsets should be able to join the conversation
- Priority call- Reset feature on MCD, using this feature an existing conversation can be superseded for making any emergency announcement
- Interfacing facility with existing PA system/EPBAX System

3.6.3 Unless requested to be routed through the central exchange, announcements/ communication within a zone shall not be audible in other zones.

3.7 Interzone communication

3.7.1 Each of the zones shall be connected to a central exchange.

3.7.2 For sub-zones of zone, all the communication facilities like paging and party mode communication as described above between the two sub-zones shall be possible as if any have now become a single zone.

3.7.3 It shall be possible to communicate from a station in one zone to another station of different zone through a master control unit to be located on unit control desk. Another master control unit, in parallel with earlier ones, shall be located in shift incharge room. Further, suitable interface with telephone exchange (existing/new) shall be provided so that it shall be possible to communicate with any station in any zone through master control unit from any telephone set. The central exchange shall have the capacity of future expansion in number of stations, as specified in section-C. diagnostic facility of individual equipment shall be provided.

4.0 POWER SUPPLY AND GROUNDING

4.1 Unless specified otherwise in Data Sheet-A, the system shall be suitable for operation from 240V AC 1-phase UPS supply. There will be two feeders of 240V AC 1-phase UPS supply. In event of failure of one UPS supply, it will switch automatically to another UPS supply.

4.2 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.

4.3 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.

4.4 Connections of cables and changeover facility for power supply connections shall be the scope of the vendor.

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

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

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

- a) Technical write-up (system Description).
- b) Bill of quantities for all items.
- c) GA drawing cum technical datasheet of all the equipments as per BOQ.
- d) Mounting arrangement drawings.
- e) Interconnection diagram showing the interconnection among Main Distribution Box, Master Handset Station, JB's, 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

6.0 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 are furnished below.

6.1 CENTRAL EXCHANGE

Microprocessor controlled electronic exchange unit is stored programme controlled (SPC) unit with distributive processing. Switching shall be fully digital using Time Division Multiplexing (TDM) and Pulse Amplitude Modulation (PAM)/Space switching technique. The fully digital switching provides higher number of simultaneous communication links, better reliability, advanced features with no cross talk and other problems related to conventional systems.

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.

Central exchange shall be wide band microprocessor based modular design. This exchange shall consist of all the necessary control hardware, required for operation, monitoring, protection, indication, switching, testing, measurement of all the voltages and load conditions of the entire system, facility for checking of the operation of all the stations and quality of speech from the master control units etc. All the card etc. shall be plug in type. Solder less termination shall be provided for every wiring. Systems bandwidth shall be at least 200-10 kHz (± 10 dB) and shall not alter frequency response of the open line system. The various oscillators for the ring tone, all tones shall be mounted inside the exchange and shall be complete in all respects. The central exchange shall be enclosed in a freestanding cabinet to be located in control equipment room all the cable entries shall be from bottom only. The working of the



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system shall be noiseless such that the same can be installed in the office area.

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

Unless otherwise specified in Section C, Main Distribution Frame (MDF) /MJB as specified below at 6.2 shall form part of the central exchange cabinet ie Central exchange shall be suitable for terminating signal cables directly from Handset stations.

SCHEME I:

6.2 MAIN DISTRIBUTION FRAME (MDF)

6.2.1 The main distribution frame (MDF) shall consist of two sides. On one side the cables from exchange equipment shall be brought and terminated, on the other side the cables from extension stations are brought and terminated. Thus providing interconnections through jumper wires. The MDF connectors shall have screwless cage clamp (WAGO) type terminals.

6.2.2 The MDF shall be suitable for wall/floor mounting and shall be flexible by way of connecting any extension line to any other exchange line.

6.2.3 The MDF shall be complete with fuse mountings and shall be fitted with delayed action fused on the extension side. It shall be complete with requisite number of test jack assemblies on the exchange side.

6.2.4 The MDF shall be dust proof and shall be suitable for floor/ wall mounting along with all facilities and hardware. The mounting shall be done by means of nuts and rawl plug of appropriated size. Degree of protection shall be IP-55.

6.3 SUB-DISTRIBUTION FRAME (SDF)

6.3.1 The sub-distribution frame (SDF) shall be of 24 pairs with screwless cage clamp (WAGO) type terminals module. SDF shall be of minimum 14 SWG MS sheet enclosed over suitable angle iron framework with base channel, pedestal etc as required for outdoor installation with flush/wall mounting arrangement. Degree of protection shall be IP-55.

SCHEME II :

6.4 MAIN JUNCTION BOX

6.4.1 Main Junction Box shall have provision for cable termination for looping of handsets. Handsets with in zone are connected in serial connection and will be terminated to MJB. The MJB will establish link between handsets and central exchange.
Maximum 10 No's handset can be connected in one serial connection of MJB with limitation upto 1.5Km loop length exceeding which signal line booster shall be provided.

6.5 DISTRIBUTED AMPLIFYING SYSTEM

The amplifier system shall be distributed type i.e. each handset station/ loudspeaker shall have its own preamplifier, line amplifiers (wherever required, shall be provided for long line signal transmission) and power amplifiers to suit the loudspeaker capacity. The system shall be as below:

a) Unit amplifying system shall be designed to deliver the wattage of connected load in the unit system.

b) The amplifiers shall be designed for high quality amplification. The amplifiers shall be class-B



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push-pull type as per IS616, IS10426 or equivalent and the range of frequency response shall not make the amplifiers liable to pick up low and high frequency noise which might disturb the original speech reproduction. Frequency response shall be as per Data Sheet A.

- c) The amplifiers shall be heavy-duty type.
- d) The amplifiers shall be of solid-state electronic type and compact in construction.
- e) Pre-amplifying stages shall be furnished to make it suitable for operation with low level input such as microphone.
- f) Suitable arrangement shall be provided for amplifiers as well as preamplifier, to cut down the power requirement during standby or idling time in order to minimise open line hum as well as unnecessary loss of power.
- h) Controls to be provided.
 - i. 0 - 100% volume control setting with facility of coarse and fine setting.
 - ii. Input sensitivity control.

All these controls shall be located inside the handset station.
- i) Wherever a number of loud speakers are connected to one handset, suitable amplifier shall be provided.
- j) Amplifier set of a handset station shall be complete with power amplifier, voltage stabiliser, mike preamplifier, etc. and housed in the control box of handset station.
- k) The various amplifiers shall be modular in construction (preferably card type edge connectors) for ease of maintenance and trouble shooting.

6.6 HANDSET STATIONS

6.6.1 The following type of handset stations shall be offered as per BOQ:

- a) Desk mounted master type
- b) Desk mounted indoor type
- c) Wall/ Column mounted indoor type
- d) Wall/ Column mounted outdoor type
- e) Portable handsets

6.6.2 Facilities

- a) Master Station:

Master Control Units shall be microprocessor based and of modular design. These units shall be mosaic grid compatible flush mountable/table mounted type along with flexible goose neck type microphone, luminous miniature push buttons for interzone communications, alarm tone generation, fire alarm tone generation etc.

However, master control unit for CHP zone (if required) shall be table/desktop monitoring type.

The master station of each group shall have following operational features:

- i. Originate calls within its own group on "Normal" as well as on "Priority" basis.
- ii. Communicate with handset stations of a particular group.
- iii. Call handset stations of all groups on "All Call Basis".
- iv. Facility for generating and introducing the siren tone in page channel.

- b) Handset Station:

~~Each of the handset stations shall have the following facilities:~~



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- i. Originate and receive calls within its own group.
- ii. Receive calls from any of the group masters.
- iii. Communicate with handset stations as well as the group master of other group via his group master station.

Each handset station shall have following:

- (i) One (1) - telephone handset.
- (ii) One (1) - Cradle switch for resetting the handset.
- (iii) One (1) - "Press to Page" push button.
- (iv) One (1) - "Press to Mute Loudspeaker" push button.
- (v) Pre-amplifier and Power amplifier.
- (vi) Indication for "A.C. SUPPLY ON".
- (vii) Indication for "PARTY CHANNEL BUSY".

6.6.3 Material

- a) The desk/ wall mounted indoor handsets shall be of elegant look and be made of die cast aluminium/ mild steel/ fibre glass/ reinforced polyester or any other material subject to prior approval of purchaser.
- b) Wall mounted outdoor handsets shall be made of high impact polystyrene/ fibre glass/ reinforced polyester or any other suitable material to prevent it from breaking due to fall or rough handling etc.
- c) However the material of handsets shall be subject to purchaser's approval.

- 6.6.4 The outdoor wall/ column mounted handsets shall be of weatherproof construction and shall be provided with neoprene gaskets. Suitable pilfer protection of wall/ column mounted handset stations shall be provided with the help of internal anchoring bolts and special (e.g. triangular) screws which can be operated only by special spanners.

Outdoor handsets shall be provided with lockable type cover for protection against pilferage. Alternatively, pilfer protected wall/column mounted handset stations with built-in microphone/ loudspeaker shall be provided. Vendor to provide either or both the alternatives as specified in BOQ.

- 6.6.5 Wall/ column mounted instruments shall be heavy duty type and shall also be suitable for dust and noise laden atmosphere.

- 6.6.6 Desk mounting type (indoor) and wall mounting column type (outdoor) handset stations shall have a degree of protection as follows:

Indoor desktop mounted - IP32
Outdoor (including CHP Area)Wall/column mounted - IP55

- 6.6.7 All the switches, including the hook switch shall be encapsulated dustproof micro-switches. Alternatively, in place of micro-switches, reed relays/ tactile push switches can be offered. Any other suitable mechanism may be used subject to prior approval of purchaser (before placement of order). All switches shall be suitably protected from the prevalent atmosphere and shall have an extremely long life.

- 6.6.8 Each handset shall be provided with sensitive dynamic noise cancelling type retractable coil type of cord of length not less than 1.2 metres when stretched.

- 6.6.9 The amplifier units in the handset station shall be plug-in type so that maintenance of the faulty unit can be done without much downtime. These amplifiers shall be of special design suitable for industrial use such that while providing high line drive audio signal, it shall also provide a special anti side tone



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circuit.

6.6.10 The db level of the announcement at any station by its own handset shall be lower than the announcement at the same station by any other handset. This shall be provided to ensure that after all the line losses, the db level of announcement from any other station at a particular station is not less than the db level of announcement of that station itself. Vendor shall demonstrate the above at site.

6.6.11 For intelligibility of the human speech, the microphones of the handsets shall be noise cancelling along with directional features by providing necessary acoustic tailoring of frequency response for external noise. Frequency response and type of microphone shall be as per Data Sheet A.

6.6.12 The handset shall be mounted on or within a control box complete with matching transformer, cradle switch, page switch, loud speaker mute switch, power indication lamp, terminal strips, call master switches etc. The handset shall also contain amplifying system of the station. "Private Channel Busy" indication shall also be provided.

6.6.13 Power terminals shall be shrouded. Isolating switch & fuses for incoming power supplies shall be mounted inside handset.

6.6.14 Portable Handsets/ Sockets

- For portable handsets, multi-pin sockets with inbuilt power supply unit shall be provided. Multi-pin socket shall be suitable for outdoor operation with IP55 degree of protection.
- Degree of protection of portable handsets shall be as specified in Data Sheet A.
- Portable handsets shall be light in weight (upto 5Kg) but sturdy in design and shall be housed in a weather proof enclosure with shoulder straps.
- Separate provision of power supply for portable handset will not be provided by BHEL
- Length of connecting wire from socket to portable handset should be 5 meter minimum.

6.7 LOUD SPEAKERS

6.7.1 Re-entrant type

- Re-entrant horn type speakers shall be provided with line matching transformer, and bracket suitable for wall/ column mounting.
- Material and degree of protection shall be as specified in Data Sheet A.
- For distributed system, volume level adjustment shall be provided at handset if the line-matching transformer is not provided.
- The mounting bracket shall be with adjustable base suitable for vertical movement. However, it shall be possible to change the axis of rotation by loosening the screws. Firm fixing arrangement with spring lock washers shall be provided.
- Other technical parameters for re-entrant horn type speakers shall be as per Data Sheet A.

6.7.2 Cone Type

- 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.
- Material and degree of protection shall be as specified in Data Sheet A.
- For distributed system, volume level adjustment will be provided at handset if the line-matching transformer is not provided.
- 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.
- Other technical parameters for cone type speakers shall be as specified in Data Sheet A.



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6.8 JUNCTION BOXES

6.8.1 Type of Junction Boxes

- a) Power Junction Box: This type of junction box shall be used for looping of incoming and outgoing power cables for handset stations.
- b) Signal Junction Box: If required, this type of junction box shall be used for looping of incoming and outgoing signal cables for handset stations.
If Signal JB is not the part of Power junction Box it should be provided for Desktop station, flush mounted and master control station separately. In case Power Junction Box can accommodate Signal cable termination and power cable termination both then Bidder shall not quote for SJB.

Number of ways	12/24/36/48/64/72/96/128 with 20% spare terminals
Material & thickness	Fibre glass reinforced polyester (FRP) 4 mm thick/ Mild Steel (MS) 2mm thick/ Al LM6 3 mm thick
Surface Type	Hot dip galvanised(except for Al Alloy LM6 which shall be painted) Screwed at all four corners for door. Door handle shall be of stainless steel (SS). Self-locking . Door gasket shall be of synthetic rubber
Mounting clamps & Accessories	Suitable for mounting on walls / columns / structures etc. The brackets bolts, nuts, screws, glands and lugs required for erection shall be of brass.
Type of terminal block	Rail mounted maxitermi or cage-clamp type suitable for conductor size upto 2.5 mm ² . A M6 earthing stud shall be provided
Protection class	IP-55 (minimum) for all applications including CHP AREA .

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

6.9 MAIN DISTRIBUTION BOARD (POWER Distribution Board)

- 6.9.1 Main distribution board shall be used for distribution of incoming power supply to different loops. Construction of main distribution board shall be similar to other junction boxes. Degree of protection and material shall be as specified in Data Sheet A.

- 6.9.2 Main distribution Board shall consist of two separate units:

- a) Auto changeover Box
Auto changeover box shall have provision for terminating incoming AC normal and UPS supply and the outgoing line to PA System distribution box. Suitable switch-fuse units/MCB shall be provided independently for both the incoming supplies.
Heavy-duty auto changeover contactor(s) and indicating lamps for "Supply Healthy" indication shall be provided. Vendor to ensure that no supply paralleling or fault coupling occurs during changeover.
- b) Distribution box
Distribution box shall be used for distribution of power supply to the different loops. Suitable number of outgoing switch-fuses and incoming switches shall be provided.

Auto changeover box and distribution box may be accommodated in a single box.

Main distribution box shall be of MS sheet with thickness 16 SWG. MDB shall have provisions of two inputs with auto changeover and 12 outputs (minimum), MCB at input and MCB & HRC fuse at output.

- 6.10 PDB shall be wall/column mounted. Necessary glands required for cable entry shall be provided along



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with PDB.WEATHER PROTECTING CANOPY / ACOUSTIC HOOD

6.10.1 WEATHER PROTECTING CANOPY

Weather protecting canopy shall be provided for outdoor field call station to meet the DOP IP-65 for CHP area and IP-55 for all other outdoor areas. The canopy shall be made of 18SWG MS/ 1.75 mm minimum glass fiber material to house the field call stations.

6.10.2 ACOUSTIC HOOD

The handset stations in the noisy areas like turbine Hall, BFP, firing floor, mill area, etc., shall be housed in Acoustic hoods. The acoustic hood will be made of MS material (Minimum 1.6mm thick)/FRP material (3 mm thick), identical to panels, paint finish. An industrial type free standing, wall mounted hood shall be used for providing the above requirements. The design noise level within the hood shall be limited to a maximum of 60 dB SIL. The Stations envisaged inside the acoustic hood shall not be provided with canopy.

6.10.3 ACOUSTIC BOOTH : Sound protecting Industrial type free standing booth

Floor mounted Acoustic booth shall be 850(L)X700(W)X2200(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.

6.11 SIGNAL LOOP LENGTH

The signal loop length will be around 4 Km in unit area, around 8 Km in coal handling plant area and around 7 Km in common plant area from the central exchange. Further, the distance between two stations in areas other than unit may be more than 1 Km. Bidder shall provide necessary repeaters, power supply modules etc to meet the requirement of the same. No. of Repeaters will be indicated in BOQ section C/

6.12 CABLES & CABLING

Following power, signal & loudspeaker cables will be used:

- a) Power cable : 3C-2.5 mm² Cu armoured.
- b) Signal cable : 4P-0.5 mm² (7/0.3mm) Cu overall screened armoured.
- c) Loud speaker cable : 2P-0.5 mm² (7/0.3mm) Cu overall screened armoured.

The cable size between MDF to SDF will 24P-0.5 mm² / 12P-0.5 mm² as per requirement.

If different size of cable is required, bidder must intimate in their offer.

- 6.12.1 The PA system cables will be laid in ready trays routed in different areas of power plant for power & signal cables. Power cable will run in separate trays, similarly the signal cables will run in separate trays.

6.13 ENCLOSURE FOR INSTRUMENTS & OTHER EQUIPMENTS

Unless otherwise indicated with the equipment, all panels, desks, cabinets and enclosures furnished shall at least comply with the requirements of protection classes as indicated below:

Indoor air-conditioned (AC) areas	-	IP22
Indoor non air-conditioned (AC) areas	-	IP42
Ventilated enclosures	-	IP42
Non-Ventilated	-	IP54
Outdoor(included CHP)	-	IP55

The design of panels, cabinets, enclosures and packaging density of components mounted therein shall be such that the temperature rise does not exceed 10⁰ C above the ambient under the worst conditions. All panels/ cabinets housing electronic equipment in non-air-conditioned area shall be provided with



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redundant cooling fans along with filters.

6.14 INTERFACE WITH EXISTING EXCHANGE:

PA system central exchange for the unit will be interfaced with existing/new EPABX/ PA System.

6.15 OTHER

6.15.1 Locations in different zones for different type of handset stations and loudspeakers are indicated in Section – C.

6.15.2 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.

6.15.3 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.

6.15.4 Three sets of hard as well soft copies (in pdf form) of dwg/ documents will be required for the purchaser's review/ approval.

6.15.5 After completion of work at site, bidder shall prepare "AS BUILT DRAWINGS" and "O&M Manuals" as per distribution list enclosed with Section – C.

6.16 COMMON REQUIREMENTS OF VARIOUS EQUIPMENT OF SUPPLY

6.16.1 Surface Treatment

6.16.1.1 Painting:

- a) Pre-treatment: In the first step, complete surface shall be cleaned with sand paper and/ or cotton cloth to remove accumulated dust and dirt. Surface pre-treatment shall generally conform to IS: 6005. Pre-treated surface shall be provided with one coat of red oxide paint.
- b) Surface Finish: Two coats of abrasion resistant, anticorrosive synthetic enamel shall be applied on the pre-treated surface. Second coat shall be applied only when the first coat has completely dried-up. Surface finish after the painting shall be smooth, uniform and free from spots.
- c) Thickness of paint shall be 80 microns.

6.16.1.2 COLOUR OF EQUIPMENT

Following colour paint shade shall be followed for different items. All painting shall be through powder coated epoxy base paint.

Central Exchange Interior and exterior

: As per project requirement

Any misc. item including wall mounted MDB in CCR/EER area

: As per project requirement

Field Stations, junction boxes, horn type speakers, extension amplifier and cone type speakers, Flush mounted, desktop and master stations

: As per project requirement /As per manufacture standard color shade

weather protecting canopy, acoustic hood ,MDB

: As per project requirement

6.16.1.3 Galvanizing

- a) Pre-treatment: In the first step, complete surface shall be cleaned with sand paper and/ or cotton cloth to remove accumulated dust and dirt. Surface pre-treatment shall be done before galvanization, which shall conform to the requirements of IS: 6005.
- b) Surface-Finish: Articles shall be hot dip galvanized after fabrication, surface cleaning and pre-treatment. The galvanizing



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c)

shall be done according to IS: 2629. The galvanizing shall be uniform, clean, smooth, continuous and free from acid spots. If the galvanizing of the samples is found defective, the entire batch of steel will have to be regalvanized at vendor's cost.

Weight and thickness of zinc deposited shall not be less than 610 gm/m² and 75 microns respectively. The purchaser reserves the right to measure the thickness of zinc deposit by an Elkometer or any other instrument acceptable to purchaser and reject any component, which shows thickness of zinc at any location to be less than the value specified.

6.16.2 Labels

All components whether mounted inside or on the surface of the main equipment, shall have identifying references as per the arrangement drawings and wiring diagrams. The labels shall be of non-rusting metal or 3 ply lamicoid and shall have white inscriptions on black background. The label size shall be subject to the purchaser's approval.

6.16.3 Earthing

6.16.3.1 Earthing of all sheet metallic parts of enclosures of all equipments covered in this specification which are non-current carrying shall be bonded to an earth stud provided in the equipment. The Contractor shall ensure that proper earthing terminals are provided in all equipment covered in this specification.

6.16.3.2 Earthing of cabling system: Armour of cables shall be earthed at both ends of cable.

For earthing of power supply cable, an additional core shall be provided or else a continuous ground conductor of 16 SWG GI wire shall be run along each conduit run.

6.16.3.3 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.

6.16.4 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.

7.0 INSPECTION AND TESTING

7.1 INSPECTION

7.1.1 The following stages of manufacture shall be stage inspected by Purchaser or his duly authorised representative.

- Inspection of manufacturing processes such as shearing, punching, bending, welding, galvanizing, painting etc.
- Inspection of finished products.
- Inspection of packing material and procedure.

7.1.2 All materials, components and equipments covered under this specification shall be procured, manufactured, inspected and tested as per the purchaser's standards and quality plan of vendor duly approved by purchaser.



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7.1.3 All material used for the construction of the equipment shall be new and shall be in accordance with the requirements of this specification. Materials utilized shall be those, which have established themselves for use in such applications.

7.1.4 All acceptance and routine tests as per relevant standards and specification shall be carried out by the manufacturer. Charges for all these routine and acceptance tests for all the materials shall be deemed to be included in the bid price.

7.1.5 Bidder shall prepare and submit along with the bid the quality plan on the prescribed format. Quality plan shall include details of quality control and testing at different stages of manufacture, testing of completely assembled items.

7.2 TESTING

7.2.1 Tests at Works

7.2.1.1 The supplier shall perform all tests necessary to ensure that the material and workmanship conform to the relevant standards and that such tests are adequate to demonstrate that the equipment will comply with the requirements of this specification. Copy of the standards/ test methods to which the tests will be conducted are to be furnished during detailed engineering stage.

7.2.1.2 Test certificates shall be submitted for purchaser's approval before despatch of the equipment. The purchaser may witness the test at supplier's works, for which sufficient advance notice shall be given before testing.

7.2.1.3 The following tests shall be conducted as acceptance tests at manufacturer's works:

a) Printed Circuit Boards

Following tests are to be performed on different PCBs and those shall also conform to approved Quality Plan:

- i. Burn-in test for all PCBs (Routine test)
- ii Climatic and Durability tests (Vibration, dry heat test, damp heat cycle, low temperature and transportation)

b) Amplifier & Handset

- i. Rated output power
- ii. Rated input voltage
- iii. Power consumption
- iv. Current drain
- v. Harmonic distortion
- vi. Input/ Output Impedance
- vii. Insulation resistance

c) Speakers

All the speakers shall be tested as per IS: 7741. Apart from these during assembly, the components like transistors, ICs, resistances, capacitors, switches, relays etc. shall be tested and a certificate shall be obtained from the manufacturer which may be verified by others.

d) Junction Boxes

All junction boxes shall be checked for 100% IR, HV and dimensional checks.

e) Tests for painting

The painting of articles shall meet the requirements of IS: 1477 (Part 1 & Part 2) in general.

f) Tests for galvanizing



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Weight, thickness and uniformity of zinc, coating shall be determined in accordance with IS: 6745 and IS: 2633 shall conform to the specification requirements.

7.2.2 Site Tests

7.2.2.1 After assembly, all major equipment together are to be site tested to establish the workability of the system at site.

7.2.2.2 Following tests are to be performed at site:

- a) Insulation resistance, HV test for cables.
- b) Rated output power.
- c) Performance of PAGE and PRIVATE channels for all equipments in the entire Public Address System.
- d) Proper functioning of auto-changeover unit.
- e) Test to ensure that db level of announcement at any station by its own handset shall be lower than announcement at the same station by any other handset.

7.2.2.3 Bidder to perform all site tests as per the Field Quality Plan. During contract stage bidder to furnish details of these tests & the standards to which these conform for purchasers approval.

7.2.3 General Requirements of Site Testing

7.2.3.1 The Owner may ask for any tests at site which in his opinion are necessary to determine that the works comply with the specification, manufacturer's instruction or the applicable IS code of installation. The

Contractor shall be responsible for conducting the tests and shall bear the cost of such additional tests.

7.2.3.2 The contractor shall have to bring all testing equipment & instruments to carry out the job. All instruments shall be calibrated to the satisfaction of the Engineer before actual testing and tests shall be conducted by qualified & experienced personnel.

7.2.3.3 All documents/ records regarding test data and all other measured values shall be submitted to Engineer for approval and subsequent record and reference. The results of all tests shall conform to the specification requirements as well as any specific performance data guaranteed during finalisation of contract.

7.2.4 Type test

Type test reports should be furnished as per enclosed Annexure A of Quality plan.

9.0 PRICES

9.0.1 The bidder shall quote his prices for equipment of complete Public Address System, supply, as per BOQ format enclosed with Section – C.

9.0.2 The unit rates of supply for all equipment and service quoted by the bidder shall be firm for a variation of quantities limited to:

- a. $\pm 20\%$ of total order value till finalisation of engineering details & BOQ.
- b. $+10\%$ of the total order value in addition to (a) above, till the completion of job.

9.0.3 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.



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9.0.4 The bidder shall furnish unpriced “Price Schedule” of all equipment and services, as per BOQ along with the technical bid.

9.0.5 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.

9.0 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.

10.0 INSTALLATION AND MAINTENANCE MANUAL

10.1 Instruction manuals for the installation, operation and maintenance of PA System shall be furnished before despatch of the equipment.

10.2 Draft manual shall first be submitted for Purchaser's approval. The manual shall contain minimum following details:

- a) General description of equipment
- b) Brief system description for which equipment is meant
- c) Technical data
- d) Salient constructional details
- e) Technical leaflets of important components used in the system
- f) All drawings
- g) Type and routine test certificates
- h) Instructions to be followed on receipt of equipment at site and for storage
- i) Material handling instructions
- j) Erection procedure and checks
- k) Pre-commissioning checks
- l) Commissioning procedures
- m) Operation instructions
- n) Maintenance instructions
- o) Trouble shooting
- p) Safety instructions

11.0 DOCUMENTATION

11.1 DOCUMENTS TO BE FURNISHED WITH THE BID

- a) Brief System Description.
- b) Filled and stamped Data Sheet B

11.2 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), JBs, handsets, loud speakers covering the size of cable.
- e) Cable schedule
- f) Operation and maintenance (O&M) manual.



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- g) Signed and stamped Standard Quality Plan.
- h) Minimum 3 copies of all test certificates for the tests actually conducted on the equipment



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Erection and Commissioning



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1.0 GENERAL

The scope of this specification covers handling and storage at site; installation, testing and commissioning of Public Address System for efficient and trouble free operation after installing the same at site.

2.0 CODES AND STANDARDS

The installation shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed. Nothing in this specification shall be construed to relieve the vendor of his responsibility.

3.0 INSTALLATION

The contractor shall carry out total installation work as per the requirements of the specification and instructions of Engineer.

3.1 PA SYSTEM EQUIPMENT INSTALLATION

3.1.1 Installation of PA System equipment shall include erection, connection, grounding, testing and commissioning of the equipment. Installation activity shall also include provision of all fittings, supports, hangers and other accessories which are not specifically mentioned but are required to complete the installation work.

3.1.2 Equipment shall be brought to the place of work only at the time of erection. Unpacking, handling, assembling and erection shall be as per the guidelines of installation manual and Field Quality Plan.

3.1.3 Erection shall commence in an area only after the clearance has been obtained from the Engineer. Vendor shall ensure that all activities, which are liable to damage the equipment in that area, have been completed.

3.1.4 The drilling and welding of building steel work for fixing supports and brackets shall not be done without the prior approval of Engineer.

3.1.5 Wherever drilling and welding of building steel work for fixing supports and brackets is done, the same shall be re-painted and restored to the same paint shade as per site requirement at no extra cost to purchaser.

3.2 ITEMS OF SUPPLY FOR CABLING INSTALLATION WORK

The supply of below listed items shall be considered to be part of cabling installation work:

3.2.1 Cable glands

Cable glands shall be single or double compression type as per Data Sheet A. Material of glands shall be brass. Nickel plating shall be provided if indicated in Data Sheet A. Rubber components used in the gland shall be of neoprene. Name/ trade name of manufacturer, type no. and applicable range of outer diameter of cable shall be engraved/ printed on the cable gland.

3.2.2 Cable lugs

Cable lugs shall be of tinned copper. Name/ trade name and size shall be engraved/ printed on each cable lug.

3.2.3 Self Locking Clamps

Clamps shall be of nylon material having self-locking feature when the cord is looped. They shall be provided with manual lock release. Clamp cord shall not move in the backward direction once it has been locked, unless the lock release is depressed.

3.2.4 Ferrules

Ferrules shall be required for individual core of cables hence they shall be suitable for the insulated



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conductor diameter. They shall be of plastic material. Numbering on the ferrules shall be engraved type. Colour of base shall be yellow and that of engraving shall be black. Engrave colouring shall be of durable quality to match the entire life of the plant. Engraving shall be legible from a distance of 600 mm. Ferrules shall be interlocked type such that the interlocked ferrules take the shape of tube with complete ferrule number marked in a straight line.

3.2.5 Tags

For identification, cables shall be provided with cable number tags of durable fibre, aluminium or stainless steel sheets. Cable numbers shall be engraved type in case of aluminium or stainless steel tags, and printed type in case of fibre sheet. Tags shall be of durable quality of size 60mm x 12mm with a tie hole at each end and shall be provided with non-corrosive wire of sufficient strength for tagging.

3.3 INSTALLATION OF CABLES AND CONDUITS

3.3.1 All cables shall be provided with identification tags indicating the cable numbers in accordance with the cable circuit schedule. Tags shall be fixed at both ends of cables and on both sides of floor/ wall crossings.

3.3.2 All cable entries in the equipment shall be sealed by cable glands.

3.3.3 Power cable terminations shall be carried out in such a manner as to avoid strain on the terminals by providing suitable clamps near the terminals.

3.3.4 Control cable cores entering the equipment or control panels shall be neatly bunched and strapped with PVC perforated tapes/ nylon ties and suitably supported to keep them in position at the terminal block. Copper conductor control cables shall be terminated directly into screw type terminals provided in the equipment.

3.3.5 Wherever control cables are to be terminated by means of terminal lugs, the same shall be of tinned copper compression type.

3.3.6 All spare cores shall be connected to spare terminals wherever possible. If spare terminals are not available, spare cores shall be neatly dressed and suitably taped at both ends.

3.3.7 Individual cores of control cables shall have ferrules for identification. Ferrule numbers shall be provided as per the control schemes and other related documents supplied by the purchaser.

3.4 ADDITIONAL POINTS OF CONSIDERATION

3.4.1 The installation work shall be carried out in a neat workman-like manner by skilled, experienced and competent workmen.

3.4.2 Installation shall be properly coordinated at site with other services and wherever necessary suitable adjustment shall be made to avoid interference with any part of the building, structures, equipment, utilities and services. Any such adjustment shall be done with the approval of Engineer.

3.4.3 All materials being supplied or consumed during erection by the vendor in the process of erection work shall be of the best quality and according to the relevant standards. All materials shall be got inspected and approved by the Engineer before the same is used for erection work.

3.4.4 Any work like chipping/ breaking of existing structure like walls, floors, fabrications, etc. shall be done after taking prior approval of Engineer.

3.4.5 Any wrong erection shall be removed & re-erected promptly to comply with the design requirements to the satisfaction of Engineer. Re-erection shall be done at no extra cost to the purchaser.



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3.4.6 While testing and commissioning, if the system is observed to be not functioning, it shall be the responsibility of the contractor to check, rectify and demonstrate that the defect has been removed to the satisfaction of purchaser.

3.4.7 Before energisation of system, physical inspection shall be carried out and all foreign bodies shall be removed and loose connecting bolts etc. shall be tightened.

4.0 QUANTITY MEASUREMENT AND WASTAGE ALLOWANCE

4.1 MEASUREMENT OF QUANTITIES

4.1.1 For all payment purposes, measurement shall be made on the basis of the execution drawings/ physical measurements. Physical measurements shall be made by the contractor in the presence of the Engineer.

4.1.2 Wastage allowance shall be kept in consideration while making material appropriation of supplied items.

4.2 CUTTING AND WASTAGE ALLOWANCE

Vendor shall carefully plan the cutting schedule of each cable drum such that wastages are minimised and any resultant short lengths can be used where appropriate route lengths are available.

5.0 TESTING

5.1 Site Tests

5.1.1 After assembly, all major equipment together are to be site tested to establish the workability of the system at site.

5.1.1.1 Following tests are to be performed at site:

- Insulation resistance, HV test for cables.
- Rated output power.
- Performance of PAGE and PRIVATE channels for all equipments in the entire Public Address System.
- Proper functioning of auto-changeover unit.
- Test to ensure that db level of announcement at any station by its own handset shall be lower than announcement at the same station by any other handset.

5.1.1.2 Bidder to perform all site tests as per the Field Quality Plan. During contract stage bidder to furnish details of these tests & the standards to which these conform for purchasers approval.

5.2 General Requirements of Site Testing

5.2.2.1 The Owner may ask for any tests at site which in his opinion are necessary to determine that the works comply with the specification, manufacturer's instruction or the applicable IS code of installation. The Contractor shall be responsible for conducting the tests and shall bear the cost of such additional tests.

5.2.2.2 The contractor shall have to bring all testing equipment & instruments to carry out the job. All instruments shall be calibrated to the satisfaction of the Engineer before actual testing and tests shall be conducted by qualified & experienced personnel.

5.2.2.3 All documents/ records regarding test data and all other measured values shall be submitted to Engineer for approval and subsequent record and reference. The results of all tests shall conform to the specification requirements as well as any specific performance data guaranteed during finalisation of contract.



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6.0 PRICES

6.1 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:

6.2 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
 - vi. All special tools and tackles for erection
 - viii. 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.

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

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/UPS Supply : Voltage \pm 10%
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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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 :	[] Yes [] 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 :	[] Included [] Excluded	
5.0	POWER SUPPLY		
5.1	Whether the system suitable for operation for power supply details given in specification and Data Sheet A. :	[] Yes [] No	
5.2	Power supply requirement at : 240V AC	kVA	
6.0	CONSTRUCTIONAL REQUIREMENTS		
6.1	AMPLIFIERS : Speaker (To be furnished separately for each type of amplifier)	Pre- Amplifier	Line Amplifier Loud Amplifier
a)	Name of the manufacturer :		
b)	Type and manufacturer's catalogue no. :		
c)	Power supply details :		



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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 :



PUBLIC ADDRESS SYSTEM

- 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 points

iv. 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: ☐ Yes ☐ No
cable

7.1.4 Voltage Grade for

a) Power cable : Volts

b) Signal & loud speaker: Volts
cable

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



TITLE

PUBLIC ADDRESS SYSTEM

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

VOLUME IIB

SECTION C

REV 0

DATE 28.11.2011

SHEET 10 OF 10

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 28.11.2011

QUALITY PLAN

ANNEXURE-I		CUSTOMER : PEEGT		PROJECT : 2X500 MW WBPDC, SAGARDIGHI TPP, PH II		SPECIFICATION : PE-TS-373-557-E001							
QUALITY PLAN		BIDDER/ VENDOR :		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 1 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. DATA SHEET	INSP. REPT.	3/2	1	1		
		4. FUNCTIONAL TEST - SPL at rated output - Sweep test response	MA	ELECTRICAL	100%	IS 9302 Part IV	APPD. DATA SHEET	INSP. REPT.	3/2	1	1		
4.0	HANDSET	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. DWG.	APPD. DATA SHEET	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., HV / IR -Frequency Response -Signal to Noise Ratio -Input impd. at 1 KHz -IR & HV Test	MA	ELECTRICAL	100%	IS(9302) Part II	APPD. DATA SHEET	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 : PEEGT		PROJECT : 2X500 MW WBPDC, SAGARDIGHI TPP, PH II		SPECIFICATION : PE-TS-373-557-E001			
		QUALITY PLAN		BIDDER/ : VENDOR		TITLE		NUMBER :			
		SHEET 3 OF 3		SYSTEM : COMMUNICATION		ITEM : PUBLIC ADDRESS SYSTEM		SPECIFICATION: TECHNICAL SPECIFICATION FOR PA SYSTEM			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION AGENCY	VOLUME III REMARKS	
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 2. MECHANICAL 3. HV / IR	MA MA MA	VISUAL DIM. ELECTRICAL	100% 100% 100%	APPD. DWG. APPD. DWG. APPD. DWG.	APPD. DWG. INSP. REPT. APPD. DWG. INSP. REPT. APPD. DATA SHEET	INSP. REPT. INSP. REPT. INSP. REPT.	3/2 3/2 3/2	1 1 1	BHEL witness on 5% sample selected at random of each type per Lot.
7.0	WEATHER PROTECTING CANOPY& SOUND PROTECTING HOOD	1. AESTHETIC 2. MECHANICAL	MA MA	VISUAL DIM.	100% 100%	APPD. DWG. APPD. DWG.	APPD. DWG. APPD. DWG.	INSP. REPT. INSP. REPT.	3/2 3/2	1 1	BHEL witness on 3 sample selected at random of each type per Lot.
8.0	INTEGRATED TESTING ON PA SYSTEM	FUNCTION -Party call -Paging call -Busy tone -Alert tone	MA	VISUAL	100%	APPD. TTR	APPD. TTR	INSP. REPT.	3/2	1	
9.0	TYPE TEST										Enclosed as Annexure-A
NOTE: ROUTINE AND TYPE TEST REPORTS ON PA SYSTEM EQUIPMENT SHALL BE SUBMITTED FOR APPROVAL.											
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						

LIST OF TYPE TEST FOR PUBLIC ADDRESS SYSTEM

S No	Equipment	Type test description	Type of test	Referred standard
1	Central Exchange	<ul style="list-style-type: none"> • High frequency radiated magnetic field test • Electrostatic discharge test • Susceptibility test • Vibration test • Dry heat & damp heat test 	Functional Performance Performance Functional Functional	IEC 61000-4-3 IEC 61000-4-2 IEC 61000-4-6 IEC 68-2-6 IEC 68-2-2
2	Intercom Exchange	Surge protection test	Functional	IEC 61000-4-5
3	Field call stations, Junction box	DOP test (dust test & water test)	Functional	IS: 1947
4	Cone type speaker	Sound pressure level (SPL) before & after DOP test (dust test & water test)	Functional	IS: 1947
5	Horn type speaker	<ul style="list-style-type: none"> • Sound pressure level (SPL) before & after DOP test (dust test & water test) • Frequency response test • Sound pressure level (SPL) test • Impedance test • Dry heat & damp heat test 	Functional Functional	IS: 1947 IS: 9302 Part-IV
6	Main distribution frame (MDF)	Contact resistance test before & after DOP test (dust test & water test)	Functional	IS: 1947
7	Intercom station	Functional test before & after DOP test (dust test & water test)	Functional	IS: 1947
8	Industrial station	<ul style="list-style-type: none"> • Dry heat & damp heat test • Vibration test • Electrostatic discharge test • Electromagnetic immunity test • Surge protection test • RF immunity test 	Functional	
9	Amplifier	<ul style="list-style-type: none"> • Frequency response test • Power output test • Signal to noise ratio test • Distortion test • Surge protection test 	Functional	IS: 9302 Part-II