2X660 MW MAITREE STPS

VOLUME IIB

TECHNICAL SPECIFICATION FOR

IP BASED PUBLIC ADDRESS SYSTEM

DOC. NO. PE-TS-421-557-E001, REV0

BHARAT HEAVY ELECTRICALS LIMITED

POWER SECTOR

PROJECT ENGINEERING MANAGEMENT

NOIDA, INDIA

CONTENTS

BIDDER'S STAMP & SIGNATURE

(REFER INSTRUCTION NO. 1 OF 'INSTRUCTIONS TO BIDDERS FOR PREPARING TECHNICAL OFFER)

INSTRUCTIONS TO BIDDERS FOR PREPARING TECHNICAL OFFERS

1. Two signed and stamped copies of the following shall be furnished by all bidders as technical offer :

   a. Unpriced Price Schedule with bidder's signature and company stamp.
   b. A copy of this sheet ("Instructions to Bidders for Preparing Technical Offer"), with bidder's signature and company stamp.
   c. A copy of previous sheet ("List of Contents"), with bidder's signature and company stamp.

   d. Necessary information about the financial and technical resources, organization and experience to undertake the manufacturing and supply of such equipment shall be supplied by Bidder as an evidence of his capability for satisfaction of the Owner. Bidder shall submit along with his Bid a list of major contracts of supply and erection of similar equipment already executed or under execution, giving detailed particulars such as equipment rating, contract value, name of the Owner, year of supply etc.

   e. In case of discrepancies between the technical requirements and other applicable Engineering Standards, Materials System Specifications, Standard Drawings, or industry standards, codes, and forms shall be resolved in writing by Bidder with the employer. Before starting the manufacturing/supply, Bidder shall inform employer of any discrepancy between the instructions of the present specification and Bidder's standard.

   f. Following documents are required to be furnished

SL. NO.	DOCUMENT TYPE
01.	Supply Document list
02.	Supply program
03.	Data sheets
04.	Technical specifications and relevant drawings
05.	Start-up, Mandatory and Recommended spare parts
06.	List of Tools and Tackle
07.	Proposed System schematic diagram.
08.	Write up on architecture and operation of proposed system
09.	BILL OF MATERIALS with make and model no. of equipment
10.	Power requirement. (capacity of FCBC and SMF battery)
11.	Quality Control Plan

2. No technical submittal such as copies of type test certificates, data Sheets, write-up, drawing, technical literature, etc. is required during tender stage. Any such submission, even if made, shall not be considered as part of offer.

3. No comments/ additions/ deletions shall be made by the bidder on the signed & stamped copy of the specification. Any such changes made by the bidder shall not be considered.

4. Confirmations/ comments (if any) regarding delivery schedules shall be furnished as part of the commercial offer. Any reference elsewhere/ covering letter of technical offer shall not be considered by BHEL.

5. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.

6. Any changes made by the bidder in the price schedule with respect to the PUBLIC ADDRESS SYSTEM description/ quantities, notes etc. from those given in NIT shall not be considered (i.e., technical description, quantities, notes etc. as per specification shall prevail).

7. The requirements mentioned in Section–C shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in the descriptive portion in Section–D.

BIDDER'S STAMP & SIGNATURE

SECTION – 'A'

SCOPE OF ENQUIRY

SCOPE OF ENQUIRY

1. This specification covers design, manufacture, assembly, inspection & testing at manufacturer's works, proper packing, delivery to **2X660 MW MAITREE STPS** 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.

SECTION – 'I'

SPECIFIC TECHNICAL REQUIREMENT

INDEX

1.00.00 INTENT OF SPECIFICATION

1.00.01 This specification covers the design, manufacture, assembly, testing and inspection at vendor's/sub-vendor's works, packing, despatch to site, site unloading/handling, system engineering and erection & commissioning of IP based Public Address System as described in the various sections of this specification. It is not the intent to completely specify all details of design and construction herein. However, the equipment shall conform 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.

1.00.02 The PA system covered herein shall also include site unloading, handling, intra site transportation, site storage, complete erection, final check -up, testing and commissioning and all other incidental works thereto (like labour, supervision, supply of erection equipment and consumables as necessary) of the equipment and accessories to be supplied under this specification as specified here under.

1.00.03 It is not the intent to completely specify all details of design and construction herein. Nevertheless, the system shall conform to high standard of engineering, design and workmanship in all respects and shall be capable of performing satisfactorily in continuous commercial operation under the specified environmental condition.

2.00.00 ABBREBIATION

- BOQ - Bill of Quantities
- CCB - Central Control Building
- CCR - Central Control Room
- DCS - Distributed Control System
- DVSP - Digital Voice Storage Playback
- GCC - General Conditions of Contract
- LED - Light Emitting Diode
- LOI - Letter Of Intent
- MDF - Main Distribution Frame
- MTTR - Mean Time To Repair
- PA - Public Address
- PABX - Private Automatic Branch Exchange
- PC - Personal Computer
- QAP - Quality Assurance Plan
- RH - Relative Humidity
- RMS - Root Mean Square
- SPL - Sound Pressure Level

- UCR - Utilities Control Room
- UHF - Ultra High Frequency
- UPS - Uninterruptible Power Supplies

3.00.00 SCOPE OF WORK

3.01.00 GENERAL

3.01.01 The scope of work in this document specifies the technical & contractual requirements for the design, supply, erection, testing and commissioning of IP Public Address and Paging System and its accessories for the Project as "turn-key" plant-wide stand-alone package unit with suitable interfaces as specified.

3.01.02 Bidder shall be fully responsible for both the products and their relevant compliance with the requirements of the specification.

3.01.03 Provisions included in the specification will not be limitative to the scope of work.

3.01.04 Bidder shall provide for any further activities which will improve the quality & performance of the system offered.

a) Tentative equipment type & location of Public Address System is listed in the Annexure-1.

b) Bidder shall indicate the unit price for each type and size of equipment/ items as per unpriced schedules enclosed with specification.

3.01.05 Necessary information about the financial and technical resources, organization and experience to undertake the manufacturing and supply of such equipment shall be supplied by Bidder as an evidence of his capability for satisfaction of the Owner. Bidder shall submit along with his Bid a list of major contracts of supply and erection of similar equipment already executed or under execution, giving detailed particulars such as equipment rating, contract value, name of the Owner, year of supply etc.

3.02.00 INCLUSION IN SUPPLY

Bidder's scope of supply shall include but shall not be limited to following.

01. Plant IP Public Address & Paging System with all accessories specified herein/Data sheet and other Technical Attachment Sheets.

02. Development, supply & installation of required software for the total system.

03. Uninterruptible Power Supply System as per Quantity mentioned in BOQ cum price schedule.

04. Associated copper, Cat6 and fibre optic cable for interconnection.

05. Necessary erection hardwares.

06. Recommended spares for 6 (six) years for the entire system trouble free operation.

07. Accommodation, transportation and all necessary permits, clearances and protective safety equipment for Bidder's personnel.

08. Mandatory spares as specified.

09. Erection/commissioning spares.

10. Consumables.

11. Special Tools & Tackle and test equipment.

12. Earthing as required for PA system

13. Items required to establish interface with EPABX system & Radio.

14. The items not mentioned but required for successful completion and guarantee run of the project / system including modification, addition in existing system shall be in the scope of the tenderer.

3.03.00 SCOPE OF SERVICE

Following service shall be provided by Bidder for equipment & systems supplied under this specification. However, Bidder has to provide the services required for completeness and correctness of the system irrespective of whether it is mentioned in the specification or not:-

1. Manufacture of all items as per requirement of specification, assembly etc.

2. System Engineering, development of software etc.

3. Furnishing drawings, documents, data sheets, manuals/catalogues as specified.

4. Inspection and testing at Bidder's works as per the Quality Assurance Plan.

5. Packing and forwarding of all equipment included under this specification.

6. Erection, Installation and commissioning, site testing of equipment supplied under this specification.

7. Laying & Termination of signal, power and grounding cables, providing earthing of the system and equipment as specified.

8. Establish the specified interfaces and demonstrate operation.

9. Vendor will, during the time of detail engineering and installation of the quoted system, interact and coordinate with any other agency regarding collection/retrieval of inputs/information/data and all such works shall be under the scope of this Vendor. If necessary, the Bidder shall contact the Owner before submission of their quotation.

10. Project management and scheduling including micro-planning in specific work area and reporting progress periodically.

11. Site modification and preparation of "as-built" documentation".

12. Prepare "Handing Over" protocol and hand over system to Owner.

13. Securing certification from relevant authorities, wherever applicable.

3.04.00 SCOPE OF DOCUMENTATION

01. Prepare work definition and interfacing requirements of all system components.

02. Provide system design documentation.

03. Provide all commissioning and test procedures.

04. Provide inspection, commissioning and test procedures for Owner's approval.

05. Operating & service manuals and handbooks.

06. Tag all equipment as per Project Specification Project Procedure.

4.00.00 PERFORMANCE GUARANTEE

4.00.01 The Systems/ Equipment to be supplied under this specification shall meet the guaranteed performance specified in the enclosed data sheet, specification sheet and technical attachment sheet when operating at the rated/ specified conditions. The acceptance of the System/Equipment shall be subject to satisfying these parameters during shop test at Bidder's works and/ or at site installation in complete assembled condition.

4.00.02 Performance figures quoted by Bidder shall be guaranteed within the tolerance permitted by relevant standards. In case of failure of the equipment to meet the guarantee, the equipment may be liable for rejection or the decline in performance from the guaranteed performance figures will be rectified by the Bidder without any extra cost.

5.00.00 WORK SCHEDULE

5.00.01 Bidder shall ensure that the delivery of Equipment and accessories shall meet the project schedule. The Project schedule/ Work schedule shall be furnished to Bidder during detail engineering.

5.00.02 Bidder shall indicate the phase-wise design, engineering, manufacturing, testing, and delivery for the complete package in the form of a bar-chart to match with the project schedule.

5.00.03 On finalization of the Contract, a detail supply programme for manufacture shall be furnished by Bidder for approval and will subsequently form a part of contract document.

5.00.04 Technical documentation such as Data Sheets, Quality Plan & Drawings are required to be submitted by bidder within the time period defined in NIT.

5.00.05 Modality of approval of technical documentation and priority of supply shall be mutually discussed and agreed upon with Bidder in the kick-off meeting after the placement of LOI.

6.00.00 REFERENCE DOCUMENTS CODES AND STANDARDS

6.00.01 The entire system and accessories materials shall conform to the requirements of the latest issues and most recent revisions and amendments of the standards listed below and to the local laws and regulations applicable to the Project.

6.00.02 This Specification shall be read in conjunction with material Standards, codes, practices and regulations.

6.00.03 Following non-exhaustive list of specific codes and standards shall apply to the all cables and accessories provided in response to this Specification. Mandatory regulations cannot be superseded by this specification.

6.00.01 GENERAL CODES AND STANDARDS

6.00.02 Materials shall be designed, manufactured and tested in accordance with the latest applicable IEC and other internationally recognized standard except where modified and/or supplemented by this specification. Performance figures quoted shall be guaranteed within the tolerance permitted by relevant standards. In case of failure of the equipment to meet the guarantee, the equipment may be liable for rejection.

6.00.03 It shall be Bidder's responsibility to comply with the requirements of all Codes and Standards which are applicable to meet the Specification.

6.00.04 The following Codes and Standards form a part of the Specification:

- ANSI : American National Standards Institute
- BS : British Standards
- CCITT : Consultative Committee on Telephone and Telegraph
- EIA : Electronics Industry Association
- FM : Factory Mutual
- IEC : International Electro technical Commission
- IEEE : Institute of Electrical and Electronic Engineering
- ISA : Instrument Society of America
- ISO : International Standards Organisation
- ITU : International Telecommunication Union
- NEC : National Electrical code
- NEMA : National Electrical Manufacturers Association

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI S3.5 Methods for the Calculation of the Speech Intelligibility Index

BRITISH STANDARDS (BS)

- BS EN 60268-5: 2003 Sound system equipment, Loudspeakers.

- BS EN 6840-13: 1998 Sound system equipment. Listening tests on Loudspeakers.
- BS 6840-14: 1987 Sound system equipment. Guide for circular and Elliptical Loudspeakers; outer frame diameters and mounting dimensions.
- BS 8473:2006+A1:2008 Intruder and hold-up alarm systems. Management of false alarms. Code of practice.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

- IEC 60268-5 Ed.3.1 en: 2007 Sound System Equipment - Part 5: Loudspeakers.
- IEC 60529 Classification of Degrees of Protection Provided by Enclosures (IP Code)
- IEC 60839-5-2 ed. 1.0 b: 1991 Alarm Systems Part 5 Requirements for alarm transmission systems.
- IEC 61000 (All Parts) Electromagnetic Compatibility (EMC)

The edition or revision of the Codes and Standards shall be the edition current at the date of the Contract.

6.02.00 **DISCREPANCIES**

6.02.01 In case of discrepancies between the technical requirements and other applicable Engineering Standards, Materials System Specifications, Standard Drawings, or industry standards, codes, and forms shall be resolved in writing by Bidder with the employer. Before starting the manufacturing/ supply, Bidder shall inform employer of any discrepancy between the instructions of the present specification and Bidder's standard.

6.02.02 It shall be the responsibility of Bidder to determine and comply with the statutory regulation (i.e. city, state, national, provincial, etc. codes or ordinances) which will apply in the location where the item is to be installed. Mandatory regulations cannot be superseded by this specification.

7.00.00 PROJECT INFORMATION

7.00.01 Environment specified as 'Indoor' shall be air-conditioned, where mentioned, having temperature between 20-25 degrees C and RH of about 40%. Outdoor location shall follow 'site condition' data as given in the NIT.

7.00.02 All outdoor equipment shall be exposed to high humidity & oil/water vapour, coal dust and fly ash laden environment, vibration and electromagnetic interference generally encountered in similar industrial environment.

7.00.03 All outdoor equipment shall be mechanically or environmentally protect with sunshade or canopy wherever necessary.

8.00.00 TECHNICAL DESCRIPTION

3.1 Specific Technical Requirement:

S.No.	***Reference Clause No. of Section-D (if any)***	***Specific Requirement/ Change***
1.	7.2 Identification, marking, packing and storing	Packing shall be sea-worthy
2.	Reference standards	Note that IS shall not be applicable for the project. Only international standards viz. IEC, IEEE, BS etc. shall be applicable.
3.	6.3 Call stations	Nomenclature for type of handsets shall be as per clause 8.17.00 of Section-C.
4.	3.2.1 Cable glands	Cable glands shall be double compression type as required for the system. Material of glands shall be tinned brass as per BS 6121.

8.01.00 **GENERAL REQUIREMENTS**

8.01.01 The System offered shall be minimum 2-Channel Page & Party configuration with various area-wise zone stations forming functional groups comprising Field Call Stations and Loudspeakers. The PA system shall be Paging System shall be IP based. The field call stations shall be IP addressable whereas the speakers shall be of analog type without IP addresses. The field call stations shall have additional amplifier to drive additional one speaker. The zone wise segregation shall be as under to the minimum extent.

- Zone-1 for Unit-1
- Zone-2 for Unit-2
- Zone-3 for Common Service & Plant water system
- Zone-4 for Coal Handling Plant

8.01.02 The system shall be based on distributed network the system shall provide coverage to various locations within the plant. The distributed nodes shall be interconnected through OFC based network.

8.01.03 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.

8.01.04 The design shall be such as to provide highly intelligible minimum two-channel voice communication even in areas of high background noise (50 dB to 100 dB).

8.01.05 The system under this tender shall make use of the redundant Optical Fiber Cable backbone, laid for connecting two geographically separated PA controllers. The PA and Industrial Talkback Controller at CCR shall cater the areas such as DM water, Boiler and Turbine, ESP, Admin Building, Security office, gates, Chemical Building, CW Plant, Switchyard etc. The PA Controller at CHP Control Room shall serve the areas around CHP such as wagon tippler, CHP Electrical Control Room. The speakers, FCS shall be connected to their respective PA controller through fiber optic cable network. The structure of the fiber optic cable backbone, field Ethernet switches, number of master call stations etc may be subject to changes during detail engineering stage. The different types of speakers and Call Stations shall be deployed over locations around each of the nodes. In noisy areas FCS shall be used along with acoustic booth. The speakers and FCS in each zone shall be

connected through Star fashion to the respective Ethernet switch. The network switches in PA system shall be connected using ring topology.

8.01.06 Each node location and some other locations equipped with a Field Ethernet Distribution switch and shall also be equipped with PA Remote Interface equipped switching technology, which form part of the In-Plant paging and PA remote node. Ethernet switch shall be connected to the Call Stations by Cat6 cable.

8.01.07 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 provide zoned and plant-wide paging together with a min 2 party communication channels within each zone or plant area.

8.01.08 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.

8.01.09 The PA and Industrial Talkback system shall be expandable to cater for future expansion phases in terms of additional nodes, zone expansion and additional control and access panels.

Note: Broadly all expansion requirement of PA and talkback system is already indicated in the technical specification.

8.01.10 Speaker cabling and visual alert cabling shall all be on a ring to provide resilience.

8.01.11 Calls will be carried out through handset stations installed in the various locations across the Project.

8.01.12 The area coverage will be such that calls will be clearly audible in the paged operating areas and their surrounding space.

8.01.13 The plant area shall be divided into zones each with sections. Final distribution of units over the zones will be finalised during detailed design. This will be related to area configuration and other operational objectives.

8.01.14 Some PA and Industrial Talkback field call station units may be located in areas with a fair degree of background noise. Therefore, the requirements shall be for directional dynamic microphones, with strong noise suppression together with input/pre-amplifier sections including filtering and speech compression giving the highest practicable levels of intelligibility.

8.01.15 The In-Plant Paging system shall provide zoned and plant-wide paging together with a minimum of 1 Channel-party communication channels within each zone or plant area and allowing minimum one (1) simultaneous conversation within the area (zone).

8.01.16 The system shall be capable of providing an audio output to a Digital Voice Recording System.

8.01.17 Facilities shall be provided for local loudspeaker muting to prevent acoustic feedback that may be generated from nearby access panels.

8.01.18 Each operator's control set will be able to:

a) Address a call to one or multiple sections.

b) Address a call to one or multiple zones, by activating the selected zones.

c) Transmit a general call to the whole area activating all sections simultaneously.

8.01.20 The following shall form part of the central equipment located in the CCR:

a) EPABX Interface

b) Acoustic feedback suppression

c) CD audio player

8.01.21 The operator control sets shall be provided in key location.

8.01.22 CD audio player shall be provided as one of the input/output sources to/from the public address system which shall have the capability to broadcast the player output.

8.01.23 Any field call station can selectively dial any other call station from its inbuilt dialling pad without the manual intervention of any zonal operator. The intelligence unit, dialling button/keypad etc shall be an integral part of the call station and shall not be procured form different OEMs and combined.

8.01.24 The powering philosophy for PA and Industrial Talkback system and other allied accessories shall be as under.

a) Bidder to consider mini UPS suitable to provide power supply to PA system and other allied accessories. Incoming supply (240V AC 50Hz) to UPS shall be provided by the Owner within 3 meters of the point of location of the PA system and allied accessories. Power cable from owner's power supply unit to I/C of UPS and power cable required for further distribution shall be provided by the bidder.

b) All power distribution boards, MCB, power supply cable shall be provided by the Bidder.

c) Extending the power supply up to the point of installation of telecom equipment, providing power supply cable, MCB etc. shall fall under the scope of works of the Bidder.

8.01.25 The Bidder shall provide the earthing of the system as per their industry standard. The telecom earth shall be connected to the main Electrical earthing system by the Bidder under their scope.

8.01.26 It must be possible to switch on the following different tone and frequency signals with the appropriate alarm buttons:-
1- Fire alarm
2- Major, large scale breakdown
3- Gas alarm
4- All-clear signal (for resetting of alarm)

The PA system shall also be supplied with a siren based annunciation system to cover all areas within the power station (incl. GIS area).

8.02.00 **DETAILED CHARACTERISTICS**

8.02.01 The equipment shall be fully solid state type, microprocessor based and programmable.

8.02.02 The Operator Access Units shall be microprocessor based and connected to the central control cabinet using Cat6 or suitable cable cables.

8.02.03 PA Controllers at CCR and CHP Control Room shall be fibre optic interfaces to establish optical communication over OFC link between two PA Controllers.

8.02.04 Configuration of the system shall be achieved by software for maximum flexibility. A "user friendly" setting up and checking routine shall be provided which enables an operator using a PC to implement speed commissioning and fault finding functions. The use of these methods shall allow adjustments to be easily made when the system is installed without resulting in modifications to the system wiring. The system shall be provided with standard
serial interface (preferably a USB connection) to be connected with a laptop for local and remote access for maintenance and operations activities. One Notebook PC shall be provided for these functions.

8.02.05 All software utilized shall be the latest and upgraded version.

8.02.06 The system shall be designed to comply with EMI and RFI Regulations particularly the requirements of IEC 61000 series.

8.02.07 Validity of License for all software shall be more than the warranty period.

8.03.05 **Interface with EPABX System & fire alarm system**

An interface to the telephone system shall be provided to enable users to broadcast routine speech announcements from telephones assigned the correct class-of-service. The system interface to the telephone system shall be via a 2- wire/4-wire E & M tie-line/E1 line/ SIP channel. Facilities shall be included to prevent acoustic feedback that may be generated from telephones situated close to loud-speakers. Hardware required for interface with EPABX system shall be in PA system supplier’s scope.

8.04.00 **TECHNICAL FEATURES**

8.04.01 The design of the system and distribution of loudspeakers and flashing lights shall be based on the following requirements :

a) The alarm signal level at every location on the installation shall exceed background noise level, at that location, by at least 10dB. Greater than 20dB is undesirable.

b) Loudspeakers will also be installed in areas where the audible communication is impossible during normal operation due to high ambient noise level. The system in that particular area shall be designed for the situation when the particular noise is shut off.

c) The Bidder shall be fully responsible for the design and distribution of loudspeakers across the plant including all buildings to ensure intelligible and adequate message broadcast.

8.04.02 After the completion of installation the system coverage shall be tested using SPL meter to ensure adequate coverage of the plant and its associated buildings.

8.05.00 SYSTEM CABINET

8.05.01 The control sub-system, speech amplifiers and their ancillary devices shall be housed in a standard rack mounted system cabinet with all control, power circuits and necessary amplifiers and shall be supplied in pre-wired conditioned and shall be completely tested at manufacturer's works prior to despatch.

8.06.00 DIGITAL VOICE STORAGE / PLAYBACK UNIT (DVSP)

8.06.01 This unit is used, as above, to gain access to the PA system by telephone or radio, but the message to be broadcast is digitally stored and played through the DVSP monitor speaker on the Engineers Test Panel, this allows the engineer to intercept calls which he does not think are suitable for broadcast.

8.06.02 The DVSP shall record calls that cannot be sent to all required zones because some are occupied by a higher priority call. The unit shall store up to minimum 15 calls in high quality format with a maximum of three minutes for each call, including chimes and pre-recorded messages. Playback of a call can start while it is still being recorded. The unit can record and/or playback up to minimum eight calls simultaneously

8.07.00 The system functions may be programmed from a variety of external and/or internal sources such as via the connection to a Notebook PC.

8.07.01 PABX Interface

This unit is provided in order to gain direct access to the PA system via telephones for high priority announcements by such people as supervisors, etc. The interface shall be based on industry standard open protocol. However, this interface shall need to be reviewed during the installation of the new IPX PABX.

8.08.00 CONTROL SETS

8.08.01 A directional gooseneck microphone shall form part of each control set. When the microphone shall be use, nearby loudspeakers shall be muted to avoid acoustic feedback. The microphone amplifier shall be fitted with an automatic gain control for convenience in use.

8.08.02 Each control set shall be equipped as minimum with the following:

a) A magnet dynamic, gooseneck microphone and a telephone handset with automatic switch from the microphone to the handset upon lifting the last one.

b) Necessary lamps, push buttons, switches, and indicators to monitor and control the system.

8.09.00 LOUD SPEAKER

8.09.01 **General Requirements**

a) The loudspeakers shall be normal, weatherproof in all locations and explosion proof type, depending upon the location in which they will be installed.

b) The nominal power is intended as the power of a sinusoidal signal continuously applicable without damage. All speakers shall have the same rated power and shall be adjusted to provide the required coverage.

c) The primary winding of the transformer shall be tapped so that the loudspeakers will absorb from the line 100%, 50%, 20%, or 10% of its power, according to the tap used.

d) The reproduced frequency band shall be at least 370 to 6000 Hz for all the transducers, within +/-6 dB range.

8.09.02 **Weatherproof Loudspeakers**

a) They shall have protection to meet IP 65, IEC 60529 Publication.

b) The explosion proof requirement shall be in accordance with the area classification in which it will be installed.

c) The utilised material shall be Special Plastic/die cast aluminium/polyester resin armoured with fibre glass or equivalent, suitable to resist the aggressive atmosphere.

d) The indoor loudspeakers installed in various buildings shall provide pleasant appearance and blend with the surroundings.

e) The flashing light shall be addressable for remote maintenance and checking from the PA Administration station.

8.09.03 **Acoustic Feedback Protection**

The system shall be fitted with devices to enable and affect frequency shifting of voice input during PABX radio access. Acoustic feedback via telephone or radio connection to the PA/alarm system can only be totally eliminated by the use of a digital voice storage/play-back (DVSP) unit.

8.11.00 **PUBLIC ADDRESS SYSTEM**

01.	System	Min.2-Channel Page & Party
02.	System Architecture	Separate functional groups (Field call stations / Loudspeakers)
03.	Zone Station	Area-wise

04.	Master Control		One station (1) - coordinating Zone Stations.
05.	Zone call discipline		Between Zones & Master station
06.	Master call discipline		All Zone stations
07.	Alarm siren		From MCS on Zone basis/plant basis
08.	Override		From MCS for broadcast.
09.	Operating Voltage		240 Volts 50 Hz AC
10.	Master Control Station		Rack mounted, free standing
11.	Location		Indoor, air-conditioned
12.	Support capability		Expandable to 100 zone stations
13.	Interface required	:	EPABX & Radio
14.	Input sources		Voice, tones, pre-recorded messages, music
15.	System features		Private communication, conference call, PA
16.	System programming		Field Programmable, touch screen
17.	**Master Access Panel**		Desk-top, Indoor, air-conditioned

- Microphone — Gooseneck(>400mm)
- Enclosure — Anodized aluminum
- Zone selection — Dedicated buttons
- Emergency features — One touch paging, caller ID, Speed dialling

18. **Zone Station** — Hands-free, wall mounted/desk top, dual direct.

- Location — Indoor/Outdoor
- Mounting — Desk/Wall mounted
- Protection — Corrosion resistant & pilfer proof.
- Protection Class — IP65
- Body — Heavy duty GRP.
- Microphone Type — Gooseneck (>400mm).
- Volume Control — Via keypad.
- Body — Moulded Polyurethane
- Operating voltage — 24 V DC.

- Distance 2Km (max.)
- Loudspeaker Output Yes

8.12.00 WEATHER PROOF HORN TYPE SPEAKER (15 WATT)

Housing	:	Special Plastic/ die cast aluminium/ polyester resin armoured with fibre glass/ equivalent industrial grade material.
Ingress Protection	:	IP65
Rated Power	:	15 watt
Frequency Range	:	370Hz to 7000Hz
Dispersion-6dB-1 KHz/4KHZ	:	140° /40°

8.13.00 INDOOR SPEAKER (10 WATT)

Housing	:	Special Plastic
Ingress Protection	:	IP32
Rated Power	:	10 Watt
Effective Frequency Range	:	100 to 20000Hz

8.14.00 CEILING MOUNTED SPEAKER (6 WATT)

Material : Special Plastic

Effective frequency Range : 100-15,000 Hz

Volume Control : Required
Ingress Protection : IP32

8.15.00 WEATHERPROOF OUTDOOR CALL STATION

Loud speaker : 15 W

Frequency range : 300 Hz To 3.4 Khz

Electrical data booster amplifier - output power : 25 W / 400 Ohm

Protection class : IP-65

8.16.00 INDOOR CALL STATION

Frequency range : 300 Hz to 7 khz

Loudspeaker : 5Watt/8Ohm

Average speech power : (1 W / 1 m) 86 dB
Ingress Protection : IP32

All handset stations and their components shall be capable of continuous satisfactory operation at an ambient temperature of 45 degree centigrade.

8.17.00 TYPE OF INSTRUMENTS SHALL BE DESIGNATED AS BELOW:

a) Type-A: Handset Station complete with or without Handset and amplifier with indoor type enclosure. It shall be suitable for mounting on wall/column with in covered area inside building.

b) Type-B: Handset Station complete with or without Handset and amplifier with outdoor type enclosure. It shall be suitable for mounting on wall/column in open area. The enclosure shall be dust proof, flame proof, water proof as per industrial standard. It shall be provided with canopy.

c) Type-C: Desk Top Mounted Handset complete with Handset and amplifier. It shall be suitable for mounting/placing on table with in control rooms.

d) Type-D: Outdoor type PA Instrument complete with microphone, speaker and amplifier, but without handset. The communication shall be possible thru built in microphone. The enclosure shall be dust proof, flame proof, water proof as per industrial standard. It shall be provided with canopy.

e) Socket: Plug in type socket for communication with the help of Portable PA Inst.

Note: All handset stations shall draw power from switches/ controller i.e. no external power supply is required for handset stations.

8.18.00 TELEPHONE PROTECTION / ACOUSTIC HOOD

1) Housing – Rot/vandal resistant glass re--enforced polyester /Hot-galvanized sheet steel or stainless steel.

2) Self-colour-yellow, visible during emergency/Paint- Powder Coated

3) Luminous yellow green glow in dark condition, lasting up to minimum 10 hours or more

4) Sound absorbent- Up to 12 dB(A) when it will be used as Acoustic Hood

5) Resistant to chemical spillage/vapours and are fire-retardant

6) Flashing beacons telephones and sounders can be attached to the hood

7) Temperature Range : +60 Deg C to -10 Deg C

8.19.00 UNINTERRUPTIBLE POWER SUPPLY (UPS)

UPS shall be supplied as per requirements described in relevant IEC. Rating and other requirement shall be as per following details:

Rated power	Rated with 30 min battery backup
Input	Voltage :140-270
Output	Suitable for Ethernet switch; Power factor >=0.7
Overall efficiency	>=85% (AC To AC)
Automatic switchover transfer time	<5 millisecond OR better
Display & controls	The UPS shall be provided with a microprocessor based unit Status display and controls section designed for convenient and reliable user operation. The monitoring function such as status and alarm indications shall be displayed on an LED display or equivalent arrangement.
Protection	**The UPS should the following protections as minimum** a. Overload b. Short circuit c. Over and under voltage d. Any other required for healthy operation
Indication and alarm a. Battery LED indication b. Battery alarm c. Battery Power indication	 a. For indicating battery mode b. Audible alarm c. Battery power status
Features a. Power on self-test b. Interface port c. Remote monitoring software	 a. Auto self-test b. DB9-RS232 or USB c. For monitoring devices status.
Environmental a. Operating temperature b. Operating relative humidity.	 a. 0-40°C b. 0-95%

8.19.01 BATTERY

Application : UPS Battery
Type : Ni-Cd
Battery shall be sized for backup of 30 minutes.

8.20.00 NETWORK SWITCH

Data highway shall be of high speed Ethernet and full duplex configuration. Network shall be built on the Managed Ethernet switches for better control of data traffic & performance and future expansion. Switch configuration shall be redundant with seamless changeover without any upset in the process or equipment. Failure reporting shall be available at HMI. MTBF of the switch shall be more than 20 Years. Configuration shall be automatic.

The Ethernet switches to be used in the plant shall be of same type and shall conform the specification requirements.

Network components shall be sourced from following sub-vendors:

1) Avaya (Extreme), USA
2) Garret, USA
3) Juniper, USA
4) Brocade, USA
5) Enterasys, USA
6) HP (3 Com, H3C)
7) Cisco
8) Foundary
9) Netgear
10) Hirschmann, Germany
11) Entron

Bidder may propose additional sub-vendors which shall be subject to BHEL/BIFPCL approval.

8.23.00 **NETWORK MANAGEMENT SOFTWARE (NMS)**

The minimum technical requirement of NMS is given below:

01. Automatic topology discovery and creation of network maps.

02. Should have high level Network Inventory polling capability for IP Network nodes, All available Switch, Camera, Modules , ports , Physical links , VLAN interfaces and all the other SNMP capable devices in the network

03. Should have powerful administration control

04. Detailed performance monitoring and management

05. Should have extensive fault management capabilities with Real time Event and Alarm notifications , System Logs and Audit trials

06. Scheduled Device configuration back-up and restore functionality

07. Automatic Detection of configuration changes for easy trouble shooting and Isolation

08. Should support 3rd party devices and end points

09. Should have the functionality of Group provisioning/Scheduled configuration roll out management

10. Should have the ability to perform scheduled or Unscheduled network wide software or Firmware upgrades

11. Should have the ability to customise the NMS dash boards as per the requirements

12. Should have the ability to perform/ create group of devices for applying same task

13. Should have extensive centralised trouble shooting tools in built

14. Should provide the flexibility to the network administrator to assign task to an Individual network engineer and assign ownership & track the status of the issue resolution

15. All the required Hardware / Software for the NMS solution should be proposed by the bidder

8.24.0 CABLES:

(i) Instrumentation cable

All instrumentation cables shall comply with VDE 0815, VDE 0207, Part 4, Part 5, Part 6, VDE 0816, VDE 0472, SEN 4241475, ANSI MC 96.1.

The cables shall be armoured FRLS type. Colour of the outer sheath shall be YELLOW. All cables of PA system shall be armoured.

(ii) Optical fiber cable (OFC)

Optic Fiber cable shall have multiple single-mode or multimode fibers on as required basis. All testing of the fiber optic cable being supplied shall be as per the relevant IEC, EIA and other international standards.

Following cables shall be used:

a)	Optical fiber Cable	:	For Cables Connecting Nodes/Switch.
b)	CAT-6	:	Ethernet Switch to PA speaker & Call Station
c)	Cu, Twisted Pair, Armoured Cable	:	From Switches to FCS and FCS to Speaker.

Sizes and no. of cores shall be decided based on System requirement.

8.27.11 **Power Cable**

The power cable shall be used for both outdoor and indoor application. It shall be 3X2.5 sq.mm size conforming to IEC-60502 standard. For outdoor application, the cable shall be armoured type. For indoor application, the power cable shall be armoured type for connection from UPS to PDB. However, it shall be unarmoured type for further cable distribution used for powering equipment like PCs, Server and network switches etc. inside rooms.

8.27.12 **HDPE Pipe**

The HDPE pipe shall be used for laying OFC and STP cables in outdoor environment. HDPE pipe shall be permanently lubricated type. The internal diameter of the HDPE pipe shall be suitably selected so that 50% free space is maintained during cable drawing. The pipe shall conform to relevant international standards.

8.27.13 **Cable Tray**

Pre-fabricated perforated & covered cable trays of average 3 meters length and of minimum dimension 100X35X3 mm shall be used. The tray shall be of minimum 100 mm wide, fabricated from not less than 2 mm thick sheet steel and of vertical edge of height not less than 35 mm on both sides. Cable trays shall be hot dip galvanized after fabrication. Minimum value of average mass of zinc coating shall be 460

gm/sq.mt. as per IS:4759. Supporting galvanized brackets shall be provided at regular intervals for fixing the trays.
Cable trays, if used in semi-closed or open areas shall be FRP type.

8.27.14 Power Supply Unit

a) The system will be powered from a suitable UPS system at 240VAC, 50Hz. A power supply unit shall provide the required low voltage levels to feed the equipment and their stand-by unit.

b) The power supply unit shall have stabilised voltage outputs for input variation between -10% and +10%.

9.00.00 ERECTION & COMMISSIONING

Bidder's scope of work shall include the erection and commissioning of the entire system offered. Bidder shall include all erection materials, consumables etc for the purpose. Bidder shall arrange all erection tools, tackle and calibration instruments.

9.01.01 INCLUSION IN ERECTION SUPPLY & WORKS

9.01.02 Supply of erection hardware with all accessories as specified herein.

a) Erection of equipment with all erection material & accessories

b) Cabling works as specified.

c) Pre-commissioning activity, loop checking, calibration & testing

d) Provide supervision of all above activities.

e) Supply of consumables

f) Supply of erection/commissioning spares.

g) Providing all necessary Tools & Tackle

h) Painting with anticorrosive paint wherever required.

i) Commissioning.

9.02.00 SCOPE OF ERECTION SERVICE

1. Keep calibration records.
2. Maintaining proper documentation & handing over to Owner.
3. Create defect records and insurance claim documentation.

9.03.00 TECHNICAL SPECIFICATION OF ERECTION HARDWARE

a) This section provides the general technical requirements for the erection hardware to be supplied under this package.

b) All erection materials shall be of good quality and conform to the operating environment of the plant.

9.03.01 Rigid Steel Conduit

This shall meet the technical requirements as described in applicable International standards and shall meet the statuary requirement.

9.03.02 Flexible Conduit

This shall meet the technical requirements as described in applicable International standards and shall meet the statuary requirement.

9.03.03 Special Fittings

This shall meet the technical requirements as described in applicable International standards and shall meet the statuary requirement.

9.03.04 Distribution Frames & Junction Boxes

This shall meet the technical requirements as described in applicable International standards and shall meet the statuary requirement.

9.03.05 Cable Glands

This shall meet the technical requirements as described in applicable International standards and shall meet the statuary requirement.

9.03.06 Earthing Wire

This shall meet the technical requirements as described in applicable International standards and shall meet the statuary requirement.

9.04.00 GENERAL GUIDELINES & PRACTICE FOR ERECTION

Erection procedure shall follow sound engineering practice throughout and shall not cause hindrance to the activities of other Bidders at the work site. The sequence of work activities shall follow logical sequence and shall be based on work-front availability.

9.04.01 Panels & Cubicles

This shall meet the technical requirements as described in applicable Indian standards and shall meet the statuary requirement.

9.04.02 Cabling Works (Overground)

This shall meet the technical requirements as described in applicable Indian standards and shall meet the statuary requirement.

9.04.03 Conduiting Works

This shall meet the technical requirements as described in applicable International standards and shall meet the statuary requirement.

9.04.04 **Cabling Works (Underground)**

This shall meet the technical requirements as described in applicable International standards and shall meet the statuary requirement.

9.04.05 **Earthing**

This shall meet the technical requirements as described in applicable International standards and shall meet the statuary requirement.

10.00.00 DOCUMENTATION

10.00.01 Details of documentation to be supplied as part of the System shall be submitted to Owner for approval prior to execution of the contract.

10.00.02 Each documentation deliverable shall be an integral part of Bidder's Project schedule and shall be identified by date for delivery.

10.00.03 All documentation shall be in the English language.

10.00.04 The following data shall be shown on all documents and/or drawings :

- Name of Bidder / Bidder
- Correct and complete designation of the document
- Exact indication of the scale employed
- Revision Index and type of revision
- Name of the site.

10.00.05 Bidder shall supply final approved sets of documentation in hard copy and soft copies on DVD.

10.00.06 Bidder shall provide the signature and seal on the each and every pages of this specification along with their offer for the confirmation to all the clauses. Along with submit deviation/clarification list if any in given format.

10.00.07 Final Documentation shall be assembled as per Owner's instructions for collation of Dossiers.

10.00.08 Following sections detail the minimum set of documentation that shall be supplied with the System.

10.01.00 ENGINEERING DESIGN DOCUMENTATION

10.01.01 Bidder will produce drawings of complete system to be submitted to Owner for approval, indicating upon each the following :

- Overall dimensional drawing of system cabinet, console and its accessories.
- Block diagram of system offered with a brief write-up on operation including hook-up arrangement with existing system.

- Data sheets.
- Bill of Materials.
- Typical general arrangement drawings of various handset and speaker stations.
- Schematic diagram of each type of station.
- Mounting details.
- Cable connection diagram for various type of stations, clearly indicating cable size, number of pairs/cores etc.
- Total power consumption details.
- Heat load details of panel equipments.
- Technical leaflets on each piece of equipment viz handset, speaker etc.

10.01.02 The Systems Design Manual shall contain all relevant information pertaining to the design and operation of the delivered equipment.

10.01.03 This is intended to provide Owner with an understanding of the operational and design parameters of the equipment and to resolve System operational problems.

10.01.04 This documentation shall typically include the following items, presented in a Systems Design Manual:

- Equipment design calculations and selection basis.
- Equipment construction and assembly drawings.
- Parts list and drawings with manufacturer's identification codes.
- Systems connection diagrams.
- Accessories list and drawings with manufacturer's identification codes.

10.02.00 OPERATION & MAINTENANCE DRAWINGS AND DOCUMENTATION

10.02.01 The O&M Drawings and Documentation shall typically include the following items:

- Assembly drawings.
- Parts list and drawings with manufacturer's identification codes.
- Accessories list and drawings with manufacturer's identification codes.
- O&M schedules.
- Maintenance guidelines including lapping instructions.
- Troubleshooting guides.

10.02.02 The O&M manuals shall be submitted in the form of handy, hard bound books which can be easily handled and transported to site.

10.03.00 DRAWING/ DOCUMENT SUBMISSION REQUIREMENTS

10.03.01 Bid shall contain at least the following documents:

SL. NO.	DOCUMENT TYPE
01.	Supply Document list
02.	Supply program
03.	Data sheets
04.	Technical specifications and relevant drawings
05.	Start-up, Mandatory and Recommended spare parts
06.	List of Tools and Tackle
07.	Proposed System schematic diagram.
08.	Write up on architecture and operation of proposed system
09.	BILL OF MATERIALS with make and model no. of equipment
10.	Power requirement. (capacity of FCBC and SMF battery)
11.	Quality Control Plan

10.03.02 following documents shall be submitted after award of contract:

SL. NO.	DOCUMENT TYPE
01.	Supply Document List
02.	Supply Program
03.	Data Sheets
04.	System Architecture Drawing
05.	Constructive equipment drawings (PA Controller, Call Station and accessories dimensional dwgs)
06.	Technical Specifications (catalogues, assembly and erection specifications)
	Details of Panel and Installation
	Erection/Installation Drawing
	Equipment Layout Drawing in buildings I locations
	Wiring Diagram of Panel
	Cable Route Layout Drawing

	Power Distribution Scheme Diagram
	Cable schedule
07.	Test certificates
08.	Compliance certificates
09.	Quality Control Plan
10.	Test procedures
11.	Start-up , Recommended and mandatory spare parts List
12.	Tools and tackle & consumable list
13.	Operation and maintenance manuals
14.	Final version of all drawings and documents furnished with the Bid.

10.04.00 **AS-BUILT DRAWINGS**

Upon completion of the final acceptance of the System by Owner, all construction drawings shall be updated by Bidder to an as-built status to reflect the equipment and System configurations as actually installed.

11.00.00 TESTING

11.01.00 **FACTORY ACCEPTANCE TEST (FAT)**

11.01.01 Factory Acceptance Test procedure shall be prepared by Bidder along with Quality Asuurance Plan. The document shall be subject to Owner's approval.

11.01.02 All System equipment shall be tested in the factory prior to clearance for shipping. The FAT shall include individual equipment tests under fully assembled condition.

11.01.03 The FAT shall demonstrate adherence that the equipment meets the design standards and functional compliance.

11.01.04 One (1) month prior to the FAT, Bidder shall submit a test procedure to Owner for approval. . Duration of FAT at manufacturer’s works shall be at least two weeks.

11.01.05 Owner's representative may, at Owner's sole discretion, attend the FAT. In this event, Bidder shall ensure all tests are carried out in the presence of Owner's personnel. If Owner declines to attend the FAT, Bidder shall carry out these tests and submit the results to Owner for review.

11.01.06 Factory Acceptance Tests (FATs) shall be documented with the results obtained and the success or failure of the test. The test results shall be submitted to Owner prior to clearance of the FAT and authority by Owner is given to ship.

11.02.00 **COMMISSIONING**

11.02.01 Bidder is responsible for delivering a fully functional equipment that meets all the requirements of the Specification and applicable standards.

11.02.02 The Commissioning processes will demonstrate the above to Owner, before handing over of the System.

11.02.03 System Commissioning shall comprise of a number of different activities culminating in the acceptance of the operational System by Owner. These activities are detailed in the following sections.

11.02.04 Bidder shall provide all necessary test equipment required to carry out the Commissioning and acceptance testing.

11.03.00 SITE ACCEPTANCE TEST (SAT)

11.03.01 Site acceptance test shall be performed by Bidder to verify the full operational functionality of the System.

11.03.02 Four weeks prior to the SAT Bidder shall submit a test procedure to Owner for approval.

11.03.03 All SAT tests shall be documented with the results obtained and their success or failure. These test results shall be submitted to Owner prior to clearance of the SAT and proceeding to the final performance tests.

12.00.00 MAINTENANCE REQUIREMENTS

12.01.00 MAINTENANCE PHILOSOPHY

12.01.01 Owner's maintenance philosophy is to undertake first line field repair by modular replacement. The module shall then be returned to the supplier, who shall either repair it or replace it during the warranty period.

12.01.02 The warranty period shall be a period a twelve (12) months, beginning when commissioning is reached.

13.00.00 SPARES, TOOLS, AND TEST EQUIPMENT

13.01.00 SPARES

13.01.01 Recommended Spares

a) Supply of spare parts as necessary and recommended by Bidder for six (6) years of reliable, trouble-free operation and maintenance of the items supplied under this specification.

b) List of such spares shall be provided by the bidder.

13.01.02 Mandatory (Contractual) Spares

Mandatory spare shall be supplied as per requirements described in annexure-3E

13.01.03 Start-Up and Commissioning Spares

a) Spares which may be required during tests, trial, commissioning and during guarantee run shall be arranged separately.

b) Spares which will be used for this purpose shall be replaced by the Bidder within reasonable period of time.

c) The cost of such spares shall be quoted separately. This may be ordered in part or on the whole.

13.02.00 GENERAL REQUIREMENTS OF SPARES

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

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

13.02.03 Bidder shall indicate the service expectancy period for equipment / parts under normal operating conditions after which replacement will be necessary.

13.02.04 Spares shall be properly packed for long term storage under the prevailing site condition and shall be clearly labelled for easy identification without uncarting. Any spare item having limited shelf life shall be clearly labelled for the expiry date beyond which it cannot be used.

13.02.05 Bidder shall inform the Owner, after having carried out the supply, if a component or part of an equipment will not be produced regularly any longer, specifying the new component or the material type which can be utilised in substitution.

13.02.06 Any spare parts for the system used during the Warranty Period (apart from those specified in the Annexure-3D O&M spares) shall be replenished at the Bidder's expense.

13.02.07 Bidder shall provide ordering information to order consumable and spare parts as required. Information required is:

- Description of item
- Bidder 's reference number
- Standard quantities recommended for start-up and normal operation
- Spare Parts Interchangeability Records (SPIR) procedures.

13.03.00 TOOLS & TACKLE

13.03.01 Bidder, in his proposal, shall indicate a list of all tools and tackle which may be required for erection, maintenance, overhaul and replacement of equipment / component to be supplied under this specification.

13.03.02 List of such items shall be supplied in the form of the enclosed format along with unit price.

13.03.03 Order for such tools & tackle may be placed simultaneously or otherwise at the option of Owner.

13.03.04 The cost of tools and tackle shall be quoted separately. Tools and tackle may be ordered in part or on the whole.

14.00.00 CLEANING, PROTECTION AND PAINTING

14.00.01 All equipment shall be shipped in properly cleaned condition. All the equipment shall be thoroughly cleaned to remove mill scales, rust etc. and properly painted with anti-rust primer, where applicable

14.00.02 Some of the equipment and accessories, after arrival at site, are likely to be in storage for long periods before they are taken up for erection. Bidder may provide adequate protection for preventing damage due to corrosion, dust & dirt ingress, ageing etc.

14.00.03 Plugs shall be provided at cable entry holes/adapters to avoid entry of dust and foreign particles. Paper cap will not be acceptable.

15.00.00 IDENTIFICATION, MARKING, PACKING AND STORING

15.00.01 Each equipment shall be individually packed, tagged and protected.

15.00.02 Inscription on equipment (labels) shall be in English.

15.00.03 Packing must be such to protect all goods from possible impacts and foreign matters; moreover, it must limit the influence of both the climate and the environment, and be suitable for the kind of shipping provided for. Packing shall be sea worthy .

15.00.04 In packing the equipment and accessories, all necessary precautions will have to be taken to avoid any damage during transport and delivery.

15.00.05 All items supplied shall be packed for long term storage under the climatic conditions prevailing at the site. Small items shall be packed in sealed transparent plastic bags with desiccator packs as necessary. Each item shall be clearly marked with its description, purpose and plant designation code as applicable. When more than one item is packed in a single case a general description of the contents is to be shown on the outside of each case and a detailed list enclosed. All cases and other packages must be suitably marked and numbered for identification purposes.

16.00.00 SHIPMENT

16.00.01 Bidder shall be responsible for ensuring that all equipment are carefully and/or suitably packed for shipment, so that they arrive at site in good condition and remain so during storage at site. Before despatch, all exposed surface shall be protected by applying anti rust primer (two coats) and suitable cover shall be provided for the equipment to be supplied.

16.00.02 Bidder will be responsible for all damages due to improper preparation of the goods for shipment

17.00.00 QUALITY ASSURANCE PLAN

17.00.01 Equipment supplied under this specification shall have assured quality and workmanship.

17.00.02 Bidder shall complete the Quality Control Plan with the information pertaining to him, in particular with the reference of the documents to be used.

17.00.03 The QCP completed by Bidder shall be submitted to employer for approval. The QAP matrix furnished hereunder is for guidance only.

17.00.04 Bidder shall carry out all the checks, tests and inspections required to verify the compliance of the supply with the specification requirements at his own expenses. Applicable test will be as per the *Inspection and Test Plan.*

17.00.05 If not specified otherwise in Contract, Bidder shall notify Owner, 10 (ten) complete working days in advance, that the equipment is ready for inspection. This notification shall include the following information :

- Bidder's Name/ address/ telephone and fax numbers
- Job /Subject, Purchase order number;
- Type / Serial No. / Tag No. / Model No.;
- List of parts to be tested;
- Type of inspection/test.....phase no.....of QCP no.....rev.....;
- Owner attendance;
- Place and date of the inspection;
- Quantity of available items;
- Expected duration;
- Bidder's reference person (name, phone, fax)

In case the inspection is performed without due notification, repetition of those tests may be requested at Bidder's expenses.

17.00.06 Owner and/or testing body's inspector shall have free access to Bidder's works both during manufacturing and tests & trials.

17.00.07 Bidder shall stand guarantee for perfect operation of the equipment during the period specified in the warranty.

17.00.08 Regardless of the results of the tests performed in Bidder's works, the final test will be performed at the plant, under actual operating conditions.

Bidder shall therefore undertake to replace, free of charge and within shortest time possible, all material which, in operating conditions, shall fail to comply with contractual requirements.

17.00.09 Bidder shall arrange the inspection and tests in easily accessible location and in properly illuminated shop to carry out the inspection in proper way.

Bidder shall, if called for, produce the necessary technical documents (drawings, specifications etc.) and copies of the codes or procedures applied to the execution of inspections and/or tests.

Owner reserves the right to reject the inspections and tests which fail to fulfil the above conditions.

17.00.10 Bidder shall perform inspections and tests in full compliance with industrial safety rules, to safeguard his own personnel as well as Owner's/ Consultant's Inspectors.

17.00.11 Bidder shall be responsible for the performance of the tests and shall :

a) provide qualified and specially skilled personnel

b) provide calibrated instruments with relevant certification

17.00.12 For Type or Special tests, Bidder shall indicate the location for carrying out the tests (Bidder's works or any recognized laboratory).

In case Owner is expected to give approval on the basis of certifications concerning similar previous supplies, Bidder shall submit for approval to Owner the documentation demonstrating the compliance between the supply and the certified model.

17.00.13 If during the execution or at the end of the supply, any non-conformances are noted, Bidder shall implement and adequately document all the corrective actions necessary to restore the contractually required conditions. The documentation related to the corrective actions shall be included in the final certification report. If the non-conformance compromises the functional or safety feature of the equipment or specific interface elements, the supplier shall inform employer in advance in writing on the corrective actions he intend to implement. Employer has the right to reject (totally or partially) the proposed actions if considered inadequate or insufficient and Bidder may be asked for more adequate actions. The failure to communicate such non-conformances will be considered fraudulent intention.

17.00.14 During manufacture Bidder shall make available, the certificates concerning the inspections and tests performed. At the end, Bidder shall provide the certificates required for components for which a QCP has been developed. These certificates shall be kept in dossiers and shall comprise the documents concerning manufacturing, inspections and tests performed on the component and on its parts. The dossier shall be organised as follows:

- Cover sheet containing:
- Bidder's Name;
- Job and order number;
- Identification (model no. & serial no.) and short description of the supplied component;
- Date and Bidder 's signature;
- List of content;
- QCP ;
- Certificates of materials, inspections and tests listed in the QCP;
- Non-conformance report (if any);
- Final Inspection Report.

All the pages shall be numbered.

17.00.15 The supply shall be considered completed if :

→ the documents presented to Owner have been approved;

→ the materials are in compliance with the specification; and related certificates are available and acceptable;

→ the necessary qualification certificates are available and acceptable;

→ the components have been inspected, examined and tested as required and related certificates are available and acceptable;

→ the non-conformances have been documented and accepted by Owner;

→ the components are clean, protected and identified;

→ the necessary instructions for protection, handling or storage are available;

→ the Final Inspection Report has been submitted.

17.00.16 Bidder shall prepare a QCP for each component or group of similar components.

→ Bidder must indicate his identifying data and those concerning the order and the component for which the QCP is referred to;

→ Bidder shall indicate the materials, parts and processes to be inspected, checked and tested and related tests and inspections to be executed.

Other types of forms may be accepted only if they contain the same information of Bidder.

17.00.17 The QCP prepared by Bidder shall be submitted to Owner for approval at least 15 days before the start of the related actives. Bidder shall be authorised to proceed if the QCP has been approved.

17.00.18 General requirements for inspection shall be as per the following guidelines.

a) *Non Destructive Tests* (NOT APPLICABLE)

b) *Tests*

- The materials, manufacturing and finished components shall be inspected, controlled and tested as defined in this paragraph in compliance with standard codes and technical specification that shall be subject Owner's approval.

c) *Visual Inspections*

The PA Controller and speakers, call stations etc. shall be subjected to the following visual inspections and checking:

- Check of the supply (quantities, accessories, markings dimensions/ examinations in compliance with relevant drawings);

ANNEXURE-1 BOQ OF PA SYSTEM

TOTAL FOR 2 UNITS

	ZONE-1/2	MCS	HANDSET	TYPE	INDOOR/OUTDOOR		FALSE CEILING CONE TYPE	CONE TYPE	HORN TYPE	ACOUSTIC HOOD
1	ESP Control Room		1	B	INDOOR		1	2		
2	ID Fan-A		1	A	OUTDOOR				2	1
3	ID Fan-B		1	A	OUTDOOR				2	
4	Boiler Elevations		16	A	OUTDOOR				32	8
5	FD/PA Fan-A		1	A	OUTDOOR				2	1
6	FD/PA Fan-B		1	A	OUTDOOR				2	1
7	Near ESP Structure		1	A	OUTDOOR				2	
	ESP roof		2	A	OUTDOOR				4	
8	Near Dearator		1	A	OUTDOOR				2	
9 *	Near TDBFP/HP Heater		1	A	OUTDOOR				2	0
10 *	TG Hall	1	2	A	OUTDOOR				4	4
11 *	Near TG Main Oil Tank		1	A	OUTDOOR				2	
12 *	Near MDBFP/LPH		1	A	OUTDOOR				2	
13	Charger/UPS room (8.5 mtrs)		1	B	INDOOR			2		
14	Near Gas cylinder room		1	A	OUTDOOR				2	
15	Near TG Seal oil unit		1	A	OUTDOOR				2	
16	Near Hotwell		1	A	OUTDOOR				2	
17	Near Clean oil/Dirty oil tank		1	A	OUTDOOR				2	
18	Control fluid room		1	A	INDOOR			2		
19	Boiler MCC Room		1	B	INDOOR			2		
20	LT Switchgear Room		1	B	INDOOR			2		
21	MV Switchgear Room		1	B	INDOOR			2		
22	CCR (On UCD)	2	2	C	INDOOR		2	4		
23	CER		1	B	INDOOR		1	2		
24	Shift Incharge Room		1	B	INDOOR		1	2		
25	C&I Shift Engr Room		1	B	INDOOR		1	2		
26	Programmer Room		1	B	INDOOR		1	2		
27*	Mill area		2	A	OUTDOOR				2	
28	CCR		3	B	INDOOR		1	2		
29	AC plant control room		1	A	INDOOR		1	1		
30	SWAS Room		1	A	INDOOR			2		
			52							

ANNEXURE-1 BOQ OF PA SYSTEM

							TOTAL FOR 2 UNITS		
	ZONE-1/2	**MCS**	**HANDSET**	**TYPE**	**INDOOR/OUTDOOR**	**FALSE CEILING CONE TYPE**	**CONE TYPE**	**HORN TYPE**	**ACOUSTIC HOOD**
	ZONE-3								
1	Compressor House		2	A	INDOOR+OUTDOOR		1	1	1
2	RO DM Plant Area		2	A	OUTDOOR	1		1	1
3	PT Plant Area		2	A	OUTDOOR	1		1	1
4	CW MAKEUP & DESALINATION FEED WATER PH		1	A	OUTDOOR	1		1	1
5	Fire Water Pump House (FWPH)		1	A	OUTDOOR			1	1
6	Ash Silo Control Room		1	B	INDOOR		1		
7	Switchyard CR		1	B	INDOOR		1		
8	Cooling Tower area		2	A	INDOOR+OUTDOOR		1	1	1
9	Chimney		1	A	OUTDOOR			1	
10	CPU Regeneration Building		2	A	OUTDOOR	1		1	1
11	Transformer Yard		2	A	OUTDOOR			2	
12	FO Pump House		1	A	OUTDOOR	**FLAMEPROOF**		1	1
13	Service Building		1	A	OUTDOOR	5			
14	Mill Reject compressor house		1	A	OUTDOOR			1	1
15	CW Treatment		1	A	OUTDOOR			1	1
16	H2 Plant building			A	OUTDOOR	explosion proof **1**		1	
17	Administrative building		2	A	OUTDOOR	2			
18	Water System Control Room		2	B	INDOOR	1	2		
19	DG Room		2	A	OUTDOOR			2	1
20	AHP Control Room		2	B	INDOOR	1	2		
21	Ash water pump house		1	A	OUTDOOR			1	1
22	Ash COMPRESSOR HOUSE		1	A	OUTDOOR			1	1
23	Fire station		2	A	INDOOR+OUTDOOR		1	1	
24	Switchyard bay		2	A	OUTDOOR			2	
25	Workshop		1	A	OUTDOOR			1	
26	FGD Control Room		2	B	INDOOR	1	1		
27	FGD WASTER WATER TREATMENT PLANT		1	A	OUTDOOR	1		1	
28	Shift In charge room		2	A	INDOOR	1	1		
29	CLARIFIED P/H		2	A	OUTDOOR			2	1
30	CW PUMP HOUSE		2	A	OUTDOOR	2		1	1
31	ASH HANDLING UNIT		1	A	OUTDOOR			1	
32	AUDITORIUM		2	A	INDOOR+OUTDOOR		2		
33	ETP PLANT		2	A	INDOOR	1	1		
33	STP PLANT		2	A	INDOOR	1	1		
34	Canteen		1	A	INDOOR		1		
35	Chemical lab		1	A	INDOOR		1		
36	Auxiliary boiler		2	A	OUTDOOR	1		2	

ANNEXURE-1 BOQ OF PA SYSTEM

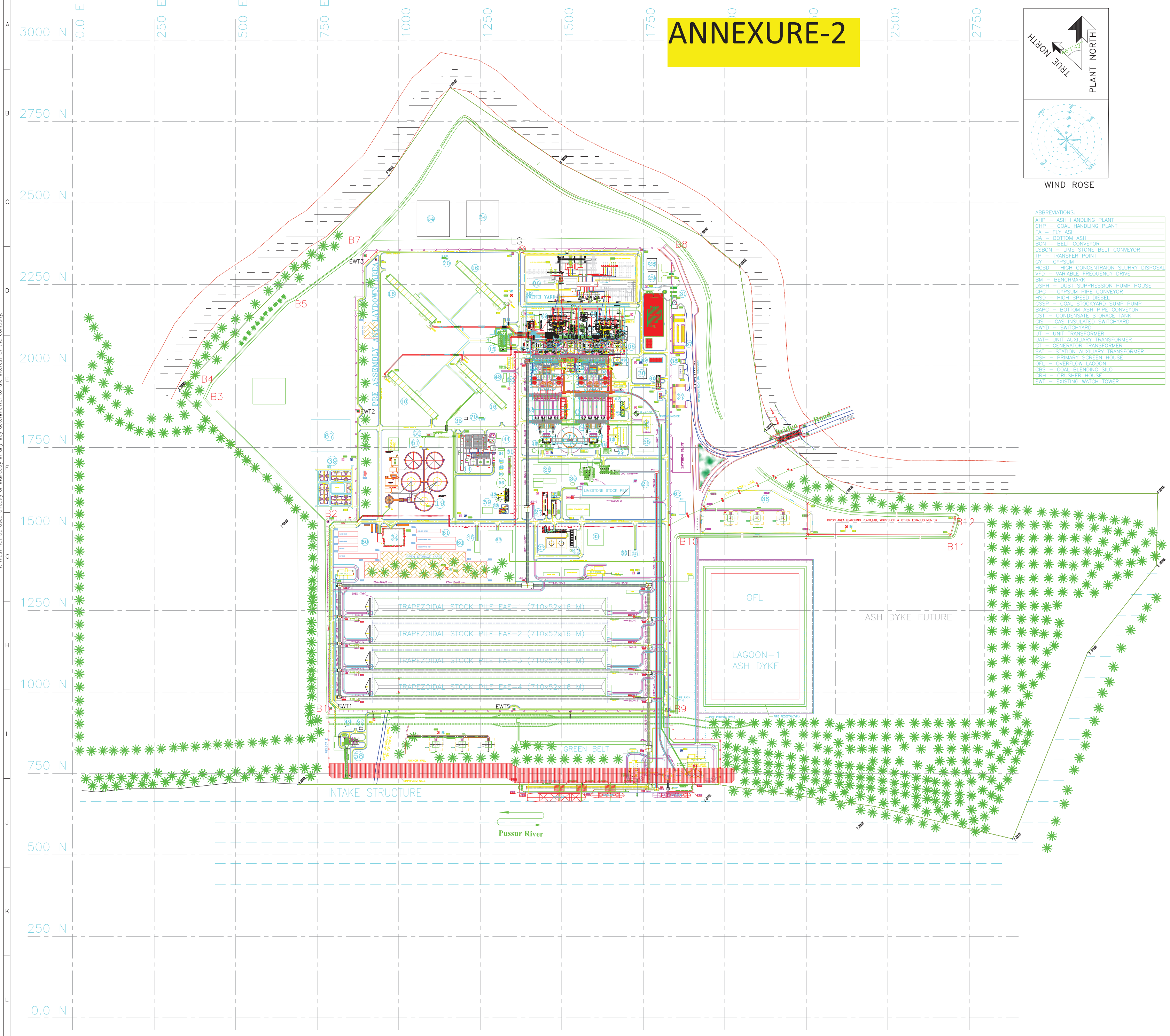
TOTAL FOR 2 UNITS

	ZONE-1/2	MCS	HANDSET	TYPE	INDOOR/OUTDOOR		FALSE CEILING CONE TYPE	CONE TYPE	HORN TYPE	ACOUSTIC HOOD
37	RO DM control room	1	2	B	INDOOR		2	1		
38	HCSD P/H		2	A	OUTDOOR		1		1	
39	FA/BA siloe		2	A	OUTDOOR		1		1	
40	Helipad		2	A	OUTDOOR				2	
41	Solid Waste treatment plant		1	A	OUTDOOR		1		2	
42	Gatehouse		1	A	INDOOR			1		
43	Raw water intake		2	A	OUTDOOR		1		1	
44	Gas chlorination for Raw water intake		1	A	OUTDOOR				1	
45	Customer office		2	A	OUTDOOR		1		1	
46	Local service building		2	A	OUTDOOR				2	
47	Foam pump house				**FLAMEPROOF**				1	
48	Gas chlorination for CWPH		1	A	OUTDOOR				1	
49	Gas cylinder room			A	FLAMEPROOF					
50	Weigh bridge		1	A	OUTDOOR				1	

	ZONE-4									
1	Bunker Floors		4	A	OUTDOOR				4	
2	CHP CR		2	C	OUTDOOR		1		1	
3	Machinery Wells		2	A	OUTDOOR				2	
4	MCC Rooms		3	B	INDOOR			3		
5	Pent Houses		6	A	OUTDOOR				6	
6	Pump Houses		1	A	OUTDOOR				1	1
7	TPs	1	16	A	OUTDOOR				16	
8	Wagon triplers		6	A	OUTDOOR				6	
9	Crusher Houses		5	A	OUTDOOR				5	5
10	Track Hopper (at different points)		3	A	OUTDOOR				3	
11	Reclaimer hopper		2	A	OUTDOOR				2	
12	CHP CR		3	B	INDOOR		2	1		
							41	**52**	**157**	**36**
	TOTAL NO. OF HANDSETS		**232**							

Total number of accoustic hoods for 2 units

ANNEXURE-2



ITEM NO.	DESCRIPTION
1.	TG BUILDING
2.	BOILER AREA
3.	ELECTROSTATIC PRECIPITATOR
4.	CHIMNEY
5.	TRANSFORMER YARD
6.	SWITCH YARD
7.	DIESEL GENERATOR HOUSE
8.	SERVICE BUILDING
9.	COMPRESSOR HOUSE
10	CONDENSATE STORAGE TANK, TRANSFER PUMP HOUSE & BOILER FILL PH
11	CENTRAL CONTROL BUILDING
12	AHP COMPRESSOR HOUSE
13	ESP/VFD CONTROL ROOM
14	RO DM PLANT
15	COOLING WATER PUMP HOUSE
16	COOLING TOWER
17	ASH HANDLING UNIT
18	FGD
19	PT PLANT WITH CHEMICAL HOUSE
20	CW TREATMENT PLANT
21	LIMESTONE STOCK PILE
22	FUEL OIL AREA
23	AUX BOILER
24	MILL BAY
25	POTENTIAL RAIN WATER RETENTION POND (NOT SHOWN)
26	WORK SHOP
27	O & M STORE/PERMANENT STORE
28	AUDITORIUM
29	ADMIN BUILDING
30	CANTEEN
31	MAIN GATE HOUSE
32	DELETED
33	SPACE FOR STEEL STORAGE YARD
34	CUSTOMER OFFICE
35	LOCAL SERVICE BUILDING
36	HELIPAD
37	PARKING (CAR, TRUCK, TRAILER)
38	SHOPS, WAITING COMPLEX, REST ROOM & PRAYER HALL
39	LIVING ACCOMMODATION
40	FIRE STATION AND DRILL TOWER
41	FOAM PUMP HOUSE
42	(DELETED)
43	FIRE WATER PUMP HOUSE
43a	DELETED
44	CPU REGENRATION
45	HYDROGEN PLANT
46	SEWAGE TREATMENT PLANT
47	CPU VESSEL AUXILLARIES
48	GAS CHLORINATION FOR CWPH
49	GAS CHLORINATION FOR RIVER INTAKE
50	CW MAKE UP & DESALINATION FEED WATER P/H.
51	CLARIFIED P/H
52	ETP
53	GAS CYLINDER ROOM
54	SOLID WASTE TREATMENT PLANT
55	FGD WASTE WATER TREATMENT PLANT
56	DESALINATED WATER STORAGE TANK
57	PRE TREATED WATER STORAGE TANK
58	INTAKE PUMP HOUSE & DESILTING CHAMBER
59	CHEMICAL LAB
60	SITE STORE(TEMPORARY)
61	BHEL SITE OFFICE (TEMPORARY)
62	SUB STATION(TEMPORARY)
63	SERVICE WATER STORAGE TANK
64	POTABLE WATER TANK FOR PLANT
65	WEIGH BRIDGE
66	DM STORAGE TANK
67	BHEL FIELD HOSTEL (TEMPORARY)
68	CUSTOMER AREA
69	EXISTING STORE BY CUSTOMER
70	SWITCHGEAR FOR COOLING TOWER
71	MILL & FAN MAINTENANCE BUILDING

ABBREVIATIONS:

- AHP – ASH HANDLING PLANT
- CHP – COAL HANDLING PLANT
- FA – FLY ASH
- BA – BOTTOM ASH
- BCN – BELT CONVEYOR
- LSBCN – LIME STONE BELT CONVEYOR
- TP – TRANSFER POINT
- GY – GYPSUM
- HCSD – HIGH CONCENTRAION SLURRY DISPOSAL
- VFD – VARIABLE FREQUENCY DRIVE
- BM – BENCHMARK
- DSPH – DUST SUPPRESSION PUMP HOUSE
- GPC – GYPSUM PIPE CONVEYOR
- HSD – HIGH SPEED DIESEL
- CSSP – COAL STOCKYARD SUMP PUMP
- BAPC – BOTTOM ASH PIPE CONVEYOR
- CST – CONDENSATE STORAGE TANK
- GIS – GAS INSULATED SWITCHYARD
- SWYD – SWITCHYARD
- UT – UNIT TRANSFORMER
- UAT– UNIT AUXILIARY TRANSFORMER
- GT – GENERATOR TRANSFORMER
- SAT – STATION AUXILIARY TRANSFORMER
- PSH – PRIMARY SCREEN HOUSE
- OFL – OVERFLOW LAGOON
- CBS – COAL BLENDING SILO
- CRH – CRUSHER HOUSE
- EWT – EXISTING WATCH TOWER

LEGEND:

1. ROADS (DOUBLE LANE)
   ROADS (SINGLE LANE)
2. BOUNDARY WALL (IN CUSTOMER'S SCOPE)
3. LIMITS OF EARTH FILLING
4. GREEN BELT
5. EXIST. 33KV LINE
6. FENCING

SHOULDER LINE
PAVEMENT LINE

NOTES

1. ALL DIMENSIONS ARE IN MM'S AND LEVELS ARE IN METRES.
2. FINISH FLOOR LEVEL = RL (+)5.60 M, CORRESPONDS TO PLANT EL 0.0M WHICH IS GROUND FLOOR OF STG BUILDING.
   FINISHED GROUND LEVEL SHALL BE RL.(+)5.0M
3. LOCATION/SIZES OF VARIOUS FACILITIES/BUILDINGS ARE TENTATIVE ONLY, SHALL BE FINALISED DURING DETAIL ENGINEERING.
4. Coordinates of BM (AS PER SURVEY)

SL	BM No.	UTM Coordinate (m)	Earlier Plant Coordinate (m)	Current Plant Coordinate (m)
1	BM-1	E 762266.264m N 2500459.554m Ht. 5.160mMSL	E 454127.265m N 497991.883m Ht. 5.160mMSL	E 1000.000m N 1000.000m Ht. 5.160mMSL
2	BM-2	E 762297.877m N 2500487.080m Ht. 5.296mMSL	E 454128.015m N 498032.306m Ht. 5.296mMSL	E 1000.750m N 1040.423m Ht. 5.296mMSL

GRID HAS BEEN ROTATED W.R.T. BM-1.
COORDINATE OF BM-2 IS DERIVED AFTER ROTATION W.R.T. BM-1.

	DATE	ALTERED	CHECKED	APPROVED	NOTE
3	05.01.18	KK	SK	JJ	1. DRAWING REVISED AS PER FICHTNER COMMENTS DATED 28.03.17 2. CHP/AHP LAYOUT, WATCH TOWERS, INTAKE AREA ROAD LAYOUT, FIRE STATION, DRILL TOWER, CANTEEN, MAIN GATE COMPLEX, CAR PARKING, WELCOME COMPLEX, TRUCK PARLING & HELIPAD UPDATED AS PER LATEST INPUT DRAWINGS. 3. JETTY AREA LAYOUT UPDATED AS PER LATEST INPUT DRAWING. 4. CO-ORDINATES MARKED FOR TG HALL A-ROW, BOILER D-ROW, UNIT-1 CENTER LINE, UNIT-2 CENTER LINE, CHIMNEY, ALL MAJOR ROADS, FIRE STATION, DRILL TOWER, STORES, TRANSFER TOWERS OF CHP & VARIOUS MCCs OF CHP & AHP AREA. 5. ROUTING OF ETP EFFLUENT DISCHARGE PIPE MODIFIED. 6. DOUBLE LANE ROAD PROVIDED AROUND HSD FACILITIES. 7. DOUBLE LANE PROVIDED ON WEST SIDE OF COAL STOCKYARD.
C	21.02.17	KK	SK	JJ	1. DRAWING REVISED AS PER FICHTNER COMMENTS DATED 08.06.16 2. CHP/AHP LAYOUT, WATCH TOWERS, INTAKE AREA ROAD LAYOUT, FIRE STATION, DRILL TOWER, CUSTOMER OFFICE, STORES, MAIN GATE, ADMIN BLDG, PARKING, SHOPPING COMPLEX, RO-DM PLANT, FGDWWTP & FUEL OIL AREA UPDATED. 3. SWITCHYARD SHIFTED TO MAKE GAP WITH ROAD AND REVISED CO-ORDINATES OF TAKE-OFF GANTRIES MARKED IN NEW & OLD CO-ORDINATE SYSTEM.
B	27.05.16	KK	SK	JJ	DRAWING REVISED AS PER FICHTNER COMMENTS DATED 04.05.16
A	02.04.16	KK	SK	JJ	DRAWING REVISED AS PER FICHTNER COMMENTS DATED 18.03.16

PROJECT
2x660MW MAITREE SUPER THERMAL POWER PROJECT, RAMPAL, BANGLADESH (EPC MAIN PLANT PACKAGE)

OWNER CONSULTANT:
FICHTNER
M/s FICHTNER GmbH & Co KG,
Stuttgart,GERMANY

OWNER:
BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED, BANGLADESH

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT
NOIDA

SCALE: 1:4000
SHEET 1 OF 1

	DATE	NAME
DRAWN BY	29/02/16	SD
DESIGN BY	29/02/16	SD/KK
CHECKED BY	29/02/16	SK
APPROVED BY	29/02/16	JJ

SUPERSEDES:
SUPERSEDED BY:
SYSTEM:

TITLE
PLOT PLAN

SIZE: A0 | PROJECT NO.: 421 | FILE: MAITREE-00-MA-LD-120001-PEM-3
ANNEX: – | DRAWING NO.: MAITREE-00-MA-LD-120001-PEM-3 | REV 3A

SIZE-A0
PROGRESSIVE REVISION-3A

CUSTOMER'S DRAWING NO.
DRAWING NO. MAITREE-00-MA-LD-120001-PEM-3

COMPUTER FILE NAME: MAITREE-00-MA-LD-120001-PEM-3

ANNEXURE – 3

(VENDOR DRAWING/DOCUMENT SCHEDULE)

S. NO.	DESCRIPTION	THROUGH DMS	HARD PRINTS	CD-ROMs
1	Docs. /drgs. for approval (First submission)	YES	-	-
2	Docs. / drgs. for approval (Second & subsequent submission till approval)	YES	-	-
3	Final approved docs. / drgs. for Distribution	YES	As per NIT	As per NIT

2X660 MW MAITREE STPS
PA SYSTEM [DOCUMENT NUMBERING]

Sl.No	BHEL DRAWING NO.	TITLE
1	PE-V0-421-557-E001	DATA SHEET FOR PA SYSTEM
2	PE-V0-421-557-E002	GA OF PA CONTROLEER
3	PE-V0-421-557-E003	GA OF MASTER CONTROL STATION
4	PE-V0-421-557-E004	GA OF FIELD CALL STATION
5	PE-V0-421-557-E005	GA OF DESKTOP STATION
6	PE-V0-421-557-E007	GA OF Misc. Items of PA System
7	PE-V0-421-557-E009	GA OF ACOUSTIC HOOD
8	PE-V0-421-557-E010	GA OF ACOUSTIC BOOTH
9	PE-V0-421-557-E011	GA OF EXTENSION AMPLIFIER
10	PE-V0-421-557-E012	GA OF FALSE CEILING TYPE LOUD SPEAKER
11	PE-V0-421-557-E013	GA OF PORTABLE STATION
12	PE-V0-421-557-E014	GA OF CONE TYPE LOUD SPEAKER
13	PE-V0-421-557-E015	GA OF HORN TYPE LOUD SPEAKER
14	PE-V0-421-557-E016	GA AND DATA SHEET OF ERECTION HARDWARE
15	PE-V0-421-557-E020	GA OF SOCKET FOR PORTABLE STATION
16	PE-V0-421-557-E021	GA OF ETHERNET SWITCH
17	PE-V0-421-557-E023	TECHNICAL DATA SHEET FOR ETHERNET SWITCH
18	PE-V0-421-557-E024	TECHNICAL DATA SHEET FOR CABLES
19	PE-V0-421-557-E025	O&M MANUAL FOR PA SYSTEM
20	PE-V0-421-557-E026	BLOCK DIAGRAM FOR PA SYSTEM
21	PE-V0-421-557-E027	CABLE SCHEDULE FOR PA SYSTEM
22	PE-V0-421-557-E028	DATA SHEET FOR ADDITIONAL ITEMS
23	PE-V0-421-557-E029	TYPE TEST PROCEDURE FOR PA SYSTEM
24	PE-V0-421-557-E030	TYPE TEST REPORT FOR PA SYSTEM
25	PE-V0-421-557-E901	QUALITY PLAN FOR PA SYSTEM

NOTE

IF ANY OTHER DRAWING IS REQUIRED TO BE SUBMITTED DURING DETAIL ENGINEERING, DRAWING NUMBER OF THE SAME SHALL BE FURNISHED AT THAT TIME.

	TITLE		
	Technical Specification for IP BASED PUBLIC ADDRESS SYSTEM	SPECIFICATION NO.	PE-SS-999-557-E002
		VOLUME	II B
		SECTION	D
		REV 00	DATE 23/03/2016
		SHEET 1	OF 26

IP BASED PUBLIC ADDRESS SYSTEM

SPECIFICATION NO. PE-TS-999-557-E002, Rev. 0

SUPPLY

CONTENTS

1.0 GENERAL

1.0 The scope of this specification covers engineering, design, manufacturing, assembling, 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.

2.0 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.

3.0 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 satisfactorily in continuous commercial operation under the specified environmental condition 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.

4.0 Review of the bidder's documents by the purchaser shall not relieve the bidder from his responsibility for the design and supply as per requirement of technical specification.

5.0 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.

6.0 Bill of Quantities is enclosed in Section C.

7.0 Exclusions: Unless mentioned otherwise in Section C,
Civil works like foundations and cable trenches are excluded from the scope of bidder.

8.0 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 this specification and latest revisions of applicable Indian Standards(IS), IEC and other internationally recognized standard and local laws & regulations applicable to the project except where modified and/or supplemented by this specification. Mandatory regulations can not be superseded by this specification.

2.2 The equipments furnished under this specification shall conform to the latest issues and most recent revisions & amendments of the following non- exhaustive list of standards. .

- ANSI : American National Standards Institute
- BS : British Standards
- CCITT : Consutative Committe on Telephone and Telegraph
- EIA : Electronics Industry Association
- FM : Factory Mutual
- IEC : International Electrotechnical Commission
- IEEE : Institute of Electrical and Electronic Engineering
- IS : Indian Standard
- ISA : Instrument Society of America

- ISO : International Standards Organisation
- ITU : International Telecommunication Union
- NEC : National Electrical code
- NEMA : National Electrical Manufacturers Association

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI S3.5 Methods for the Calculation of the Speech Intelligibility Index

BRITISH STANDARDS (BS)

- BS EN 60268-5 : 2003 Sound system equipment, Loudspeakers.
- BS EN 6840-13 : 1998 Sound system equipment. Listening tests on Loudspeakers.
- BS 6840-14 : 1987 Sound system equipment. Guide for circular and elliptical Loudspeakers; outer fram diameters and mounting dimensions.
- BS 8473 :2006+A1:2008 Intruder and hold-up alarm systems.Management of false alarms. Code of practice.

INDIAN STANDARD (IS)

- IS-5 Colour for ready mixed paints and enamels.
- IS-694 PVC insulated cables for working voltages upto and including1100 V.
- IS-1554 PVC insulated electric cables.
- IS-2147 Degree of protection provided by enclosures for low voltage switchgear and controlgear.
- IS-3961 Recomended current ratings for cables.
- IS-3975 Mild steel wires, formed wires and tapes for armouring of cables.
- IS-5831 PVC insulation and sheath of electric cables.
- IS-7741 Specification for Loudspeakers.
- IS-8130 Conductors for insulated electric cables and flexible cords.
- IS-9302 Characteristics and methods of measurements for sound system equipment.
- IS-9537 Conduits for electrical installations.
- IS-10426 Specification for public address amplifiers.
- IS-10918 Vented type nickel cadmium batteries.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

- IEC 60268-5 Ed.3.1 en:2007 Sound System Equipment – Part 5:Loudspeakers.
- IEC 60529 Classification of Degrees of Protection Provided by Enclosures (IP Code)
- IEC 60839-5-2 ed. 1.0 b:1991 Alarm Systems Part 5 Requirements for alarm transmission systems.
- IEC 61000 (All Parts) Electromagnetic Compatability (EMC)

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 SCOPE OF WORK

Bidder shall be fully responsible for both the products and their relevant compliance with the requirements of the specification.

Provisions included in the specification will not be limitative to the scope of work. Bidder shall provide for any further activities which will improve the quality & performance of the system offered.

3.1 INCLUSION IN SUPPLY

Bidder's scope of supply shall include but shall not be limited to following

(i) Plant IP Based Public Address & Paging System with all accessories specified herein and other Technical Attachment Sheets.

(ii) Development, supply & installation of required software for the total system.
(iii) Uninterruptible Power Supply System to cater to the entire system load.
(iv) Associated copper, Cat6 and fibre optic cable for interconnection.
(v) Recommended spares for the entire system trouble free operation. (if specified in BOQ cum unpriced price schedule).
(vi) Mandatory spares as specified (if specified in BOQ cum unpriced price schedule).
(vii) Erection & commissioning spares
(viii) Special Tools & Tackle and test equipment.
(ix) The items not mentioned but required for successful completion and guarantee run of the project / system including modification, addition in existing system shall be in the scope of the bidder.

3.2 SCOPE OF SERVICE

Following service shall be provided by Bidder for equipment & systems supplied under this specification. However, Bidder has to provide the services required for completeness and correctness of the system irrespective of whether it is mentioned in the specification or not.

(i) Manufacture of all items as per requirement of specification, assembly etc.
(ii) System Engineering, development of software etc.
(iii) Furnishing drawings, documents, data sheets, manuals/catalogs as specified
(iv) Inspection and testing at Bidder's works as per the Quality Assurance Plan
(v) Packing and forwarding of all equipment included under this specification.
(vi) Establish the specified interfaces and demonstrate operation.
(vii) Site modification and preparation of "as-built" documentation".

4.0 DESIGN REQUIREMENTS (CONCEPTUAL VIEW)

.

The PA System shall be designed as standalone IP based network architecture. The system shall be based on centralized control together with distributed nodes permitting speech broadcasts and pre-recorded messages/ alarm tones etc. The carrier system shall be based on Voice over IP to provide IP communication across the complete PA system.

The System offered shall be minimum 2-Channel Page & Party configuration with various area-wise zone stations forming functional groups comprising Field Call Stations and Loudspeakers. The Field Call Stations & Standalone amplifiers shall be IP addressable whereas speakers shall be of analog type without IP Address. Any conversion of analog field call station to IP mode by separate attachment of the intelligent module/ unit shall not be acceptable. The field call stations shall have additional amplifier to drive additional one speaker.

The distributed nodes shall be interconnected through OFC based network. The PA system shall be designed such that no single failure shall disrupt the availability of the complete system. If specified in section C, a redundant server will cater to all zones of the plant. However, one server shall be located at Unit CER and another server shall be located at CHP CR.

Each node location shall be equipped with a Field Ethernet Distribution Switch and shall also be equipped with PA remote interface equipped switching technology which form part of the in plant paging and PA remote node.
The speakers, FCS shall be connected to their respective PA controller (Central Exchange) through fiber optic cable network. The structure of the fiber optic cable backbone, field ethernet switches, number of master call stations etc may be subject to changes during detail engineering stage. The different types of speakers and Call Stations shall be deployed over locations around each of the nodes (Ethernet switch).

In noisy areas shall be used along with acoustic booth. The speakers and FCS in each zone shall be connected through Star fashion to the respective Ethernet switch by CAT-6.

The system will be installed in an adverse industrial environment. Equipment in some areas will be subject to vibration, dust, oil/water vapors as prevalent in thermal generating plant. The design shall be such as to provide highly intelligible minimum two-channel voice communication even in areas of high background noise (50 db to 100 db).

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.

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. Configuration of the system shall be achieved by user friendly based
software for maximum flexibility, easy re-configuration, maintenance and future expansion which enables an operator to implement speed commissioning and also carry out routine diagnostic checks/ fault finding functions of PA System components. It should be possible to make adjustments when the system is installed without resulting in modification to the system wiring. The system shall be provided with standard serial interface (preferably a USB connection) to be connected with a laptop for local and remote access for maintenance and operations activities. One Notebook PC shall be provided for these functions.

Speaker cabling and visual alert cabling shall be on a ring to provide resilience.

The plant area shall be divided into zones each with sections. Final distribution of units over the zones will be finalized during detailed design. This will be related to area configuration and other operational objectives.
Some PA and Industrial Talkback field call station units may be located in areas with a fair degree of background noise. Therefore, the requirements shall be for directional dynamic microphones, with strong noise suppression together with input/pre-amplifier sections including filtering and speech compression giving the highest practicable levels of intelligibility.

Each operator's control set will be able to:
a) Address a call to one or multiple sections.
b) Address a call to one or multiple zones, by activating the selected zones.
c) Transmit a general call to the whole area activating all sections simultaneously.

The system shall also provide the following facilities:
Any field call station can selectively dial any other call station from its inbuilt dialling pad without the manual intervention of any zonal operator. The intelligence Unit dialling button/keypad etc shall be an integral part of the call station and shall not be procured form different OEMs and combined.

The system shall be capable of providing an audio output to a Digital Voice Recording System.
This unit is used, as above, to gain access to the PA system by telephone or radio, but the message to be broadcast is digitally stored and played through the DVSP monitor speaker on the Engineers Test Panel, this allows the engineer to intercept calls which he does not think are suitable for broadcast.
The DVSP shall record calls that cannot be sent to all required zones because some are occupied by a higher priority call. The unit shall store up to minimum 15 calls in high quality format with a maximum of three minutes for each call, including chimes and pre-recorded messages. Playback of a call can start while it is still being recorded. The unit can record and/or playback up to minimum eight calls simultaneously.

CD audio player shall be provided as one of the input/output sources to/from the public address system which shall have the capability to broadcast the player output.

An interface to the telephone system shall be provided to enable users to broadcast routine speech announcements from telephones assigned the correct class-of-service. The system interface to the telephone system shall be via a 2- wire/4-wire E & M tie-line/E1 line /SIP channel. Facilities shall be included to prevent acoustic feedback that may be generated from telephones situated close to loud-speakers.

The system shall be fitted with devices to enable and affect frequency shifting of voice input during PABX radio access. Acoustic feedback via telephone or radio connection to the PA/alarm system can only be totally eliminated by the use of a digital voice storage/play-back (DVSP) unit.

Power Supply to PA System and allied accessories shall be provided from local UPS. The local UPS shall be in Bidder's scope of supply. Unless specified otherwise in section C, Power points (240V AC supply) for charging of local UPS for PA System and allied accessories shall be provided by the Owner within 3 Meters (wherever possible) of the point of location of the local UPS.. Bidder shall also provide local power distribution boxes (if required) for sub distribution of supply from local UPS to call stations and amplifiers. Location of local UPS & power distribution scheme shall be finalized during detailed engineering.

All the main elements in PA and Industrial Talkback system viz. Controller, field call stations, DTS, MCS, speaker shall be sourced from the same OEM.

The software shall be "user Friendly", for easy re-configuration, maintenance and future expansions. All software utilized shall be the latest and upgraded version. The software shall be able to work with the latest windows version.

"The system shall be designed to comply with EMI and RFI Regulations particularly the requirements of IEC 61000 series."

The system shall also have the following functional features:

1. Configuration of Announcement Priorities
   Announcements from different sources can be configured to override others. Fixed frequency preannouncement tones can be generated under software control.

2. Gain Control of Announcements
   Announcements shall be individually configurable to different levels. This is a useful feature which allows an alarm to be muted while a broadcast is made and then increased back to its original level afterwards.

3. Speaker/ Line Monitoring

a) The system shall provide the facility for monitoring speaker loop status. Automatic setting procedures shall be able to be programmed in order to check and set all output line conditions.

b) Difference above a set percentage will result in an alarm indication on the control mimic panel.

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

5.0 SYSTEM DESIGN ENGINEERING

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 field call stations & 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 all the PA System equipments/ allied accessories 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 PA system controller , network switches, media converters ,Call stations, master control stations , amplifier and loud speakers, associated cabling. Details of each of these and other items required to make the system complete are furnished below.

6.1 PA SYSTEM CONTROLLER (SERVER)

The server shall be based on state of art VOIP technology. The server should support protocols including SIP or equivalent, TCP, IPV4/IPV6, Codec G 722, SNMP, RTP, NTP etc. Suitable built in IP security such as firewall, SSH, HTTPS etc. shall be provided in server. The server should be able to support the required number of call stations with future provision. The required no. of all hardware/ software licenses to meet the specifications shall be supplied by the contractor.
The server shall be capable of self recovery in case of any fault/network break down. It shall be rack mounted type. The server shall be able to support minimum 4 channels for GSM communication with PA system. Suitable interface for the same shall be provided by the bidder. All programming tools & Software that are required to program/reprogram the system shall also be provided along with the server. The system functions may be programmed from a variety of external and/or internal sources such as via the connection to a Notebook PC.

The control sub-system and their ancillary devices shall be housed in a standard rack mounted system cabinet with all control, power circuits and necessary amplifiers and shall be supplied in pre-wired conditioned and shall be completely tested at manufacturer's works prior to despatch.

6.2 DISTRIBUTED AMPLIFYING SYSTEM

6.2.1 Each call station shall have its own preamplifier, line amplifiers (wherever required, shall be provided for long line signal transmission) and power amplifiers to suit its loudspeaker capacity. The system

shall be as below:

(i) The amplifiers shall be heavy-duty type.
(ii) The amplifiers shall be of solid-state electronic type and compact in construction.
(iii) The amplifiers shall be solid state class D push pull type, in built with the call station fully conforming to applicable Indian standard.
(iv) Amplifier shall have 0-100% volume control facility for coarse and fine setting, input sensitivity control, receiver volume control, bass cut filter and anti side tone control feature.
(v) Pre-amplifying stages shall be furnished to make it suitable for operation with low level input such as microphone.
(vi) 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.

6.2.2 Standalone amplifier

Amplifiers of suitable rating shall be provided for general announcement. Multiple loudspeakers spread across a zone shall be used along with a standalone amplifier in the field/centralised amplifier. This amplifier shall be IP based and health monitoring of associated loudspeaker shall be provided.

6.3 CALL STATIONS

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

a) Type A-Desk mounted master type (Overall master station & zone master station)
b) Type B-Desk mounted indoor type
c) Type C-Wall/ Column mounted indoor/outdoor type
d) Type D-Wall/ Column mounted explosion proof type
e) Type E- Portable type

6.3.1 Type A-Desk mounted Master Station (Overall master station and zone master station):

A directional gooseneck microphone shall form part of each control set. When the microphone shall be use, nearby loudspeakers shall be muted to avoid acoustic feedback. The microphone amplifier shall be fitted with an automatic gain control for convenience in use.
Each master station (overall/zone) shall be equipped as minimum with the following:

a) A magnet dynamic, gooseneck microphone and a telephone handset with automatic switch from the microphone to the handset upon lifting the last one.
b) Necessary lamps, push buttons, switches, and indicators to monitor and control the system.

6.3.1.1 Constructional Features of overall master control station are as follows:

(i) Desk-top, Indoor, air-conditioned
(ii) Microphone : Gooseneck
(iii) Enclosure : Anodized aluminium/ fibre glass reinforced polyester/high impact polycarbonate/stainless steel/ polyurethane or any other material subject to prior approval of purchaser
(iv) Zone selection : Dedicated buttons
(v) Emergency features : One touch/one push button paging, caller ID, Speed dialling

6.3.1.2 Constructional Features of zone master station are as follows:

(i) Hands-free, desk top, dual direct.

(ii) Location : Indoor
(iii) Protection : Corrosion resistant & pilfer proof.
(iv) Protection Class : IP 32
(v) Body: Anodized aluminium/ fibre glass reinforced polyester/high impact polycarbonate/stainless steel/ polyurethane or any other material subject to prior approval of purchaser
(vi) Microphone Type : Gooseneck
(vii) Volume Control shall be provided.
(viii) Loudspeaker output : Yes

6.3.2 Type B-Desk mounted indoor station

Constructional Features of desk top mounted indoor station are as follows:

(i) Material: Die cast aluminium/ fibre glass reinforced polyester /polyurethane/high impact polycarbonate/ stainless steel or any other material subject to prior approval of purchaser
(ii) Integrated full range speaker
(iii) All keys with individual labelling area
(iv) Call or busy signal by light emitting diodes
(v) Noise cancelling goose neck microphone with dynamic compression
(vi) Microphone sensitivity and loudspeaker volume control
(vii) Potential free relay contact
(viii) Frequency range : 300 Hz to 7 khz
(ix) Amplifier power rating : 1 W
(x) Loudspeaker : 5Watt
(xi) Electrical data booster amplifier - output power - 25 W
(xii) Operating Temperature : 0° to +55° C
(xiii) Protection class : IP30 or better

6.3.3 Type C-Wall/ Column mounted indoor/outdoor station:

All call stations have a compact, robust, rust resistant, shock resistant body. The outdoor wall/ column mounted call stations shall be tamperproof, using internal anchoring bolts and peculiar (e.g. triangular head, counter sunk) screws which can be loosened only with special keys. The entire electronic part shall be modular type and can be removed from the call station enclosure for easy maintenance.
Wall/ column mounted instruments shall be heavy duty type and shall also be suitable for dust and noise laden atmosphere.

Call stations transmitter/microphone shall be dynamic noise cancelling type and anti side control facility shall be inbuilt.

Constructional Features of wall/column mounted indoor/outdoor station are as follows:

(i) Material: special plastic/ fibre glass reinforced polyester /high impact polycarbonate/stainless steel or any other suitable material subject to approval of owner.
(ii) Dust tight weatherproof pilfer proof type
(iii) Plug in front unit with all functional parts
(iv) One “Press to Page” push button/ key
(v) One “Press to Mute Loudspeaker” push button/ key
(vi) Dial keypad (10 digit dial pad & atleast 2 special keys)
(vii) Pre-amplifier and Power amplifier

(viii) Call or busy signal by light emitting diodes
(ix) Noise compensated inbuilt microphone with anti side tone control facility & dynamic compression and PTT operation
(x) Microphone sensitivity and volume control
(xi) Potential free relay point
(xii) Booster amplifier
(xiii) Direct intercom connections
(xiv) Can be switched to low volume
(xv) Led indication of incoming call and line busy, prioritized
(xvi) Loud speaker : 15 W
(xvii) Frequency range : 300 hz to 3.4 khz
(xviii) Electrical data booster amplifier - output power : 25 w
(xix) Operating temperature : -10° to +60° celcius
(xx) Protection class : IP-65
(xxi) Area of use : Non hazardous

6.3.4 Type D-Wall/ Column mounted explosion proof station:

Explosion proof field call stations shall be provided in hazardous areas as specified in Section C. The field call station shall be complete with microphone, speaker and amplifier but without handset. The communication shall be possible through built in microphone.

Constructional Features of wall/column mounted explosion poof station are as follows:

(i) Material: special plastic/ fibre glass reinforced polyester /high impact polycarbonate/stainless steel or any other suitable material subject to approval of owner.
(ii) Explosion proof EEX-d type, , water proof
(iii) Plug in front unit with all functional parts
(iv) Dial keypad
(v) Call or busy signal by light emitting diodes
(vi) Noise compensated inbuilt microphone with anti side tone control facility & dynamic compression and PTT operation
(vii) Microphone sensitivity and volume control
(viii) Potential free relay point
(ix) Booster amplifier
(x) Direct intercom connections
(xi) Can be switched to low volume
(xii) Led indication of incoming call and line busy, prioritized
(xiii) Loud speaker : 15 W
(xiv) Frequency range : 300 hz to 3.4 khz
(xv) Electrical data booster amplifier - output power : 25 w
(xvi) Operating temperature : -10° to +60° celcius
(xvii) Protection class : IP-65
(xviii) Area of use : Hazardous

6.3.5 Type E-Portable station:

Portable type call stations with network compatible ports shall be used at certain location where operational personnel are not present normally. Necessary network connection, power supplies etc. shall be provided at these locations. The locations distributed among different zones shall be decided during detailed engineering.
The network compatible ports shall be suitable for outdoor operation with IP 55 degree of protection.

Degree of protection of portable station shall be IP 55. Portable stations shall be light in weight but sturdy in design. Length of connecting wire from network compatible port to portable station should be 2 meter minimum.

6.4 FLOOR/WALL MOUNTED ACOUSTIC HOOD

The call stations in noisy areas like turbine hall, BFPs, Mill area etc. shall be housed in acoustic hoods. An industrial type free standing, floor mounting hood/ wall mounting hood shall be used for providing the above requirement. The design noise level within the hood shall be limited to a maximum of 60 dB SIL.

(i) Material - Rot/vandal resistant glass re--enforced polyester /Hot-galvanized sheet steel or stainless steel with 15 watt lamp
(ii) Self-colour-yellow, visible during emergency/Paint- Powder Coated
(iii) Luminous yellow green glow in dark condition, lasting up to minimum 10 hours or more
(iv) Sound absorbent- Up to 12 dB(A) when it will be used as Acoustic Hood
(v) Resistant to chemical spillage/vapours and are fire-retardant and weather proof
(vi) Flashing beacons telephones and sounders can be attached to the hood
(vii) Temperature Range : +60 Deg C to -10 Deg C

6.5 WEATHER PROTECTING CANOPY

Weather protecting canopy shall be provided wherever required for field call stations as specified in section C. The canopy shall be made of mild steel/ glass fiber material to house the field call stations. It shall have cover to open from the side. When the canopy cover shall be opened, it shall be in open position and shall have to be closed manually.

6.6 LOUD SPEAKERS

The loudspeakers shall be cone type/weatherproof horn type /explosion proof horn type, depending upon the location in which they will be installed and as specified in Section C. The primary winding of the transformer shall be tapped so that the loudspeakers will absorb from the line 100%, 50%, 20%, or 10% of its power, according to the tap used. The reproduced frequency band shall be at least 370 to 6000 Hz for all the transducers, within +/-6 dB range.

6.6.1 WEATHER PROOF HORN TYPE SPEAKER (WEATHERPROOF/ EXPLOSION PROOF)

Re-entrant horn type speakers shall be provided with bracket suitable for wall/ column mounting. The mounting bracket shall be with adjustable base suitable for vertical and horizontal movement. The horn type loudspeakers shall be weatherproof in all locations and explosion proof type depending upon the location in which they will be installed.

(i) Housing : Special Plastic/die cast aluminium/ polyester resin armoured with fibre glass/equivalent industrial grade material
(ii) Connection : Screw Terminal
(iii) Ingress Protection : IP65
(iv) Mounting : Plastic Bracket/Stainless Bracket
(v) Rated Power : 15 watt
(vi) Sound Pressure Level 1W,1m : 110 dB
(vii) Frequency Range : 370Hz to 7000Hz
(viii) Operating Temperature : -10°C to 60°C

6.6.2 CONE TYPE SPEAKER

a) Permanent magnet, cone type speaker shall be housed in a sturdy metal cabinet suitable for wall/ column or ceiling mounting as specified in the schedules and drawings.
b) 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.

6.6.2.1 INDOOR WALL/COLUMN MOUNTED SPEAKER (10WATT)
(i) Housing : Special Plastic
(ii) Ingress Protection : IP40
(iii) Connection : Clamp
(iv) Volume Control : Required
(v) Rated Power : 6 Watt
(vi) Sound Pressure Level 1W,1m : 91dB
(vii) Effective Frequency Range : 100 to 20000Hz

6.6.2.2 CEILING MOUNTED SPEAKER (6WATT)
(i) Housing : Mild steel
(ii) Sound pressure level, power Watts/1m, dB : 103 dB
(iii) Effective frequency range,: 100-15,000 Hz
(iv) Operating Temperature : 0°C to +50°C
(v) Protection class : IP-65

6.7 JUNCTION BOXES

Wherever required, junction boxes shall be provided by the vendor.

Material & thickness:	Fibre glass reinforced polyester (FRP) 4 mm thick/ Mild Steel (MS) 2mm thick/ Al LM6 3 mm thick
DOP:	IP 55 For all applications except CHP IP 65 for CHP area

6.8 NETWORK SWITCHES

All the network switches shall be of high quality and shall be sized to meet the functional requirements. The location of network switches shall be decided during detailed engineering.

6.9 PC STATION

PC station shall be provided for overall viewing and monitoring of PA system functionality in plant area. It shall be provided with PA system management software. Further, Integrated test equipment to identify faults on the external loudspeaker lines along with a Notebook PC for testing purposes at remote locations as a maintenance terminal together with the existing PC shall be utilized for testing purposes at the main equipment.

6.10 CABLES

6.10.1 CAT 6 CABLE

Cat 6 cable shall be Unshielded Twisted pair (UTP).
(i) Conductor : Solid tinned copper
(ii) Nominal DC Resistance : 67 ohms/1km

(iii) Nominal Impedance : 100 ohms+/-15 Ohms
(iv) Nominal Capacitance : 46pf/m
(v) Nominal Velocity of Propagation : 68%
(vi) Nominal Attention : 100 MHz:- 19.9 dB/100m
155MHz:- 25.3 dB/100m
200 MHz:- 29.2 dB/100m
(vii) Insulation Materials : Poly Vinyl Chloride

6.10.2 SINGLE MODE FIBER OPTIC CABLE

(i) No. of Cores : 4/6/8/12 Core
(ii) The fiber shall be full spectrum, low water peak type
(iii) Guiding standard : ITU-T recommendation G.652.D and IEC 60793-2-50
(iv) Bandwidth : 10Gbps
(v) Core Diameter : 9 µm (approx.)
(vi) Cladding diameter : 125 µm (approx.)
(vii) Nominal Velocity of Propagation: 68%
(viii) Optical laser source wave length : 1310nm/1550 nm
(ix) Attenuation level : 0.34 dB/km or better at 1310 nm, 0.21 dB/km or better at 1550 nm
(x) Inner Sheath and Outer Sheath: Polyethylene
(xi) Armouring : Corrugated steel tape
(xii) Patch cord, Pigtails and connectors: Single mode and duplex type and same throughout the network
(xiii) Bend Radius : 20X outside diameter for installed load and 10X outside diameter for long term load

6.10.3 POWER CABLE

(i) Conductor : stranded compacted annealed copper conductor
(ii) XLPE insulated
(iii) Inner sheath : Extruded PVC type ST2
(iv) Armour: Galvanised steel round wire
(v) Outer sheath : Extruded PVC type ST2 with FRLS properties

6.11 E & C SPARES

Spares which may be required during tests, trial, commissioning and during guarantee run shall be supplied by the bidder.

6.12 TOOLS & TACKLE

Bidder, in his proposal, shall indicate a list of all tools and tackle which may be required for erection, maintenance, overhaul and replacement of equipment / component to be supplied under this specification.

7.0 COMMON REQUIREMENTS OF VARIOUS EQUIPMENT OF SUPPLY

7.1 CLEANING, PROTECTION AND PAINTING

7.1.1 All equipment shall be shipped in properly cleaned condition. All the equipment shall be thoroughly

cleaned to remove mill scales, rust etc. and properly painted with anti rust primer, where applicable.

7.1.2 Some of the equipment and accessories, after arrival at site, are likely to be in storage for long periods before they are taken up for erection. Bidder may provide adequate protection for preventing damage due to corrosion, dust / dirt ingress, ageing etc.

7.1.3 Plugs shall be provided at cable entry holes/adapters to avoid entry of dust and foreign particles. Paper cap will not be acceptable.

7.2 IDENTIFICATION, MARKING, PACKING AND STORING

7.2.1 Each equipment shall be individually packed, tagged and protected.

7.2.2 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. Inscription on equipment (labels) shall be in English.

7.2.3 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.All items supplied shall be packed for long term storage under the climatic conditions prevailing at the site. Small items shall be packed in sealed transparent plastic bags with desiccator packs as necessary. Each item shall be clearly marked with its description, purpose and plant designation code as applicable.When more than one item is packed in a single case a general description of the contents is to be shown on the outside of each case and a detailed list enclosed.All cases and other packages must be suitably marked and numbered for identification purposes

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7.3 EARTHING

7.3.1 Earthing of all sheet metallic parts of enclosures of all equipment 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.

7.3.2 If microprocessor control, monitoring and information system or backup control system requires its own unique and isolated grounding requirements, then these requirement should be clearly stated and shall be provided, so as to ensure proper operation of the above mentioned system

7.3.3 Earthing of cabling system: Armour of cables wherever applicable 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.

7.3.4 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.

8.0 OTHER

8.1 Locations in different zones for different type of field call stations and loudspeakers are indicated in Section – C.

8.2 Bidder shall furnish separately the location wise power supply requirements (in watts) for PA system and its allied accessories.

8.3 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.

8.4 Bidder shall submit the sets (hard & soft) of Customer approved Document as per distribution list enclosed with Section – C.

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

.

9.0 INSPECTION AND TESTING AT MANUFACTURER'S WORKS

9.1 Inspection of various equipment shall be carried out as per BHEL quality plan attached with this specification.

9.2 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.

9.3 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.

9.4 All acceptance and routine tests as per relevant standards and BHEL quality plan 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.

9.5 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.

9.6 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.

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

10.0 PRICES

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

10.2 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. ±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.

10.3 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.

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

10.5 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.

10.6 Bidder to note that charges for all the routine and acceptance tests for all the materials shall be deemed to be included in the bid price.

11.0 PERFORMANCE GUARANTEE

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.

12.0 INSTALLATION AND MAINTENANCE MANUAL

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

12.2 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

13.0 DOCUMENTATION

13.1 DOCUMENTS TO BE FURNISHED WITH THE BID

a) Brief System Description.

b) Filled and stamped Data Sheet B
c) Catalogues of various equipments
d) List of E & C spares
e) List of tools & tackles

13.2 DOCUMENTS TO BE FURNISHED BY THE VENDOR DURING DETAILED ENGINEERING STAGE

All documentation shall be in English language & MKS system.

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, call stations , loud speakers covering the size of cable.

e) Cable schedule
f) Operation and maintenance (O&M) manual.
g) Signed and stamped Standard Quality Plan.
h) Test certificates for the tests actually conducted on the equipment
i) Power consumption details (location wise)

ERECTION AND COMMISSIONING

CONTENTS

1.0 GENERAL

The scope of this specification covers handling and storage at site; installation, testing and commissioning of IP Based 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 erection materials & consumables which are not specifically mentioned but are required to complete the installation work. Bidder shall arrange all erection tools, tackle and calibration instruments.

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 bidder's 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.

3.1.6 Laying & Termination of various cables, providing earthing of the system and equipment as required shall be in the scope of the bidder.

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 required for the system. Material of glands shall be brass. Nickel plating shall be provided if indicated. 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 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 with a tie hole at each end and shall be provided with non-corrosive wire of sufficient strength for tagging.

3.2.5 100/50 mm galvanized steel cable trays/Rigid steel conduits/ flexible conduits/HDPE pipe for local cabling and earthing wire / other earthing materials for earthing of PA system item shall be supplied by the bidder as part of cabling installation work. HDPE pipe shall be permanently lubricated type with ISI marked. The internal diameter of the HDPE pipe shall be suitably selected so that 50% free space is maintained during cable drawing. The pipe shall conform to DOT standard GR/CDS-08/02 Nov. 2004 with latest amendments

3.3 INSTALLATION OF CABLES AND CONDUITS

3.3.1 The PA system cables will be laid in ready trays routed by BHEL 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. Local cabling from nearby main route cable tray (BHEL scope) to PA system equipment terminal shall be through 100/50 mm cable trays/ MS/ PVC conduits/ HDPE Pipe (bidder's scope).

3.3.2 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.

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

3.3.4 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.

3.4 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.

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 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.

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

5.0 COMMISSIONING & SITE ACCEPTANCE TESTING

5.1 Bidder is responsible for delivering a fully functional equipment that meets all the requirements of the Specification and applicable standards. The Commissioning processes will demonstrate the above to Owner, before handing over of the System. System Commissioning shall comprise of a number of different activities as described below culminating in the acceptance of the operational System by Owner. Bidder shall provide all necessary test equipment required to carry out the Commissioning and acceptance testing.

5.2 Following tests are to be performed at site:

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

5.3 Bidder to perform all site tests apart from those mentioned above as per the Field Quality Plan. During contract stage bidder to furnish FQP indicating details of the tests & the standards to which these conform for purchaser’s approval.

5.4 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.

5.5 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.

5.6 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.

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 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, HDPE Pipe, Cable Trays, etc for local cabling
    iv. Conduit plugs, gaskets, couplers, and insulated bushings
    v. Sealing compounds for wall and floor openings
    vi. Consumables like enamels, cold zinc paint, electrodes for welding etc.
    vii. 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
    i. All testing equipment

h) Requirement of Field Quality Plan shall be considered in the quoted prices.
i) Instruments required for testing & commissioning shall be arranged by the contractor and shall be taken back after E & C.
j) 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-C

DATA SHEET - C

S.NO.	DESCRIPTION	UNIT	PARTICULARS
1.0	SYSTEM DESIGN DATA		
1.1	Design ambient temperature :	^{o}C	
2.0	APPLICABLE STANDARDS		
2.1	Whether all standards Specified in specification are 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 :		[ ] Yes [ ] No
5.2	Power supply requirement at 240V AC :	kVA	
6.0	CONSTRUCTIONAL REQUIREMENTS		
6.1	AMPLIFIERS (To be furnished Separately for each type of amplifier) :		Pre- Amplifier / Line Amplifier / Loud Speaker Amplifier
	a) Name of the manufacturer :		
	b) Type and manufacturers Catalogue no. :		
	c) Power supply details :		
	d) Full load consumption (VA) :		

e) Rated load/ Output impedance (W/Ohm):

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 : Volume control [ ] Yes [ ] No

ii. Standby and idle : Time power supply Cut-off arrangement Arrangement [ ] Yes [ ] No

iii. Bass & treble : Control [ ] Yes [ ] No

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 :

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 Transmitter : Ohm

e) Frequency response of The transmitter : Hz

f) Impedance of the receiver : Ohm

g) Receiver output : mV

h) Receiver frequency Response : Hz

i) Details of provision for Noise cancellation features :

j) Details of provision for Directional features :

k) Whether all features Provided on handset station as per specification requirements : [ ] Yes [ ] No

l) Degree of protection :

m) Surface treatment :

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

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 :

ii. Colour of paint

1. Inside :

2. Outside :

iii. Minimum thickness : microns

b) If galvanized;

i. Method :

ii. Applicable Standard :

iii. Minimum thickness of zinc deposit on all points : microns

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 :

b) Signal cable :

c) Loud Speaker cable :

7.1.3 Whether FRLS type cable Provided for

a) Power cable : [ ] Yes [ ] No

b) Signal & loud speaker: Cable [ ] Yes [ ] No

7.1.4 Voltage Grade for

a) Power cable : Volts

b) Signal & loud speaker: Cable Volts

7.1.5 Conductor

a) Material

i. Power cable :

ii. Signal & loud : Speaker cable

b) No. of pairs/cores, Conductor cross sectional Area, no. of strands and Dia. of each strand for

i. Power cable :

ii. Signal cable :

iii. Loud Speaker cable :

7.1.6 Insulation

a) Material :

b) Application :

c) Volume resistivity :

7.1.7 Identification of cores/pairs

a) Power cables: Control cables up to 5 core & 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 marking provided on outer : [ ] Yes [ ] No

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 and its operation. : [ ] Yes [ ] No

b) Dimensional and mounting details of all equipments. : [ ] Yes [ ] No

c) General arrangement drawings for handset station (all types), loud speakers (all types), JBs, Auto changeover Box, distribution box etc. : [ ] Yes [ ] No

d) Auto changeover switching scheme. : [ ] Yes [ ] No

e) Bill of quantities of cables, JB boxes, conduits etc. : [ ] Yes [ ] No

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

QUALITY PLAN

Note: Quality plan attached is indicative & for reference only. Bidder shall prepare QAP in line with clause no of 17.00.00 of technical specification and submit for approval. No price implication shall be entertained for any changes in QAP during detail engineering. Bidder to quote accordingly.

CUSTOMER:Telengana State power generation Corp. Ltd. | PROJECT TITLE: 2X660 MW Maitree STPS | QUALITY PLAN

VENDOR :

SHEET 1 OF 3 | SYSTEM : COMMUNICATION | ITEM : PUBLIC ADDRESS SYSTEM | DOC. NO. :

SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
1.0	SERVER (Controller)	1. AESTHETIC	MA	VISUAL	100%	APPD. DWG.	APPD. DWG. INSP. REPT.	INSP. REPT.	2	1	1	
		2. MECHANICAL	MA	DIMENSION	100%	APPD. DWG.	APPD. DWG. INSP. REPT.	INSP. REPT.	2	1	1	
		3 SHEET THICKNESS	MA	DIMENSION	100%	APPD. DWG.	APPD. DWG.	INSP. REPT.	2	1	1	
		4. ELECTRICAL -Rated input voltage -Rated output voltage	MA	ELECTRICAL	100%	TC	TC	TC	2		1	
1.1	ELECTRONIC MODULE	1. Burn in test at 50 °C for 48 hours in energised condition.	MA	ELECTRICAL	100%	TC	TC	TC	2		1	
2.0	MASTER CONTROL STATION (MCS)	1. AESTHETIC	MA	VISUAL	100%	APPD. DWG.	APPD. DWG. INSP. REPT.	INSP. REPT.	2	1	1	
		2. MECHANICAL	MA	DIMENSION	100%	APPD. DWG.	APPD. DWG. INSP. REPT.	INSP. REPT.	2	1	1	
		3 THICKNESS	MA	DIMENSION	100%	APPD. DWG.	APPD. DWG.	INSP. REPT.	2	1	1	
		4. ELECTRICAL	MA	ELECTRICAL	100%	TC	TC	TC	2		1	
2.1	ELECTRONIC MODULE	1. Burn in test at 50 °C for 48 hours in energised condition.	MA	ELECTRICAL	100%	TC	TC	TC	2		1	

BHEL	PARTICULARS	VENDOR
	NAME	
	SIGNATURE	
	DATE	

BIDDER'S/VENDORS COMPANY SEAL

LEGEND : 1 -BHEL/ CUSTOMER 2 - Vendor P - PERFORM W - WITNESS V - VERIFICATION TC- Test Cerificate

CUSTOMER:Telengana State power generation Corp. Ltd. | PROJECT TITLE: 2X660 MW Maitree STPS

VENDOR:

SHEET 2 OF 3 | SYSTEM : COMMUNICATION | ITEM : PUBLIC ADDRESS SYSTEM

SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
3.0	CONE TYPE SPEAKER, HORN LOUD SPEAKER FALSE CEILING SPEAKER	1. AESTHETIC	MA	VISUAL	100%	APPD. DWG.	APPD. DWG. INSP. REPT.	INSP. REPT.	2	1	1	BHEL witness on 5% sample (min 5) selected at random of each type per lot.
		2. MECHANICAL	MA	DIM.	100%	APPD. DWG.	APPD. DWG. INSP. REPT.	INSP. REPT.	2	1	1	
		3 THICKNESS	MA	DIMENSION	100%	APPD. DWG.	APPD. DWG.	INSP. REPT.	2	1	1	
		4. ELECTRICAL -DC Resistance	MA	ELECTRICAL	100%	IS 9302 Part IV TC	TC TC	TC	2		1	
		5. FUNCTIONAL TEST - SPL at rated output - Sweep test response	MA	ELECTRICAL	100%	IS 9302 Part IV TC	APPD. DATA SHEET TC	INSP. REPT.	2		1	
4.0	FIELD CALL STATION, PORTABLE STATION, DESKTOP STATION & FLAME PROOF STATION (AS APPLICABLE)	1. AESTHETIC	MA	VISUAL	100%	APPD. DWG.	APPD. DWG. INSP. REPT.	INSP. REPT.	2	1	1	BHEL witness on 5% sample (min 5) selected at random of each type per lot.
		2. MECHANICAL	MA	DIM.	100%	APPD. DWG.	APPD. DWG. INSP. REPT.	INSP. REPT.	2	1	1	
		3 THICKNESS	MA	DIMENSION	100%	APPD. DWG.	APPD. DWG.	INSP. REPT.	2	1	1	
		4. ELECTRICAL -THD at 1 KHz. -Frequency Response -Signal to Noise Ratio -Input impd. at 1 KHz	MA	ELECTRICAL	100%	APPD. DATASHEET TC	APPD. DATA SHEET TC	TC	2		1	
5.0	EXTENSION AMPLIFIER	1. AESTHETIC	MA	VISUAL	100%	APPD. DWG.	APPD. DWG. INSP. REPT.	INSP. REPT.	2	1	1	BHEL witness on 5% sample (min 5) selected at random of each type per lot.
		2. MECHANICAL	MA	DIMENSION	100%	APPD. DWG.	APPD. DWG. INSP. REPT.	INSP. REPT.	2	1	1	
		3 THICKNESS	MA	DIMENSION	100%	APPD. DWG.	APPD. DWG.	INSP. REPT.	2	1	1	
		4. ELECTRICAL -IR & HV Test	MA	ELECTRICAL	100%	APPD. TD. TC	APPD. DATA SHEET TC	INSP. REPT.	2		1	

BHEL	PARTICULARS	VENDOR
	NAME	
	SIGNATURE	
	DATE	

LEGEND : 1 - BHEL/ CUSTOMER 2 - VENDOR 3 - SUB- VENDOR P - PERFORM W - WITNESS

CUSTOMER:Telengana State power generation Corp. Ltd. | PROJECT TITLE: 2X660 MW Maitree STPS

VENDOR : I

SHEET 3 OF 3 | SYSTEM : COMMUNICATION | ITEM : PUBLIC ADDRESS SYSTEM

SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
6.0	POWER DISTRIBUTION BOX, SOCKET BOX FOR PORTABLE STATION	1. AESTHETIC	MA	VISUAL	100%	APPD. DWG.	APPD. DWG. INSP. REPT.	INSP. REPT.	2	1	1	BHEL witness on 5% sample selected at random of each type per lot.
		2. MECHANICAL	MA	DIM.	100%	APPD. DWG.	APPD. DWG. INSP. REPT.	INSP. REPT.	2	1	1	
		3 THICKNESS	MA	DIMENSION	100%	APPD. DWG.	APPD. DWG.	INSP. REPT.	2	1	1	
		4. HV / IR	MA	ELECTRICAL	100%	TC	TC	TC	2		1	
7.0	ACOUSTIC HOOD ACOUSTIC BOOTH	1. AESTHETIC	MA	VISUAL	100%	APPD. DWG.	APPD. DWG.	INSP. REPT.	2	1	1	BHEL witness on 3% sample (min 3) selected at random of each type per lot.
		2. MECHANICAL	MA	DIM.	100%	APPD. DWG.	APPD. DWG.	INSP. REPT.	2	1	1	
		3 THICKNESS	MA	DIMENSION	100%	APPD. DWG.	APPD. DWG.	INSP. REPT.	2	1	1	
8.0	INTEGRATED TESTING ON PA SYSTEM	FUNCTION -Party call -Paging call -Busy tone -Alert tone	MA	AUDIO/ VISUAL	100%	APPD. TD	APPD. TD	INSP. REPT.	2	1	1	BHEL to witness on 5 no. of stations or min 5% connected to central exchange.
9.0	TYPE TEST	-	MA	ELECTRICAL	SAMPLE	TC	Reference standard	TC	2		1	
10.0	Cables											
	Make , Model & type	1. AESTHETIC	MA	Visual	100%	APPD. TD	APPD. TD	INSP. REPT.	2	1	1	
	Routine test	2. ELECTRICAL	MA	TC	100%	TC	TC	TC	2		1	
	Functional	3.ELECTRICAL	MA	ELECTRICAI	Sample	APPD. TD	INSP. REPT.	INSP. REPT.	2	1	1	

BHEL	PARTICULARS		VENDOR	
	NAME			
	SIGNATURE			
	DATE			BIDDER'S/VENDORS COMPANY SEAL

LEGEND : 1 - BHEL/ CUSTOMER 2 Vendor P - PERFORM W - WITNESS V - VERIFICATION TC- Test Certificate