PROJECT : YADADRI 5x800MW

CUSTOMER : M/s TSGENCO

EQUIPMENT : IP PUBLIC ADDRESS SYSTEM

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REVISION HISTORY SHEET

REV No.	DATE	NATURE OF CHANGE	REASON	PREPARED BY	REVIEWED & APPROVED BY
00	05.01.2021	FIRST ISSUE	---	AKS	SKK

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SECTION-A

GENERAL INSTRUCTIONS TO BIDDERS

INTRODUCTION: Bidders are required to submit complete technical offer for supply, erection, commissioning and handing over of IP based PA SYSTEM for thermal power plants of M/s TSGENCO located at Yadadri 5x800MW. All documents submitted by bidders shall be in English language only.
Pre-Qualification Requirement (henceforth referred as PQR) for bidders are mentioned in section-B and technical requirement are mentioned in section-C of this document.

Evaluation Methodology
a) PART-1 bid related to PQR qualification will be opened first for review and evaluation by BHEL. If a bidder does not submit complete PQR document or document submitted by bidder does not meet the PQR criteria mentioned, offer of such bidders will be rejected and will not be considered for further evaluation in the tender.

b) Credential of Bidder as well as their offered make of PA system (as submitted under cl 11 & 12 below and section-B) shall be forwarded to M/s TSGENCO for approval.
If a bidder (system integrator) is not approved by M/s TSGENCO, then offer of such bidders shall be rejected.
If make of PA system offered by a bidder is not approved, then such bidders will be permitted once to change the make of PA system to any approved makes without cost implication.

c) If bidder's offered make of PA system is not found meeting PQR criteria / technical specification, offer of such bidders will be rejected and no change of make of PA system shall be allowed. Therefore, bidders are advised to quote most suitable make / model of PA SYSTEM which meets all PQR criteria and technical specification requirements of the PA system mentioned in Section-C

4. If required during evaluation of PQR / Technical bids, the bidder should visit BHEL- Electronics Division, Bangalore for discussion in 3 day's notice and failure of this can result in rejection of bid. Further in event of order and if required, the successful bidder along with PA system OEM representative shall visit M/s TSGENCO for discussion on document approval, on as required basis.

5. This specification does not prohibit any bidder to quote / participate in this tender with deviation from the specification. Changes in technical specification / scope / BOM, if any, shall be informed to participating bidders only.

6. All bidders, irrespective of their existing approval with BHEL / other units of BHEL / TSGENCO, should submit all above mentioned documents.

7. Consolidated Pre-Bid queries must be sought by Bidders through email within 8days from floating the tender and it is suggested & preferred that bidders may visit BHEL-EDN for seeking clarifications to such queries. Clarification sought within 4 days from due date of bid submission will not be entertained and replied.

8. Multiple make / model number are not acceptable for any major active components like call station, loudspeaker, servers, network switch etc. For indigenous components, bidder can offer maximum two makes / model no's within approved makes mentioned in Annexure-IV of this specification.

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9. **Bidders can also quote any other make for any or all items which is not an already approved make of such item(s) as mentioned in Annexure-IV. However, acceptance of such new makes shall be subject to approval by TSGENCO. In case, the proposed new makes are not approved by TSGENCO, bidder will have to offer alternate approved make without any cost implication to BHEL.** For taking up approval of such makes, bidder should submit following documents:

i. Company Profile of the new make offered
ii. Tabular List such makes already installed & commissioned. The list should mention name of project, year of supply /commissioning / handing over, contact details of user/owner etc.
iii. Technical compliance of offered unapproved makes along with supporting documents of past supplies / performances, if available.

10. Approval of bidders by TSGENCO is also required for acceptance of such bidder's offer in the tender. Bidder must furnish following documents for taking up with customer their approval as system integrator:

i. Company Profile of the bidder
ii. Tabular List of IP PA system already executed / orders in hand of bidder (especially in power plants, cement plants, petroleum refinery, steel plant, coal mines) clearly mentioning name of project, year of supply /commissioning / handing over, make of PA system and contact details of user/owner etc.
iii. Unpriced Copy of Purchase order, Performance certificates, handing over protocols of PA system commissioned by bidder.
iv. Technical compliance of offered unapproved makes along with supporting documents of past supplies / performances, if available.

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SECTION-B

PRE-QUALIFICATION REQUIREMENTS

All of the following Pre-qualification requirements are to be met by all bidders. Bidders should submit tabular compliance on how they are meeting these PQR criteria and shall also submit all documents mentioned against each PQR:

1. **The bidder should have supplied and commissioned at least one IP PA SYSTEM having 50nos of handsets in a power plant.** Bidder should furnish all of following document for meeting this requirement:

   i) Unpriced PO copy issued in name of bidder

   ii) Commissioning report/MOM signed by user of the system to ascertain that 50nos of handsets are commissioned.

2. Make of the IP PA system (OEM) quoted by bidders should have a minimum of 2-year satisfactory operation track record in a power plant or oil/gas refinery. The quantity of outdoor call station commissioned in such PA system shall be minimum 100nos.

The bidder shall submit following supporting documents for this requirement:

   a) Performance certificate issued by user along with other supporting documents to ascertain that 100nos of handsets have satisfactorily worked for 2 years. If the make or quantity of handsets of PA system are not mentioned in the performance certificate, then other user signed/approved documents like PO, LOI, design document, commissioning report etc. to be submitted

   b) Contact details of end user

3. All PA system components offered by bidder like control station, call stations, extension amplifier, software etc. shall be from same OEM and the OEM shall have its own in-house manufacturing facility for these items.

Bidder should submit OEM's document like factory license certificate, details of factory for manufacturing of the items, quality plan for raw material selection/inspection and production, organization details of the factory, list of machines and facility in factory required for manufacturing of the products offered etc. Type test report of call station (as per relevant international standard) should also be submitted.

4. **Bidders should submit colour scanned pdf file of Manufacturer Authorisation Letter issued by the OEM for their consent to participate in this tender and confirmation following**

   a. OEM shall provide support / troubleshooting during commissioning and operation of the systems within warranty period.

   b. OEMs offered products are new (not refurbished) and not in an existing End of Life product list

   c. Spares (both finished product and spare parts) of their products shall be available for 5 years from dispatch of the PA system by their system integrator.

5. **Bidder should have a clean track record, i.e. the bidder should not be under hold or blacklist by any of the BHEL units / any Govt of India PSU / Govt of India as on bid submission date.** Bidder should submit a declaration for this on their letter head duly signed by competent authority of the organization.

6. The bidder should have an average financial turnover of more than Rs 400 Lakhs for last three financial years viz 2019-20, 2018-19 & 2017-18.

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SECTION-C
GENERAL SPECIFICATION

1. Project Location:

Yadadri 5x800MW Power plant:
The 5x800 MW project site is located near Damarcherla of Miryalguda town in Nalgonda District. The site is approachable from Nalgonda city by road. The nearest airport is at Hyderabad.

2. INTENTOF SPECIFICATION

2.01.01 This specification is intended to cover the design, manufacture, assembly, Inspection and testing at Bidder's works; delivery including packaging in container for road worthy shipping for the items and all accessories specified in the scope of supply and as required for safe and trouble free operation of IP PUBLIC ADDRESS (PA) SYSTEM.

2.01.02 All systems covered herein shall be for the permanent phase of the project and shall include but not be limited to; design, supply, supervision of interface installation Bidder's works, test, commission and hand over to End user.

2.01.03 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 prevailing environmental condition of the project site.

3. SCOPE OF WORK AND EXCLUSIONS

GENERAL
The scope of work in this document specifies the technical & contractual requirements for the design, supply, erection, testing and commissioning of IP PA SYSTEM. Bidder shall be fully responsible for compliance of the system to be supplied in line with the requirements of this specification. Provisions included in the specification will not be limitative to the scope of work and bidder shall be responsible for supply, installation, erection, commissioning and handing over of complete system. Bidder shall provide supply/services for any further activities which will improve the quality & performance of the system offered within the quoted price. Tentative list of distribution of call station and speakers are listed in the Annexure-II of this specification. The plot plan of the projects is enclosed as Annexure-VI for estimating the quantity of cables and other associated accessories called in sets /lots in the BOM (Annexure-I) of this specification. **The project is spread in a very wide area having a boundary wall of approx 22Km.**

INCLUSION IN SUPPLY: The scope of supply in this specification includes complete design, fabrication, manufacture and assembly, inspection, shop testing at manufactures works, supply, transportation to site, site testing, erection and commissioning and performance testing of the complete PA SYSTEM. All items mentioned in the BOM of the PA system at Annexure-I along with all other miscellaneous consumables required for meeting the functional requirement of the system or for erection and commissioning of the system are to be supplied on as required basis.

SCOPE OF SERVICE
Following service shall also be provided by Bidder for equipment & systems supplied under this specification except specific exclusion mentioned in later section of the specification: -

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- Carrying out detail engineering, preparation and submission of all drawings as specified elsewhere in this specification including preparation and submission of area wise bill of materials, layout and erection drawings showing location of all system equipment and components, cable schedule, cable tray/rack and conduit routing.
- Inspection and testing at Bidder's works as per TSGENCO approved Quality Assurance Plan (after ordering).
- Packing and forwarding of all items (except cables) included under this specification in a weather proof container with lock and key. The bidder shall be responsible for safe storage of the items inside the container. It shall be bidder's responsibility to take required materials out of container for erection and commissioning of the systems and keep the remaining in the container.
- The erection, installation and commissioning of the complete PA SYSTEM will be in bidder scope of services. This will include but not limited to following
  - i. Storage in weather proof container during entire period of E&C
  - ii. Erection (including civil work), Mounting, Installation, programming and commissioning of all items supplied for PA system (as per site requirement on as required basis)
  - iii. Laying, splicing, testing and termination of all type of cables
  - iv. The cables of the systems will be generally laid on the cable tray where ever available in the plant. For remaining areas, required cable trays and its erection shall be in bidder scope. Last section of cables may be required to be laid inside conduits/cable trays. Underground cabling is also to be done on as required basis.
  - v. Erection of conduit/cable tray, network panels, enclosure, switch, LIU, patch cords etc.
  - vi. Erection and commissioning of all the interfaces
  - vii. Installation and configuration of all the software
  - viii. Travel to site, stay at site and local travel at site. Any incidental expenses at site to engage local man power.
  - ix. Demonstration of functionality to BHEL/END users
  - x. Training on operation and maintenance to end users

- Bidder 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 Bidder. If necessary, bidder may contact purchaser for clarifications before submission of their Bid.
- Site modification and preparation of "as-built" documentation".
- Securing certification from relevant authorities, wherever applicable.
- Project management and scheduling including micro-planning in specific work area and reporting progress periodically.
- 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.
- **The complete erection and commissioning of PA SYSTEM shall be done as per availability of fronts in the project and would have to be done spreading over a period of approximately 4-5 years from delivery of the materials at site. The erection and commissioning would therefore require multiple visits to site for survey, planning, cable schedule preparation, laying of cables, call station / loudspeaker mounting, sever installation and commissioning and call station / loudspeaker commissioning and bidders should include the same in their offer for E&C.**

EXCLUSIONS from scope of supply / services:

a) Unloading of container and other items at site
b) Lifting of 42U panels from BHEL stores to respective control room

4. ENVIORNMENTAL CONDITIONS

Instruments, devices and equipment for location in outdoors/indoor/air-conditioned areas shall be designed to suit the environmental conditions indicated below and shall be suitable for continuous operation in the operating environment of a coal fired utility station and also during periods of air conditioning failure without any loss of function, or departure from the specification requirements covered under this specification.

Ambient Temperature Class	Pressure	Relative Humidity	Atmosphere	IP
Outdoor Location				
55 degree C max.	Atmosphere	100 % Max.	Air (dirty)	IP 55
10 degree C min.	Atmosphere	5 % min.	Air (dirty)	IP 55
Indoor Location				
55 degree C max.	Atmosphere	95 % Max.	Air	IP 54**
10 degree C min.	Atmosphere	5 % min.	Air	IP 54**
Air-Conditioned Areas				
24 +/- 5 degree C normal	Atmosphere	95 %Max.	Air	IP 22***
55 degree C max.*	Atmosphere	5 %min.	Air	IP 22***

* During air conditioning failure.
**For non-ventilated enclosures. For ventilated enclosures, protection class shall be IP 42.
***With a suitable canopy at the top to prevent ingress of dripping water.
For Hazardous areas the protection class shall be in accordance with the requirements of the relevant NEC code for the location

PCs, OWS, EWS, Servers, Printers, mini UPS and other peripherals, maximum ambient temperature shall be 40 Deg. C.

5. FACTORY ACCEPTANCE TEST (FAT)

i. Factory Acceptance Test procedure shall be prepared by Bidder along with Quality Assurance Plan. The document shall be subject to End user's approval.
ii. All System equipment shall be tested at bidder's work prior to clearance for shipping. The FAT shall include individual equipment tests and integrated under fully assembled condition.
iii. The FAT shall demonstrate adherence that the equipment meets the design standards and functional compliance.
iv. One (1) month prior to the FAT, Bidder shall submit a test procedure to End user for approval.
v. 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 End user prior to clearance of the FAT and authority by End user is given to ship
vi. Typical applicable Quality plan for FAT is attached as Annexure-V.

6. DISCREPANCIES

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 Purchase. Before

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starting the manufacturing / supply, Bidder shall inform Purchase of any discrepancy between the instructions of the present specification and Bidder's standard. Bidder is also advised to discuss on any clarification required before submitting their offer to avoid any ambiguity/dispute later on.

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.

In case of any discrepancy in specification / parameter mentioned in this purchase specification, the stringent one shall be applicable and to be considered & offered.

7. Technical Specification Requirements

It is highly preferable to provide the PA SYSTEM solution based on open architecture as described in the specification. Proprietary products / solutions are not acceptable. All software offered in the system including OS shall be offered with lifetime validity permanent licenses for the required quantities. The software supplied should be latest at the time of dispatch.

7.1 Interface of the PA SYSTEM:

i. Interface from Master Clock System: Complete PA SYSTEM has to be time synchronized with Master Clock (MC) available at site. This has to be achieved by acquiring clock signal either to servers or to network switch using Network Time Protocol (NTP). Subsequently rest of PA SYSTEM items i.e., other servers, client stations, call stations and network switches shall be time synchronized with master clock.

ii 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 loudspeakers.

iii. The PA system shall have to be interfaced / linked to CCTV system of the project. Details of linking and functionalities of integration shall be finalized during detailed engineering.

7.2 Detailed specifications of system components: The detailed technical specification of the PA SYSTEM is available at later sections and BOM is available as Annexure-I. However, technical requirement for other components are mentioned below.

LED Backlit Monitor:

Viewable size min	As per BOM
Max resolution	1920 x 1080 Pixels.
Contrast ratio	1000:1
Brightness	250 cd /m^2.
Viewing angle	160V / 170H Typical (@ 10:1 CR)
Interface	HDMI
Power supply	100 to 240 VAC; 50/60Hz.
Other features	Height adjustable stand, pivot, tilt and swivel provisions to be present.

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Alarm I/O Device:

Input ports	As required
Output ports	As required
Interface	RJ-45, 10/100 mbps Ethernet.
Mounting kit	DIN Rail or Rack Mount.
Compatibility	Should seamlessly integrate with proposed VMS

a) N/A

b) Uninterruptible Power Supply (UPS):
1KVA UPS with 30min backup with SMF VRLA battery. The UPS should have following features:

i) Input: 140-270V AC
ii) Frequency: 47 – 53Hz
iii) Output: 1KVA
iv) Rated voltage: 230V AC 50Hz
v) Power factor: >= 0.7
vi) Overall efficiency: >= 85%
vii) Automatic Switchover time: <5msec or better
viii) Other features: overload, short circuit, over voltage and under voltage protections

c) Rack End Patch Cord
The Patch Cord shall be of CAT6 STP PATCH CORD –min 1 MTR (3 feet) Blue Colour factory molded as per EIA/TIA standards.

d) End User Site Patch Cord
End User Site Patch Cord shall be of CAT6 STP LSC2 PATCH CORD –min 2 MTR (7 feet) Blue Colour factory molded as per EIA/TIA standards.

e) 19" rack mountable 24 Port CAT6 STP Patch Panel Loaded
This item shall be 24 port PATCH PANEL RJ-45 Loaded CAT-6 STP 19" rack mountable patch panel preferably with front loaded 6 in a block as per EIA/TIA standards, modular in mechanism.

f) 9U cabinet 65X600X500 (HXWXD) - Wall Mounting Rack
9U cabinet shall be of Width (mm)-600, Depth (mm) - 500, Approx. Wt (kg) - 20, CRCA 'D' Grade thickness (mm) - 1.2, Powder Colour for Cabinet - RAL9002, Glass - 4mm Toughened Tinted Glass Door,
Accessories: Cable Manager Metal- 2 Nos, Mounting Hardware, rubber grommet (nickel coated), Door Lock – 1no

g) 42U cabinet 2026X800X800mm (HXWXD)–
Standalone Rack42U cabinet shall be minimum of Width (mm) 800, Depth (mm) 800, Powder Colour for Cabinet, Glass: 4mm Toughened Tinted Glass Door, Accessories: Cooling Fan (230V A/C 90 CFM), Heavy Duty Stationary Shelf, Mounting Hardware, earthing Strips 150mm, Door Lock - 1No

1. Material of Construction: Cold Rolled Coal Annealed (CRCA) steel sheet
2. Thickness of Sheet:
    a) 2.0 mm for faces supporting instruments / terminals
    b) 1.6 mm for other sides and top
3. Construction: Welded throughout as per approved National Standards

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4. Post welding operation:
    a) Grounding of all welds to smoothness
    b) Rounding of corners
    c) Cleaning of weld spatters
5. Panel height: 2300 mm (approx.)
6. Corners: 7 mm inner radius
7. Dimensional Tolerances:
    a) In height & length - 3 mm
    b) In height between adjacent sections - 2 mm
    c) Total for a group - 6 mm
8. Doors: Double, recessed, turned back edges, full height front & rear
    i) Thickness of Sheet: 2 mm
    ii) Hinges: Stainless steel
    iii) Door latches: Three-point type
    iv) Door gaskets: Neoprene rubber on fixed frame to result dust proof/weatherproof enclosure
    v) Opening of the doors: Outward
    vi) Louvers: With removable wire mesh to ensure dust and vermin proof
9. Gland plates: Removable in sections 4 mm thick (bottom)
10. Cable entry: Bottom
11. Hardware:
    a) Anti vibration pad- 15 mm
    b) Predrilled base channel ISMC – 100 or equivalent for all sides
    c) Stainless steel buff- finished 2 mm thick kick plate for all sides
    d) Stainless steel scratch strips along desk edges fixed with pan-head recessed screws
    e) Rubber strips to ensure air tightness between kick plate and finished floor
    f) Lifting hook / Eye bolt
    g) Drawing pocket
    h) Door switch, lamps, thermostat, heaters and industrial grade cooling fans, illumination fixtures
12. Name Plate: Both at front and back surface of the panel
13. Fixing of name plate: Stainless steel pan head screws
14. Name plate material: Laminated phenolic (3 layers)
15. Lettering: Black with white engraved
16. Mounting of terminal blocks: Vertical angle support bracket tack welded on sheet steel plate, screwed on internal wall of enclosure

h) Splicing Tray - It shall be Modular Splice Tray Cassette for pigtails 12 fiber capacity.

i) 19" LCS2 Modular LIU-Fiber Optic Drawer-24 Port The item shall be Modular fiber optic drawer modular 19"(LIU) 24 port - FIBER OPTIC
DRAWER loaded with SC Pigtail - 9/125 µm for 6 Cr. OFC armored LCS2 and adapter for 6 OFC SM LCS2 without Blanking plate. The LIU should either be suitable for outdoor mounting/fixing or suitable enclosure for outdoor mounting to be provided

j) HDPE pipe
The HDPE pipe shall be used for laying OFC and STP cables for underground cabling. 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

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drawing. The pipe shall conform to DOT standard GR/CDS-08/02 Nov. 2004 with latest amendments.

k) Power Supply Unit

BHEL will provide 230 VAC 50HZ single phase centralized UPS power supply at each power generation unit of the project's in CCR area for the PA system. Bidder has to use this UPS supply to power the entire PA SYSTEM including items like Servers, Clients, Network active components, call stations, amplifiers, loudspeakers etc. For equipment far away PA system's PDB mounted in the 42U panels, shall be powered from 1 KVA online mini UPS. Any power conversion needed by PA system / other equipment due to their rated operating voltage level / types the suitable power packs shall be included from the same make of the main equipment.

ii) The component level power supply unit shall have stabilized voltage outputs for input variation between-10% and +10%.

iii) The power supply unit shall be able to supply the whole equipment load and allow 50%future growth. It shall be fitted with suitable optical indication of correct working condition.

l) RIGID STEEL CONDUIT

i) Conduits up to and including 25 mm shall be of 16 SWG and conduits above 25 mm shall be of 14 I size of conduits shall be 19 mm.

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

iii) All rigid conduit couplings and elbows shall be hot dip galvanized rigid mild steel in accordance withIS:9537 Part-I (1980) and Part-II (1981). The conduit interior and exterior surfaces shall have a continuous zinc coating with an over coat of transparent enamel lacquer or zinc chromate. Conduits shall be furnished in standard length of 3 meters, threaded at both ends.

iv) All rigid conduit fittings shall conform to requirements of IS:2667,1976. Galvanized steel fittings shall be used with steel conduit. All flexible conduit fittings shall be liquid tight, galvanized steel. The end fitting shall be compatible with the flexible conduit supplied.

m) FLEXIBLE CONDUIT

i) Flexible conduit shall be of three-layer construction of very high quality of lead coated steel. Outside and inside layer shall be reinforced with heat resistant material.

ii) Lead coating outside and inside of the conduit steel surface shall provide a non-corrosive characteristic. Besides flexibility, this shall be strong enough to stay at the desired profile without support and shall be durable and strong so as to offer sufficient mechanical protection. It shall also be fully liquid dust and air tight and shall withstand temperature up to 200 °C.

n) Cable Tray:

Perforated mild steel, hot dip Galvanized cable trays with cover – Height 25mm, Width 50mm, and thickness 2.0mm, Coupler plate and cover are also of 2mm thick mild steel and hot dip galvanized. Associated fasteners shall be zinc passivated/electroplated. (Standard length of each tray: 2.5m).

Perforated cable trays along with associated accessories such as coupler plates, bends, and covers shall be fabricated from minimum 2.0 mm thick mild steel sheets.

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The hot dip galvanized coupler plates thickness of 2mm shall be provided.
All trays with above mentioned accessories shall be hot dip galvanized after fabrication.
Weight of zinc coating shall be 610gm/sq. mtrs with minimum thickness of zinc deposit at any spot as 86 microns.
Cable trays shall be supplied in standard length of 2500 mm.
Finished cable trays and accessories shall be free from sharp edges, corners, burrs and unevenness.
Coupler plates and accessories like fasteners etc.; shall be provided on “As required” basis. Fasteners shall be zinc passivated / electroplated.

o) Junction Box

a) Material- min 4mm thick FRP (Fiberglass Reinforced Polyester)
b) Type- Screwed at four corners of door, door gasket shall be synthetic rubber
c) Mounting clamps and accessories: Mounting plate of 2mm thick mild steel to be provided inside JB, mounting clamps suitable for mounting on walls, columns, structures etc. shall be provided. The brackets, bolts, nuts, screws, glands, SS handle and Lugs required for erection shall be of SS304, included in Bidders scope of supply. M6 earthing to be provided.
d) Protection Type: IP55 of indoor and IP65 for outdoor

p) OWS

1. Processor : Latest, minimum Intel Core i5 or equivalent
2. Configuration : Tower
3. Internal clock : 3.2 GHz (minm.)
4. Architecture : 32 bit
5. Video Card : PCI
6. RAM : 4 GB (Minimum) DDR
7. Hard drive : 500 GB SATA
8. Cache : 512 KB Level 2
9. CD/DVD Drive : DVD - Both Read & Write for OWS.
10. Audio controller : 16-bit
11. Operating system : Latest Windows
12. Communication ports : minimum 2nos Ethernet ports(1000 MB) & 4nos USB ports

Monitor:
1. Type : TFT monitor
2 Screen diagonal : 24 inch flat
3 Display : XGA or better
4 Resolution : 1024 X 768 or better
5 Degree of protection : IP-30
6 External Controls : Brightness, contrast, Horizontal / Vertical amplification & shift
7 Power supply : 240 V, 50 Hz, 1 phase
8 Ambient temperature: 0-50 Deg C
9 Humidity : 95% non-condensing

q) SERVER- Rack mountable

1. Processor : Latest, minimum Quad core intel xeon or equivalent
2. Mother board : Intel C600 series chipset or equivalent

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3. Internal clock : 3.2 GHz (min.)
4. Raid support : SAS Raid Controller with support for RAID 0/1/1+0/5/5+
5. Video Card : Min 4 PCI-Express slots using single processor
6. RAM : 16 GB (Minimum) DDR3
7. Hard drive : Server should support minimum eight 2.5" HDD bays as Standard, expandable to 16 HDD bays. The chassis should be capable of supporting SAS/SATA/SSD drives. The storage capacity of server shall be adequate for storing all voice and data of PA system of respective zone for 1month.
8. Power supply : Redundant hot swappable
9. Operating system : Latest Windows server
10. Communication ports: minimum 5nos Ethernet ports(1000 MB) & 6nos USB ports

8.00.00ENGINEERING DESIGN DOCUMENTATION

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

a) 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.
b) Data sheets.
c) Bill of Materials.
d) Typical general arrangement drawings of various handset and speaker stations.
e) Schematic diagram of each type of station.
f) Mounting details.
g) Cable connection diagram for various type of stations, clearly indicating cable size, number of pairs/cores etc.
h) Total power consumption details.
i) Heat load details of panel equipment.
j) Technical leaflets on each piece of equipment viz handset, speaker etc

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

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

9.00.00 SITE ACCEPTANCE TEST (SAT)

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

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

9.0.03 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.

10.00.00 TOOLS & TACKLE

Bidder, in his proposal, shall include and provide 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. Unit rate of the same shall be provided.

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11.00.00 CLEANING, PROTECTION AND PAINTING

11.00.01 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

11.00.02 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.

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

12.00.00 IDENTIFICATION, MARKING, PACKING AND STORING

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

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

12.00.03 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.

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

12.00.05 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.

13.00.00 SHIPMENT

Bidder shall be responsible for ensuring that all equipment is carefully and/or suitably packed for shipment, so that they arrive at site in good condition and remain so during storage at site. Before dispatch, 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. Bidder will be responsible for all damages due to improper preparation of the goods for shipment.

14.00.00:

Documents to be submitted Along with offer

- Data sheets / catalog for all the items offered in the system.
- Signed Technical compliance to each clause of this specification.
- Deviation list, if any; Bidder may note that for all the items of exact or better specifications (if model meeting exact specification is not available) are acceptable but not inferior.
- Block diagram for connectivity of PA SYSTEM
- Write-up on functionality of each item and overall system

Documents to be submitted after receipt of order

- On receiving the order prior to supply, manufacturing datasheet for all the items to be provided which will be approved by end user
- Quality plan based on format attached in this specification.
- Power distribution scheme drawing.
- Network scheme drawing.

- General Arrangement (GA) of Power Distribution, Network panel and wall mount Enclosure.
- User manuals for all the equipment.
- Original Software Set up CDs OS, VMS, VCA and any other relevant CDs.
- Standard Test certificates for Call stations, loud speakers, accessories, Computers, Storage, Network switches, cables.

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PROJECT SPECIFIC TECHNICAL SPECIFICATION

1.0 PURPOSE:
The purpose of this design document is to cover basic approach for designing of Public Address System (PA System) for the 5x800MW Yadadri power plant.

2.0 DESCRIPTION:
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 analogue type without IP addresses. The field call stations shall have additional amplifier to drive additional one speaker.

3.0 ZONE WISE DISTRIBUTION OF SYSTEM:
PA system shall comprise following separate zones:

a) Zone-I for Unit 1
b) Zone-II for Unit 2
c) Zone-III for Unit 3
d) Zone-IV for Unit 4
e) Zone-V for Unit 5
f) Zone-VI Common area
g) Zone-VII for CHP Area
h) Zone-VIII for Plant Water System

3.01.02 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.
3.01.03 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.
3.01.04 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).
3.01.05 The system under this tender shall make use of the 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 thoroughfare 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 shall bemused along with acoustic booth. The speakers and FCS in each zone shall be connected through Star fashion to the respective ethernet switch.
3.01.06 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. L2 field/edge switches shall be minimum Layer-2 managed type with minimum 8 port 10/100 Mbps port and

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2 Nos. SFP FO Port. L2 distribution switch shall be minimum Layer-2 managed type and minimum 24 port 10/100 Mbps port and 2 Nos. SFP FO Port. These switches should be connected in a ring network and 20% spare port of each type shall be available in each switch.

3.01.07 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 amin 2 party communication channels within each zone or plant area.

3.01.08 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.

3.01.09 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.

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

3.01.11 Calls will be carried out through loudspeakers installed in the various locations across the Project.

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

3.01.13 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.

3.01.14 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.

3.01.15 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).

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

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

3.01.18 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.

3.01.19 The system shall also provide the following facilities:

a) A two-wire telephone interface is to be connected to the telephone system.
The PABX to which this is to be connected shall be designated during the detailed engineering phase.
b) The interface shall provide 48 V supply on the two wires respectively with600 ohm impedance.
c) An acoustical feedback suppresser.
d) 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.

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

a) PABX Interface
b) Acoustic feedback suppression

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c) CD audio player

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

3.01.22 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.

3.01.23 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 intelligent unit, dialling button/keypad etc shall be an integral part of the call station and shall not be procured from different OEMs and combined.**

3.01.24 All the system elements in PA and Industrial Talkback system viz. Controller, field call station, amplifier, software shall be offered from the same OEM.

3.01.25 The powering philosophy for PA system and other allied accessories shall be as under.

a) At Power House, PS power points shall be provided by the Owner within 3meters of the point of location of the 42U panel housing PA system server and allied accessories.

b) At other locations, a PDB shall be provided by the Bidder to distribute UPS power supply to PA system components. All required components for PDB like MCB, fuses, power supply cable etc shall be provided by the Bidder on as required basis.

3.01.26 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.

3.02.00 DETAILED CHARACTERISTICS

3.02.01 The equipment shall be fully solid-state type / microprocessor based and programmable.

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

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

3.02.04 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.

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

3.02.06 The system shall be designed to comply with EMI and RFI regulations, particularly the requirements of IEC 61000 series.

3.03.00 MAIN SYSTEM FEATURES

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

3.03.02 Gain Control of 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.

3.03.03 Software

a) The software shall be “user Friendly”, for easy re-configuration, maintenance and future expansions.

b) The software shall be able to work with the latest windows version.

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3.03.04 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 condition.

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

3.04.00 TECHNICAL FEATURES

3.04.01 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 10 dB. Greater than20dB is undesirable.

3.04.02 The main design criteria for coverage shall be:

a) Areas with average noise level below 86 dBA shall have complete audible voice and alarm coverage with all loudspeakers working, and complete alarm tone coverage with half the loudspeakers on.

b) Areas with average noise level above 83 dBA shall have a partial audible voice coverage during operation. Alarm and voice signals shall be completely audible when ambient sound level is reduced below 83 dBA as during maintenance.

c) 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.

d) 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.

3.04.03 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.

3.05.00 SYSTEM CABINET

3.05.01 The control sub-system, speech amplifiers and their ancillary devices shall be housed in a 19” 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.

3.05.02 This shall meet the technical requirements as described in Section VI and VII of this volume of the specification.

3.06.00 DIGITAL VOICE STORAGE / PLAYBACK UNIT (DVSP)

3.06.01 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.

3.06.02 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 15calls 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

3.07.00 PROGRAMMING AND INTERFACE

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

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b) Long range remote access which may be used for setting up, fault finding, system parameter changes etc., using the PTT network via 32 bit dial up modem is an advantage.

3.08.00 CONTROL SETS

3.08.01 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.

3.08.02 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, display and indicators to monitor and control the system.

4.00.00 LOUD SPEAKER

4.01.00 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.

4.02.00 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 polyester resin armoured with fibre glass or equivalent, suitable to resist the aggressive atmosphere. The loudspeakers shall have a diffusion angle between 100° and 120° with the minimum sound pressure level, measured 1 m away along the diffusion axis, when a continuous constant level sinusoidal sound signal with 1 W power is applied and the transformer is tapped for the maximum absorbed power shall be minimum 107 dBA.

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.

4.03.00 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.

5.01 TECHNICAL PARAMETERS- PUBLIC ADDRES 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)-coordination Zone Stations.
05. Zone call discipline	: Between Zones & Master station

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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
17. Master Access Panel : Desk-top, Indoor, air-conditioned
    - Microphone : Gooseneck(>400mm)
    - Enclosure : Anodized aluminium / ABS plastic
    - 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 for outdoor and IP40 for indoor
    - 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

5.02 TECHNICAL PARAMETERS- WEATHER PROOF HORN TYPE SPEAKER

01. Housing : Special Plastic
02. Connection : Screw Terminal
03. Ingress Protection : IP65
04. Weight : Bidder to quote
05. Colour : Light
06. Mounting : Plastic Bracket/Stainless Bracket
07. Rated Power : 25 watts
08. Transformer : 100v; 25/14/7. 5/2 watt
09. Sound Pressure Level1W,1m: 110dB
10. Sound Pressure Level25W,1m: 120dB
11. Frequency Range: 370Hz to 7000Hz
12. Dispersion-6dB-1KHz/4KHZ: 140° /40°
13. Operating Temperature: -10°C to 60°C

5.03 TECHNICAL PARAMETERS- INDOOR CONE SPEAKER

01. Housing : Special Plastic
02. Ingress Protection : IP40
03. Weight : Bidder to quote
04. Connection : Clamp
05. Volume Control : Required
06. Rated Power : 15 Watt

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07. Transformer : 100v 6/3/. 5watt
08. Sound Pressure Level1W,1m: 91dB
09. Effective Frequency Range: 100 to 15000Hz

5.04 TECHNICAL PARAMETERS- INDOOR CEILING MOUNTED SPEAKER (6WATT)

01. Housing : Mild steel
02. Sound pressure level, power Watts/1m, Db: 103 dB
03. Nett weight, Kg : Bidder to quote
04. Effective frequency range : 100-20,000 Hz
05. Transformer Power tapings, Watts : 0.75, 1.5, 3.0, 6.0, 10
06. Input impedance standard model, Ω : 13.33k, 6.6k, 3.3k, 1.66k, 1.0k
07. Impedance : 8 Ω
08. Operating Temperature : 0°C to +50°C
09. Protection class : IP-40

5.05 TECHNICAL PARAMETERS- WEATHERPROOF OUTDOOR CALL STATION (TYPE-B)

01. Glass FRP / ABS housing, pilfer proof type
02. Plug in front unit with all functional parts
03. Dial keypad
04. Call or busy signal by light emitting diodes
05. Noise compensated inbuilt microphone with dynamic compression and PTT operation
06. Microphone sensitivity and volume control
07. Potential free relay point
08. Connector for optional amplifier booster amplifier
09. Direct intercom connections
10. Can be switched to low volume
11. Led indication of incoming call and line busy, prioritized
12. Supply voltage range : 48-60 v dc
13. Max. Quiescent current : 25 mA
14. Max. Operating current : Approx. 125 ma
15. External Loud speaker : 25 W
16. Frequency range : 300 hz to 3.4 khz
17. Electrical data booster amplifier - output power: 25 w / 400 ohm
18. Operating temperature : -10° to +60° Celsius
19. Protection class : IP-65
20. Area of use : Non hazardous
21. Inbuilt Loudspeaker : 1 watt

5.06 TECHNICAL PARAMETERS- INDOOR CALL STATION (TYPE-A)

01. Plastic housing (ABS) with aluminium base plate, pilfer proof type
02. Humidity non-condensing : 80%
03. Integrated full range speaker : 1W 8 Ω
04. All keys with individual labelling area
05. Call or busy signal by light emitting diodes
07. Microphone sensitivity and loudspeaker volume control
08. Monitoring of microphone function
09. Potential free relay contact
10. Supply voltage range : 48-60 V DC
11. Frequency range : 300 hz to 3.4 khz
12. Max. Quiescent current : 50 ma

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13. Max. Operating current : 180 ma
14. Amplifier power rating : 25 Watt
15. External Loudspeaker : 25Watt
16. Average speech power : (1 W / 1 m) 86 dB
17. Electrical data booster amplifier - output power - 25 W / 400 Ohm
18. Operating Temperature : 0° to +40° C
19. Protection class : IP30 or better

5.07 TECHNICAL PARAMETERS- MASTER CALL STATION

1. Frequency range : 300 Hz to 7 khz
2. Inbuilt Loudspeaker : 1 Watt/8Ohm
3. Electrical data booster amplifier : output power: 25w / 400 Ohm
4. Protection class : IP30 or better
5. Microphone : Gooseneck & handset
6. Enclosure : ABS plastic
7. Number of Keys : 40 direct keys with individual labelling area & LED

5.08 TECHNICAL PARAMETERS- DESKTOP MOUNTED CALL STATION (TYPE-C)

1. Frequency range : 300 Hz to 7 khz
2. Inbuilt Loudspeaker : 1 Watt/8Ohm
3. Electrical data booster amplifier : output power: 25w / 400 Ohm
4. Protection class : IP30 or better
5. Microphone : Gooseneck & handset
6. Enclosure : ABS plastic

All outdoor handset stations and their components shall be capable of continuous satisfactory operation at an ambient temperature of 55 degree centigrade.

6.00 DIFFERENT TYPE OF HANDSET STATIONS:

a) Type-A: PA Instrument complete with or without wired 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: PA Instrument complete with or without wired handset & amplifier with **outdoor-type** enclosure. It shall be suitable for mounting on wall/column in open area. The enclosure shall be dust proof, water proof as per industrial standard. It shall be provided with canopy.

c) Type-C: Desk Top Mounted PA Instrument 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 wired handset. The communication shall be possible thru built in microphone. The enclosure shall be dust proof, flame/explosion proof (EEX-D type), water proof as per industrial standard. It shall be provided with canopy. For areas with explosive gaseous environment, the handset shall also meet explosive gas requirement of Gas group-IIC.

7.00 POWER SUPPLY:

The system shall be suitable for operation from 240V AC 1-phase, 50Hz supply. Redundant power supply will be provided to PA system cabinets (housing servers / switches etc) to be mounted in various locations. The redundant power supply will be distributed to various components and also field components. For certain location where it is not possible to power field components from PA system cabinet, mini UPS shall be provided with2hrs back to power

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such field components. The power supply to such mini UPS shall be fed from nearest Lighting Panel/ Power DB/Lighting receptacle.

8.00 ACOUSTIC HOOD/BOOTH:

01) Housing - Rot/vandal resistant glass reinforced polyester /Hot-galvanized sheet steel or stainless steel with 15-watt lamp
02) Self colour-yellow, visible during emergency/Paint- Powder Coated
03) Luminous yellow green glow in dark condition, lasting up to minimum 10 hours or more
04) Sound absorbent- Up to 12 dB(A) when it will be used as Acoustic Hood
05) Resistant to chemical spillage/vapours and are fire-retardant and weather proof
06) Flashing beacons telephones and sounders can be attached to the hood
07) Temperature Range: +60 Deg C to -10 Deg C
08) Humidity: Up to 100%
09) Insulation: Rockwool RAF-SE
10) Dimension: As per Vendor

Sound proof booths shall be provided in BFP, ID, FD, PA, MILLS, BOILER BURNER FLOOR, TG 8.5 MTRS, TG 17 MTRS, feeder floor, AHP Silo, Crusher House, Air Compressor, DG Building.

9.00 JUNCTION BOXES: All junction boxes (JB) shall be made of Fibreglass reinforced polyester material with min thickness 4 mm, door handle, self-locking with common key, door gasket shall be of Synthetic rubber & provided with cage clamp type terminal blocks. Protection class of junction box shall be IP-65.

10.00 CABLES:

Following cables shall be used:

a) Optical fiber Cable: For Connecting two separated PA controllers
b) CAT-6: Ethernet Switch to PA speaker & Call Station
c) Power cable: For powering the equipment like server, network switches etc.

CAT6 STP Cable

Cat6 cable shall be shielded Twisted Pair (STP- CAT6 Cable) category 6 LAN (local area network) four pair cable per box 305 mtrs 23 AWG, which is UL listed, conforming to the following standards in Cat 6 STP cable like IEC 11801 edition 2.0, Nominal Velocity Propagation (NVP) 72%, as per EIA/TIA standards and cable laying shall be through MS/PVC conduit or floor raceways including connections etc. as required complete in all respects. Screened Twisted Pair (STP) Cables conforming to ANSI/TIA/EIA 568-B.2-1, 4pair UL/NEC rated and shall have maximum attenuation of 54.8 dB/100m at 600 MHz Each pair shall be separately shielded with polyester aluminum foil.

01. No of Pairs	: 4 Pair
02. Conductor	: Solid tinned copper
03. Construction Parameters	: Values
04. Nominal DC Resistance	: 67 ohms/1km
05. Nominal Impedance	: 100 ohms+/-15 Ohms
06. Nominal Capacitance	: 46pf/m
07. Nominal Velocity of Propagation	: 68%
08. Nominal Attention	: 100 MHz: - 19.9 dB/100m 155 MHz: - 25.3 dB/100m 200 MHz: - 29.2 dB/100m

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09. Insulation Materials : Poly Vinyl Chloride
10. Cable Outer Diameter : 0.38 mm+/-0.15 mm
11. Nominal Outer Diameter : 6.35 mm
12. Bend Radius : 0.90 For 6.35 mm

FIBRE OPTIC CABLE

Fibre Optic cable shall be single mode 4F, full spectrum, low water peak type fibre core, with polyethylene inner and outer sheath, armoured cable conforming to IEC 60793-2-50 and ITU-T Recommendation G 652D. All OFC should be laid in conduits.

01. No. of fiber : 4F
02. Core : The fiber shall be full spectrum, low water peak type
03. Guiding standard : ITU-T recommendation G.652.D and IEC60793-2-50
04. Bandwidth : 10Gbps
05. Core Diameter : 9 µm
06. Cladding diameter : 125 µm
07. Nominal Velocity of Propagation: 68%
08. Nominal Attenuation : 100 MHz: - 19.9 dB/100m
155 MHz: - 25.3 dB/100m
200 MHz: - 29.2 dB/100m
09. Optical laser source wave length: 1310nm/1550 nm
10. Attenuation level: 0.34 dB/km or better at 1310 nm, 0.21dB/km or better at 1550 nm
11. Inner Sheath and Outer Sheath: Polyethylene
12. Armouring : Corrugated steel tape
13. Patch cord, Pigtails and connectors: Single mode and duplex type and same through out the network.
14. Bend Radius : 20X outside diameter for installed load and10X outside diameter for long term load

(Refer Annexure-III for more details of FO Cable)

POWER CABLE

Power cables shall be Annealed tinned copper conductor, armoured FRLS type with PVC inner and outer sheath (yellow colour) conforming to IS 1554. Cable Glands shall be Double Compression type.

SL.NO.	PARAMETER	SPECIFICATION
01.	Component Copper	: Auxiliary power Four conductors, 14AWG,0.9mm
02.	Shielding	: Unshielded
03.	Jacket	: HDPE
04.	Insulation	: PE
05.	Overall Copper Braiding: Overall 80% Tinned Copper Braiding	

(Refer Annexure-III for more details of Power Cable)

11.00 NETOWRK REQUIREMENTS: ETHERNET SWITCHES

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. The bidder shall select the port architecture of each switch by considering adequate nos of SFP and ethernet port for connection to calls station as well as other IP equipment in the system. Failure reporting shall be available at HMI. MTBF of the switch shall be more than 20 Years. Configuration shall be automatic. Other requirements shall be as follows.

FIELD SWITCHES

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a) All managed switches shall work in IEC-61850-3 protocol environment and shall support IEC-62439 standard ring redundancy topology (MRP) and also fast MRP. It shall also support IEC-62439-3 standard PRP& HSR technology with 0ms recovery time and also support IEC-61850 switch (RSP & MSP switches).
b) Switch shall act as IGMP-querier and minimum 2 alarm contacts shall be available
c) It shall have High MTBF value
d) It shall support ACA adaptor for reconfiguration of the switch in case of failure to reduce MTTR value to less than one minute and shall have minimum of 4 fibre and 4 copper din rail switch RSPL.
e) It shall be of POE type (i.e Power over Ethernet)

L3 CORE / DISTRIBUTION SWITCH
a) Switch shall have the capacity for maximum of 4nos Giga bit fiber port and 24nos ethernet ports ensuring 30% spare port of each type in each switch.
b) The Central control switch shall be manageable type with minimum Layer-3 functionality. The switch shall have required nos. of fiber optic (FO)/SFP and RJ-45 port including 20% Spare ports for each type. No media converter shall be used for connecting OFC cable to switches or call station to switches. All the switches shall be powered from UPS.
c) All the switches shall operate with wire speed switching on the same Network Management Software and shall have required intelligence and synchronization to control, monitor and maintain the IP network of the CCTV system. It shall be possible to administer all the switches from a pre define PC in the network.
d) Following is indicative network ring to be followed. However, the network shall be as per actual site requirement based on location finalisation of all handsets and loudpseakers.

RING-1
CCR-Boiler and Turbine Area-> CPU Generation Plant -> DG &Compress House -> 400KV Switchyard->400KV Switchyard Control Room-> Service Build-> HFO, LDO Pumphouse->Ash Water Pump House->CCR
RING-2
CCR-> Ash Slurry Pump House ->AHP Control Room-> AHP Compressor House ->ESP Control Room ->FGD Plant->Vacuum Pump House->Silo Utility HCSD Pump House-> CCR
RING-3
CCR->Switch Yard Control Room->DM Plant Building->Cooling Water Pump House->CW Plant->Chemical House->Clarified Water Pump House-> Centrifuge Building->CCR
RING-4
CCR->CHP Area-> CCR

12.0 CABLE ROUTING:
The PA system cables will be laid in already routed cable trays in different areas of power plant for power& signal cables.
12.0.1 The VOIP (voice over IP) server shall have the provision for telephone/EPBAX interface in line with specification.
12.0.2 The system distribution nodes shall be interconnected through OFC based network in line with specification.
12.0.3 System shall have CD audio player as one of I/O sources to/from the PA system which shall have the capability to broadcast the player Output.
12.0.4 System shall be such that fixed frequency pre annunciation tones can be generated under software control.

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13.0 MEAN TIME TO REPAIR (MTTR)

The design and construction of the PA system shall ensure high reliability and availability. The PA system shall employ modular constructional techniques in its design. Allowing a first line maintenance philosophy of module replacement to be implemented.

The average module replacement time for the system is less than 1 hour as long as the correct spares holding are maintained as recommended by Bidder.

14.0 LOCATION OF CALL STATIONS, SPEAKERS ETC:

Locations for different type of handset stations and loudspeakers in general shall be as per Annexure-II. However, these are tentative location and there can be some change in the exact location depending on functional requirements of the system / mounting feasibilities etc. Bidder has to supply all items called in lots in BOM on as required basis as per location finalised during E&C stage of the system.

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Annexure-I
Bill of Material

	Quantity to be offered		Reference Quantity	
ITEMS DESCRIPTION	**UNIT**	**Qty**	**UNIT**	**Qty**
MAIN SUPPLY				
CALL STATIONS				
OUTDOOR WALL MOUNTING TYPE WITH AMPLIFIER	NOS	255		
INDOOR WALL MOUNTING TYPE WITH AMPLIFIER	NOS	193		
Desktop mount call station	NOS	17		
Flame proof type call station	NOS	10		
LOUDSPEAKERS				
OUTDOOR INDUSTRIAL HORN TYPE	NOS	301		
CEILING TYPE	NOS	71		
INDOOR WALL MOUNTED CONE TYPE	NOS	103		
ACOUSTIC BOOTH	NOS	39		
ACOUSTIC HOOD	NOS	87		
MASTER CONTROL UNIT	NOS	15		
EXTENSION AMPLIFIER-25W (each call station) along with power supply	NOS	475		
REDUNDANT SERVER for handsets (excluding CHP Area)	SET	1	NOS	2
REDUNDANT SERVER for handsets in CHP Area	SET	1	NOS	2
OWS with 24" Monitor	SETS	4		
NETWORK SWITCHES (INCL 30% SPARE PORT OF EACH TYPE OF PORT FOR EACH SWITCH)				
L3 Core Switches (20% spare port each type)	LOT	1	Nos	1
Distribution Switches (20% spare port each type)	LOT	1	Nos	2
NETWORK Switch(Edge Switch) - PoE with min 4Tx and 4Fx ports ensuring 30% spare ports	LOT	1	Nos	195
CABLES & ASSOCIATED ACCESSORIES				
POWER CABLE ARMOURED (MIN 2.5SQMM OR AS REQD) FOR CONNECTING HANDSETS & FIELD SWITCHES	LOT	1	MTRS	75,000
POWER CABLE UNMOURED (MIN 0.75SQMM 2 core) BETWEEN HANDSET TO LOUDSPEAKER	LOT	1	MTRS	6,000
CAT6 CABLE	LOT	1	MTRS	35,000
ARMOURED FO CABLE 6F	LOT	1	MTRS	95,000
Cable Tray with necessary mounting accessories	Lot	1	MTRS	5,000
Flexible GI Conduit for power cable to loudspeaker, FO cable, CAT6 cable on as required basis with necessary accessories	Lot	1	MTRS	15,000
Rigid Conduit for all CAT6 cables and FO cable (where ever required)	Lot	1	MTRS	10,000
HDPE 32mm ISI, with bends, coupler and other mounting accessories	Lot	1	Lot	10,000
PVC conduit 25/32mm along with all mounting/jointing accessories	Lot	1	MTRS	5,000
Miscellaneous items	LOT	1	As required for entire system	
Fiber optic accessories like Fiber Patch Cable, LIUs, Pigtails etc required for completion of the splicing and termination of FOC				
Cat-6 cable accessories like UTP Patch Cable, patch panel, etc for Termination of all CAT5e cables.				
Electrical items such as TBs, MCBs, cable coverings, cable managers, RJ45 connectors, power distribution boards etc.				

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Mechanical items such as G/C channels, DIN Rail, JBs, cable glands, lugs, mounting accessory for handsets/speakers etc.				
IP65 Industrial Wall Mount Enclosure or JBs with other electrical/FO accessories for housing field switches along	Lot	1	NOS	195
IP65 Industrial Wall Mount Enclosure or JBs with glass door & other electrical/FO accessory (for housing Field call station, amplifier, Power supply for call station and amplifier).	Lot	1	NOS	475
Mini UPS OF SUITABLE RATING WITH PDB FOR POWERING 4-6 CALL STATION & LOUDSPEAKER WITH 60MIN BATTERY BACKUP	Lot	1	NOS	20
42U panel for housing SERVER, NETWORK SWITCH, PDB etc in control room	Lot	1	NOS	2
Interface to/from GSM system, plant EPABX system and CCTV system along with required hardware, software, cables etc on as required basis	Lot	1	As required.	
ANY OTHER HARDWARE, SOFTWARE, ACCESSORY, CABLE ETC REQUIRED TO COMPLETE THE SYSTEM AND ALSO ITEMS MENTIONED IN TECHNICAL SPECIFICATION BUT NOT COVERED IN THIS BOM	Lot	1	As required.	
Weather proof Container of suitable size and quantity as required for with lock and key for storing PA SYSTEM components except cables	SETS	1	As required.	
SERVICES				
ERECTION, CABLE LAYING, INSTALLATION, COMMISSIONING & HANDING OVER OF ALL ITEMS FOR THE COMPLETE PA SYSTEM and Training for 5 days to TANGEDCO officials on operation and maintenance of the system	LOT	1	As required.	
MANDATORY SPARES				
CALL STATIONS				
OUTDOOR WALL MOUNTING TYPE WITH AMPLIFIER	NOS	64	NOS	64
INDOOR WALL MOUNTING TYPE WITH AMPLIFIER	NOS	49	NOS	49
Desktop mount call station	NOS	5	NOS	5
Flame proof type call station	NOS	3	NOS	3
Power supply Module	NOS	119	NOS	119
LOUDSPEAKERS				
OUTDOOR INDUSTRIAL HORN TYPE	NOS	76	NOS	76
CEILING TYPE	NOS	18	NOS	18
INDOOR WALL MOUNTED CONE TYPE	NOS	26	NOS	26
MASTER CONTROL UNIT	NOS	3	NOS	3
Power supply Module	NOS	123	NOS	123
EXTENSION AMPLIFIER-25W WITH EACH HANDSET	NOS	119	NOS	119
Panel wiring cables & Special cables (if any)- 20% used in Panel	LOT	1		
Terminal Blocks- 20% used in entire system	LOT	1		
Fuses – 20% used in entire system	LOT	1		

Note: The quantity mentioned under column "Reference quantity" are indicative quantity which may be required for the PA system. These quantities are neither minimum nor maximum quantity to be offered/supplied. Bidder should refer the plot plan & call station/ loudspeaker location provided in this specification to "estimate & offer" quantities on as required basis, for all items which are called in lots/sets in above BOM, without any cost implication to BHEL.

ANNEXURE-II-LOCATION OF CALL STAION / SPEAKER/HOOD/BOOTH

SL. NO	DESCRIPTION OF LOCATION	CONTROL / ZONE STATION	FCS TYPE-A	FCS TYPE-B	FCS TYPE-C	FCS TYPE-D	CEILING TYPE SPEAKER	INDOOR CONE SPEAKER	HORN TYPE SPEAKER	ACOUSTIC HOOD	ACOUSTIC BOOTH
A.	**Unit Area Zone**										
1	Power House Bldg (Exact Location finalisation later)	1	11	4	1	1	5	5	5	2	1
2	Boiler Area (Exact Location finalisation later)			16					16	4	1
3	ESP Area		1	1				1	1		
4	Mill Bay Area			2					2	1	1
5	FD/PA/ID Fan Area		1	1				1	1		1
6	AHP Unit area		3	2			1	2	2		
	Total ZONE-1 (Unit Area)	**1**	**16**	**26**	**1**	**1**	**6**	**9**	**27**	**7**	**4**
	Total for 5 units (5 zones # 1-5)	**5**	**80**	**130**	**5**	**5**	**30**	**45**	**135**	**35**	**20**
B	**ZONE-6 (Common services Area)**										
1	Power House Building Control Room	1	1				1		1		
2	Switchyard Area			6	1			1	6	6	
3	Fuel Oil Unloading					1			1		
4	Fuel Oil Pump House					1			1		
5	LDO					1			1		
6	Central Control Building	1					2				
7	Chemical LAB (Neumatic Lab) Stg-1		1					1	1		
8	Chemical LAB (Neumatic Lab) Stg-2		1					1	1		
9	Chemical House		3					1	2		
10	Air Conditioning Plant Stg-1		1	1				1	1		
11	Air Conditioning Plant Stg-2		1	1				1	1		
12	Air Conditioning Plant Stg-3		1	1				1	1		
13	Emergency DG Building-1		2					1	1		1
14	Emergency DG Building-2		2					1	1		1
15	Emergency DG Building-3		2					1	1		1
16	Ash slurry pump house-1		2					1	1		
17	Ash slurry pump house-2		2					1	1		
18	AWR P/H		3					1	2		
19	Fly Ash Silo Area		3					1	2		
20	Service Building Stg-1 (including Elec and C&I lab)		8				2	4	2		

ANNEXURE-II-LOCATION OF CALL STAION / SPEAKER/HOOD/BOOTH

SL. NO	DESCRIPTION OF LOCATION	CONTROL / ZONE STATION	FCS TYPE-A	FCS TYPE-B	FCS TYPE-C	FCS TYPE-D	CEILING TYPE SPEAKER	INDOOR CONE SPEAKER	HORN TYPE SPEAKER	ACOUSTIC HOOD	ACOUSTIC BOOTH
21	Service Building Stg-2 (including Elec and C&I lab)		8				2	4	2		
22	Fire Station Building		2				1	1			
23	Air Comp. House Area-1		1	1				1	1	1	
24	Air Comp. House Area-2		1	1				1	1	1	
25	Hydrogen generation Building					1			2	1	
26	Administration Building		5		2		2	5			
27	Canteen (2 nos)		2						4		
28	Security & Time Office		3				1		2		
29	Workshop Building			1					1		
30	AHP Compressor Building-1	1	2				1		1		
31	AHP Compressor Building-2		2				1		1		
32	AHP Control Building		2					2			
33	FGD Area (3 nos)			3					6	1	
34	FGD MCC -1		2	1			1	1	1		
35	FGD MCC -2		2	1			1	1	1		
36	Gypsum & Limestone Area Stg-1		1	1				1	1		
37	Gypsum & Limestone Area Stg-2		1	1				1	1		
38	Premanent Store		1						2		
39	Watch Tower			6					6		
40	Gate Complex & Security Bldg		1		1		1	1	1		
41	Weigh Bridge			2					2	2	
42	Boiler SWgr Room 1,2 &3			3					3		
43	SWAS Room (5 Nos)		5				2	3			
44	Parking Area			3					3	2	
45	SCR		1	5				1	5	1	2
	TOTAL ZONE-6	**3**	**75**	**38**	**4**	**4**	**18**	**41**	**75**	**15**	**5**

ANNEXURE-II-LOCATION OF CALL STAION / SPEAKER/HOOD/BOOTH

SL. NO	DESCRIPTION OF LOCATION	CONTROL / ZONE STATION	FCS TYPE-A	FCS TYPE-B	FCS TYPE-C	FCS TYPE-D	CEILING TYPE SPEAKER	INDOOR CONE SPEAKER	HORN TYPE SPEAKER	ACOUSTIC HOOD	ACOUSTIC BOOTH
G.	**ZONE-7 (CHP Area)**										
1	CHP Areas	2		35					35	15	10
2	Coal Bulldozer House			2					2	2	1
3	Coal complex office building (6 Nos)		16		2		6	12	3		
4	Wagon Tippler Control Room	2	2	2			1	1	2	1	1
5	Coal transfer tower			15					15	7	
6	Crusher house		1	2			1		2		2
	TOTAL ZONE-7	**4**	**19**	**56**	**2**	**0**	**8**	**13**	**59**	**25**	**14**
H.	**ZONE-8 (Plant Water)**										
1	Raw Water Pump House	1	1	2			1		2	1	
2	Raw Water reservoir			3					3	3	
3	Effluent Treatment Plant		1	2			1		2	1	
4	Clarified Water Pump House		1	2			1		2	1	
5	Sewage Treatment Plant		1	2			1		2	1	
6	Water Service S/S & DM Plant Area		1	2			1		2	1	
7	CW Pump House Area (2 Nos)		2	2			2		2	1	
8	Chlorination & CWT Area-1	1	1	1			1		1	1	
9	Chlorination & CWT Area-2		1	1			1		1	1	
10	PTP Plant		1	1			1		1	1	
	TOTAL ZONE-8	**2**	**10**	**18**	**0**	**0**	**10**	**0**	**18**	**12**	**0**
	SPARE	**1**	**9**	**13**	**6**	**1**	**5**	**4**	**14**	**0**	**0**
	GRAND TOTAL	**15**	**193**	**255**	**17**	**10**	**71**	**103**	**301**	**87**	**39**
		Total qty of handset- 475					**Total qty of loudspeakers - 475**				

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ANNEXURE- III

Specification of FO Cable: 4F, multi-tube, Armoured, Direct Burial 9µm/125µm SM FO cable

FOUR FIBRE MULTI TUBE CONSTRUCTION GEL FILLED, SINGLE MODE OPTICAL FIBRE CABLE (OFC) WITH 04 Nos. 9/125 MICRONS COLOR CODED FIBRES AS PER G.652 STANDARDS, ECCST ARMOUR, CENTRAL FRP STRENGTH MEMBERS, INNER SHEATH, WATER SWELLABLE/WATER BLOCKING TAPE, OUTER UV RESISTANT AND FIRE RETARDANT LSZH SHEATH HAVING ANTI-TERMITE AND ANTI-RODENT PROPERTIES, SUITABLE FOR DIRECT/DUCT BURIAL AND LAYING ON CABLE TRAYS. QUANTITY TOLERANCE: UPTO +5% OF TOTAL LENGTH EXTRA

Cables with fibers in jelly filled construction with ECCST Armour with WATER SWELLABLE/WATER BLOCKING TAPE for water ingress protection, provided with Central FRP strength member and inner sheath.
Outer UV resistant and fire retardant LSZH jacket having anti-termite and Anti-rodent properties
Provided with sequential length marking suitable for direct/duct burial, laying on cable tray

Single-mode fiber utilized in the optical fiber cable shall meet ITU G.651D, IEC Specification 60793-2-50 Type B1.3, with following specifications:

i. Fiber and buffering:

a) Fiber type: Stepped single mode Fiber
b) Core diameter 9 ± 1micron
c) 125 microns ± 0.7 micron
d) Cladding non-circularity ≤1.0 %
e) Core non-circularity ≤ 0.8µm
f) Primary coating diameter 245µm + 5µm

ii. Attenuation & Bandwidth:

a) At 1550 nm, attenuation < = 0.23dB / Km
b) At 1310 nm, attenuation < = 0.35dB / Km

General Specifications

Mechanical, Geometrical, Transmission and Environmental characteristics should be as per relevant IEC 60794-1-2-X spec
Stripping ability: All layers easily removed with commercially available tools.
Fiber Identification: All the fibers in the PBT lose tube are to be color for identification purpose with UV curable inks i.e., Blue, Orange, Green and natural. The tube color will be natural.
Marking: The cable should have identification marking at regular intervals of 1 meter which will be of permanent nature. The accuracy of the sequential marking should be within +/- 0.5%. The optical fiber cable shall as a minimum have the
following markings in every meter.
i) Type of Cable,
ii) Running meter length,
iii) Number of fibers,
iv) Type of fiber,
v) Manufacturer's name
vi) Supplier's Name – BHEL-EDN

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Immunity: The cables shall be immune to corrosive element found naturally in the ground. Optical fibers shall be coated with protective materials / coatings and should not have any reaction with cladding or core materials.
Life of cable: The minimum expected life of the cable shall be 25 years.
Cable Ends: Running end shall be provided with pulling eye & the other end shall be sealed with thermal shrink cap
Length of the cable drum: The length can be standard factory length. Care to be taken to minimize wastage while cutting to length by optimizing drum length in line with site requirement
Compliance: Cable should, in general, be ISO/IEC and EIA/TIA compliant and conform to Mechanical conditions as per IEC 60794-1-2-X Standards for Tensile force, Crush Resistance, Impact Resistance, Torsion, Kink, Repeated Bending and Water Penetration, etc.

Tests as per IEC 60794-1-2-X and other relevant specs have to be carried out and reports to be submitted:

1. Attenuation And Dispersion Characteristics Tests
2. Proof Tests
3. Macro-Bend resistance Test
4. Mechanical Tests
5. Low and High Temperature Cable Bend Test
6. Impact Resistance Test
7. Compressive Strength Test
8. Tensile Strength Test
9. Cable Twist Test
10. Cable Cyclic Flexing Test
11. Environmental Characteristics Test 12. Temperature Cycling Test
13. Color Performance Test
14. Cable Aging Test
15. Water Penetration Test
16. Lightning Test
17. FRLS Test

2.5 sq.mm 1100V GRADE, 85 deg. C TEMP. GRADE POWER CABLE :

1) The conductor material shall be of stranded, non-compacted & circular, high conductivity annealed plain copper, Armoured cables with voltage grade of 1100 V & temperature grade of 85 deg. C.
2) The cables shall be of 2.5 sq.mm cross-section, 7 strands high conductivity annealed bare copper conductor [7X0.67 mm for 2.5 sq.mm] (as per IS-8130).
3) The insulation material shall be extruded HR PVC type C (as per IS-5831). PVC insulation shall be suitable for continuous conductor temperature of 85 deg. C and short circuit Conductor temperature of 160 deg. C.
4) The minimum volume resistivity of cables shall be 3.5 X 10^{14} ohm-cm at 27° C & 3.5 X 10^{11} ohm-cm at 85° C
5) The inner & outer sheath material shall be extruded HR PVC type ST2 (as per IS-5831) with FRLS properties. The FRLS properties shall be identical to those required under Instrumentation cables
The thickness of insulation, inner sheath & outer sheath shall be conforming to IS- 1554, part 1 & other relevant standards. Filler material shall be same as inner sheath material.

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Cable shall be generally conforming to IS-1554, part 1 and shall also comply with other relevant standards for specific requirements. The list of relevant standards for this cable includes the following - IS-1554, part 1, IS-3961, IS-3975, IS-5831, IS-8130, IS- 10418, IS-10810, ASTMD-2863 & 2843, IEC-754-1, IEEE-383, IEC-332 (latest editions) and their amendments.

6) The cable shall also conform to other general requirements for Instrumentation cables under Clause 1 (1.2 through 1.11) & Clause 2 (E, H, J & L). The standard drum length shall be 1000 ± 5% meters, with balance quantity to complete the supply being given as a separate drum.

7) Cores of the cables shall be identified by coloring of insulation. Following color scheme shall be adopted:

1 Core Cable - Red, Black, Yellow or Blue.
2 Core Cable - Red, Black.
3 Core Cable - Red, Yellow, Blue.
4 Core Cable - Red, Yellow, Blue, Black.
5 Core Cable - Red, Yellow, Blue, Black, Grey.
3.8) The color of inner sheath & outer sheath shall be black.

8) HV Test to be 3kV rms core to core for 5 min.

Type Tests for power cables:

All cables to be supplied will be of type tested quality. The list of type tests applicable for Instrumentation, thermocouple & control cables is given in table below this clause. The vendor shall submit the reports of all the type tests listed in the below table for each size & type of cable under the supply (for each variety) for Customer/BHEL approval. The reports should be of type tests conducted within 5 years. The type tests should have been either conducted at an independent laboratory or should have been witnessed by a client. The type test reports in compliance to these requirements shall be submitted for Customer/BHEL approval. In case the vendor is not able to submit type test reports of earlier conducted type tests in compliance to above requirements, or, the type test reports submitted by the vendor is not approved/not accepted by Customer/BHEL, then the vendor shall conduct all such tests and submit the reports for Customer/BHEL approval.

TYPE TESTS FOR INSTRUMENTATION CABLES				
Sl. No.	Component	Test	Standard	Remarks
1	For Conductor (including drain wire)	Resistance test	IS-10810	
2		Diameter test	IS-10810	
3		Tin coating test (Persulphate test)	IS-8130	
4	For PVC Insulation and PVC Sheath (Outer)	Test for Thickness		
5		Tensile Strength & Elongation (before & after ageing)	IS-5831	
6		Ageing in air ovens	IS-10810	
7		Loss of mass	IS-10810	
8		Hot deformation	IS-10810	
9		Heat shock	IS-10810	
10		Shrinkage	IS-10810	

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11		Color fastness to water	IS-5831	Only for outer sheath
12		Bleeding & Blooming	IS-10810	
13		Cold bend/ Cold impact test	IS-10810	
14		Thermal stability test		
15		Volume resistivity & water immersion test (at room & elevated temperature)	IS-5831	
16		Oxygen Index & Temperature Index Test	ASTMD-2863	
17		Smoke Density Rating Test	ASTMD-2843	
18		Acid gas generation test	IEC-60754-1	
19		Oxygen index & Temperature index test for fillers	ASTMD-2863	
20		Acid gas generation test for fillers	IEC-60754-1	
21	For Al-Mylar Shield	Continuity test		
22		Shield thickness test		
23		Overlap & coverage test		
25	For Armoring	Tensile Strength		
26		Elongation		
27		Winding / Torsion test		
28		Resistivity		
29		Dimensions		
30		Uniformity of zinc coating		
31		Dip test		
32		Mass of zinc coating		
33		Tightness and gap test		

34	For Completed Cable	Constructional Details (Conductor & drain wire - number of strands & diameter of strands, Twisting & Lay of pairs Thickness of Insulation and Sheath, Dia of Armor, overall diameter, color & marking on outer sheath, numbering of pairs, core color, band marking, unit identification, visual & surface finish etc.)	BS-EN-50288-7	
35		Electrical Parameters (Mutual capacitance, Cross talk, Attenuation,	VDE-0472	

		Characteristic Impedance etc. as applicable)		
36		Insulation resistance		
37		High Voltage test	BS-EN-50288-7	
38		Noise Interference	IEEE Transactions	
39		Flammability test	IEEE-383, IEC-332-1	
40		Swedish Chimney test	SEN-4241475	
41		Drain wire continuity		
42		Anti-rodent, anti-termite, test on sheath		

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ANNEXURE- IV (APPROVED MAKES OF COMPONENTS)
Power cable
ADVANCE CABLES TECHNOLOGIES, BANGALORE
SUYOG ELECTRICALS LTD. ALKAPURI, BARODA Gemscab industries ltd, Bhiwadi
Gemscab industries ltd, Bhiwadi
NICCO cables,kolkata
KEC international ltd, Bangalore
Special Cables Pvt Ltd, New Delhi
CORDS CABLES, RAJASTHAN
DELTON CABLES,FARIDABAD
GOYOLENE FIBRES ,MUMBAI
ELKAY TELELINKS LTD FARIDABAD, HARYANA
INCAB, PUNE
KEI INDUSTRIES LTD, CHENNAI
T C COMMUNICATION PVT. LTD, NEW DELHI
MANSFIELD CABLES COMPANY LTD. NOIDA, U.P.
PARAMOUNT CABLES,ALWAR
POLYCAB,DAMAN
M/s THERMO CABLES, HYDERABAD
Cable Tray
M/s GEE DEE PACKAGES PVT LTD, MYSORE
M/s PRAMMEN INDUSTRIES, PUDUKKOTTAI
M/s PATNY SYSTEMS PVT. LTD, SECUNDARABAD
M/s M.J.ENGINEERING WORKS PVT. LTD, NEW DELHI
M/s]AMNA METAL COMPANY, NEW DELHI
M/s INNOSPACER ENGIN EERING TECHNOLOGIES, BANGALORE
M/s INDIA ELECTRICALS SYNDICATE, KOLKATA
M/s APT ENGINEERING WORKS, NEW DELHI
M/s RUKMANI ELECTRICAL & COMPONENTS PW, KOIKATA
M/s VATCO, KHAIRHNE, NAVI MUMBAI
M/s KANADE ANAND UDYOG PVT. LTD, ANDHERI
M/s CHEMIN CONTROLS AND INSTRI.JMENTATION" PONDICHERRY
M/s Silverline Power Infrastructurre Fvt Ltd"
M/S Indiana Gratings - Pune/Mumbai
M/S Industrial Perforation, Kolkata
MIS Ratan Engineerong and Projects, Kolkata
M/S Steelite Engg, Mumbai
M/S Amtech, Pune
FO CABLE
AKSH FIBRE, BHIWADI

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HFCL-GOA
FINOLEX , PUNE/GOA
D-LINK
BIRI.A ERICSSON,REWA
STERLITE
TERRACOM
MINI UPS
HITACHI HI-REI- POWER ELECTRINICS, BANGALORE
SCHNEIDER ELECTRIC, BAN GALORE
EMERSON NETWORK iNDIA,BANGALORE
APLAB LIMITED ,THANE
EMERSON NETWORK,PUNE
MONITOR
HP
DELL
IBM-LENOVO
SAMSUNG
OWS & SERVER
HP
DELL
IBM-LENOVO
NETWORK SWITCH
HIRSHMANN
CAT 5e UTP CABLE / PATCH CABLE/PATCH PANEL/LIU
AMP / DIGILINK / D-LIK / SYSTEMAX
SINGLE MODE FIBER PATCH CABLE / SC PIGTAIL
Avaya / Belden /D-Link / Digilink / Tyco

Note:

1. The makes mentioned above makes are approved makes approved by M/s TSGENCO as on date. However, bidders can offer other equivalent makes. BHEL will take up with M/s TSGENCO for approval of such makes offered by bidders for approval. In case offered make of an item(s) is not approved by M/s TSGENCO, bidder will be permitted to change and offer approved makes of such item(s) without any price implication.
2. For all other items whose makes are not mentioned above, for such items, bidder should offer only reputed makes which have been previously supplied and are in use in power plants or similar industries.
3. M/s TSGENCO has expressed that products of Chinese make are not preferred by them. In case bidder is offering any product made in china, the same should be clearly brought out in their bid so that the consent of M/s TSGENCO for such makes are obtained.

ANNEXURE- V FACTORY ACCEPTANCE TEST PLAN (TENTATIVE)

PROJECT: TSGENCO YADADRI 5x800MW			QUALITY ASSURANCE PLAN IP PA SYSTEM				EPC CONTRACTOR: BHEL SUB VENDOR:					
S.No.	COMPONENT & OPERATION	CHARACTERISTICS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	INSPECTION AGENCY			REMARKS
				M	C&N				M	C	N	
1	Handsets (outdoor / Indoor / Portable)	Aesthetic	Visual	100%	10%	Approved Datashet	Approved documents/Internal TC/OEM TC	internal inspection Report	P	V	V	
		Mechanical	Visual						P	V	V	
		Power on checks	Functional						P	V	V	
2	Loudspeaker (outdoor / Indoor)	Aesthetic	Visual	100%	10%	Approved Datashet	Approved documents/Internal TC/OEM TC		P	V	V	
		Mechanical	Visual						P	V	V	
		SPL level & sweep test response	Measurement									
		Dimensional	Measurement									
		Power on checks	Functional						P	V	V	
3	ACOUSTIC HOOD (BOOTH)	Aesthetic	Visual	100%	10%	NTPC Approved Datashet	Approved documents/Internal TC/OEM TC		P	W	V	
		dimensional	Measurement									
		Mechanical	Visual						P	W	V	
4	MASTER CONTROL UNIT	Aesthetic	Visual	100%	10%	Approved Drawing & datasheet	Approved documents/Internal TC/OEM TC		P	W	V	
		Mechanical	Visual						P	W	V	
		Power on checks	Functional						P	W	V	
5	STAND ALONE AMPLIFIER	Aesthetic	Visual	100%	10%		Approved documents/Internal TC/OEM TC		P	W	V	
		Mechanical	Visual						P	W	V	
		Power on checks	Functional						P	W	V	
6	Workstation with monitor, keyboard	Aesthetic	Visual	100%	10%		Approved documents/Internal TC/OEM TC		P	W	V	
		Mechanical	Visual						P	W	V	
		Power on checks	Functional						P	W	V	
7	Network Switches	Aesthetic	Visual	100%	10%		Approved documents/Internal TC		P	W	V	
		Mechanical	Visual						P	W	V	
		Power on checks	Functional						P	W	V	
~~8~~	~~Ethernet Media Converter 10/100~~	Aesthetic	Visual	100%	10%		Approved documents/Internal TC		P	W	V	
		Mechanical	Visual						P	W	V	
		Power on checks	Functional						P	W	V	
9	19" Control Rack (42U)	Aesthetic	Visual	100%	10%		Approved documents/Internal TC/OEM TC		P	W	V	
		Mechanical	Visual						P	W	V	
10	Mini UPS	Aesthetic	Visual	100%	10%		Approved documents/Internal TC/OEM TC		P	-	V	
		Mechanical	Visual						P	W	V	
		Power on checks	Functional						P	W	V	
11	5C x 1.5 sq mm Power Cable		Visual	100%	10%		Approved documents/Internal TC		P	W	V	
12	12P x 0.5 sq mm alarm Cable		Visual	100%	10%		Approved documents/Internal TC		P	W	V	

		LEGENDS: 1) IIR=Internal Inspection Report 2) M=Manufacturer/Sub-Supplier 3) C=BHEL EDN 4) N= TSGENCO 5) P=Perform 6) W=Witness 7) V=Verfication	FOR USE BY NTPC:	REVIEWED BY:	APPROVAL SEAL:
MANUFACTURER / SUB-SUPPLIER	EPC CONTRACTOR				
SIGNATURE WITH SEAL	SIGNATURE WITH SEAL				

PROJECT: TSGENCO YADADRI 5x800MW			QUALITY ASSURANCE PLAN IP PA SYSTEM				EPC CONTRACTOR: BHEL SUB VENDOR:					
S.No.	COMPONENT & OPERATION	CHARACTERISTICS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	INSPECTION AGENCY			REMARKS
				M	C&N				M	C	N	
13	Cable Tray	Aesthetic	Visual	100%	10%	Approved Datashet	Approved documents/Internal TC/OEM TC	internal inspection Report	P	W	V	
		Mechanical	Visual						P	W	V	
14	1 inch Flexible GI Conduit	Aesthetic	Visual	100%	10%	Approved Datashet	Approved documents/Internal TC/OEM TC		P	W	V	
		Mechanical	Visual						P	W	V	
15	50 mm HDPE pipe	Aesthetic	Visual	100%	10%		Approved documents/Internal TC/OEM TC		P	W	V	
		Mechanical	Visual						P	W	V	
B. FINAL INSPECTION												
1	BOM & Model Nos.	Verify	Visual	100%	100%		Approved documents/Internal TC		P	W	W	1. For all Imported items- 100 % OEM TC/COC review. 2. For all Indigenous items- Mfr's TC/COC/Internal TC review.
2	Complete functional test of system using 1 sample of each type of handset & loupspeaker, server, Workstation and network switch	Functional	Functional	1 Sample	1 Sample		Approved documents/System Functionality	-	P	W	W	

		LEGENDS: 1) IIR=Internal Inspection Report 2) M=Manufacturer/Sub-Supplier 3) C=BHEL EDN 4) N= TSGENCO 5) P=Perform 6) W=Witness 7) V=Verfication	FOR USE BY NTPC:	REVIEWED BY:	APPROVAL SEAL:
MANUFACTURER / SUB-SUPPLIER	EPC CONTRACTOR				
SIGNATURE WITH SEAL	SIGNATURE WITH SEAL				