



SOUTH WESTERN RAILWAY

TECHNICAL SPECIFICATION FOR TELECOMMUNICATION WORKS

Revision: 0.0

OFFICE OF CHIEF PROJECT MANAGER

GATI SHAKTI UNIT (HUBBALLI)

HUBBALLI DIVISION

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Chapter-01

Jointing, Splicing, Termination accessories of communication installation

1. **Thermo shrink jointing kits for jointing underground Quad cable:** Thermo shrink jointing kits for jointing underground quad cable and jointing procedure shall be conforming to RDSO Specification No. IRS: TC 77-2012 Rev. 3 or latest.
2. **Thermo shrink jointing kits for jointing underground PIJF cable:** Thermo shrink jointing kits for jointing underground PIJF cable and jointing procedure shall be conforming to RDSO Specification No. RDSO/SPN/TC/57/2015 Rev. 1 or latest.
3. **V.F. and Signaling Transformers used for Derivation and Termination of Underground Telecommunication Cable Circuits:** V.F. and signaling transformers used for derivation and termination of underground telecommunication cable circuits shall be conforming to RDSO Specification No. IRS/TC/22/2021 Ver. 1.1 or latest.
4. **Two/Three V.F. Transformers (2T/3T) For Derivation and Termination of Underground Telecom Cable Circuit:** Two/three V.F. transformers (2T/3T) for derivation and termination of underground telecom cable circuit shall be conforming to RDSO Specification No. IRS/TC/76-2021 Ver. 1.0 or latest.
5. **Joint enclosure for armoured optical fiber cable:** Joint enclosure for armoured optical fibre cable shall be conforming to RDSO Specification No. RDSO/SPN/TC/68/2014 Rev. 1.0 or latest.
6. **Fiber Distribution Management System (FDMS) for 48/24/12/6F:**
 - 6.1. The FMS shall be confirming to RDSO specification No. RDSO/SPN/TC/37/2020 Rev. 4 or latest. However, the FMS should have the following:
 - 6.1.1. There should be an arrangement of termination of 48/24/12/6 Nos. of fibers as mentioned in Schedule.
 - 6.1.2. It should be 19" rack mountable and of slider type.
 - 6.1.3. It should be supplied with 48/24/12/6 Nos. of pigtails of respective type of connector of minimum 3 meter length as mentioned in Schedule.
 - 6.1.4. Colour coded pigtails shall be provided for easy identification.
 - 6.1.5. The FMS should be supplied with arrangement of required number and type of adapters.

- 6.1.6. The adaptors shall be fixed in such a way that these shall be easily accessible protecting the eye from direct exposure to laser.
- 6.1.7. There should be number of trays or as per site requirement for the provision of termination of the fibers & sufficient space for routing of the fibers in the trays.
- 6.1.8. Trays shall be numbered bottom to top (tray no. 1 is lower most).
- 6.1.9. Pigtailed shall follow tray numbering. Pigtailed shall be labeled through colour coding/ferruling.
- 6.1.10. Adaptors shall be numbered bottom to top or left to right in ascending order.
- 6.1.11. All adaptors shall be provided with dust protection caps at a convenient place on the FMS.
- 6.1.12. The FMS shall be manufactured as per latest state of art technology.
- 6.1.13. The FMS shall be protected against the entry of dust and insects, rodents etc.
- 6.1.14. Body should be of MS steel; powder coating painting shall be provided with rust resistance paint.
- 6.1.15. Insertion Loss: lesser than or equal to 0.3 db or less
- 6.1.16. Return Loss: lesser than or equal to 0.45 db or less
- 6.1.17. Marking: The marking on the system shall be indelible and following minimum information shall be provided by way of engraving or Laser printing method:
 - i. SWR should be written on each FDMS to be visible from front.
 - ii. Manufacturer's Name & date/ year of production.
 - iii. Model No./Batch No./ Serial No.
 - iv. Capacity i.e. No. of cables and the fibers.
 - v. Identification details/ cables/ fiber/ labelling facility.
 - vi. Preferred type of connector is SC/APC for all connectors.

7. Cable termination boxes (indoor) for railway electrified areas: Cable termination boxes (indoor) for railway electrified areas shall be conforming to RDSO Specification No. IRS: TC 18-75 Ver. 1 or latest.

8. Krone Type Termination Boxes:

- 8.1. Krone termination box: It should be LSA-Krone disconnection module. 10 pair krone module should be TEC approved with suitable box for 10 pair, 20 pair, 50 pair and 100 pair as per site condition.

9. Wago Type Termination Boxes:

- 9.1. The cable termination box can be supplied for 10 - 20 Pairs as per the requirement. The box is rugged, weatherproof, and highly reliable and uses universal test disconnect terminal blocks of PHOENIX OR WAGO Make.

10. Jointing and termination of Optic Fibre Cable:

- 10.1.** Jointing and termination of optic fibre cable shall be conforming to Indian Railway telecom manual 2021 “Section – X “.

Chapter-02

Train Control Communication

1. **4Wire/2Wire Train traffic control equipment with dual tone multi frequency (DTMF) signaling:** 4Wire/2Wire Train traffic control equipment with dual tone multi frequency (DTMF) signaling shall be conforming to RDSO Specification No. IRS : TC-60/2007 Amdt. 1 or latest.
2. **4 Wire way station control telephone:** 4 Wire way station control telephone shall be conforming to RDSO Specification No. IRS: TC 38-97 Amdt. 2 or latest.
3. **Universal way side DTMF control telephone:** Universal way side DTMF control telephone shall be conforming to RDSO Specification No. IRS: TC 82-2005 Ver. 0 or latest.
4. **Power supply unit (PSU) for Telecom Installation at way side stations in 25 KV Electrified Area:** Power supply unit (PSU) for telecom installation at way side stations in 25 Kv electrified area shall be conforming to RDSO Specification No. IRS: TC 72-97 Amdt. 1 or latest.
5. **Voice Data Logger/Monitor for control circuits:** Voice data logger/monitor for control circuits shall be conforming to RDSO Specification No. RDSO/SPN/TC/038-2002 Ver. 2.0 or latest.

Chapter-03

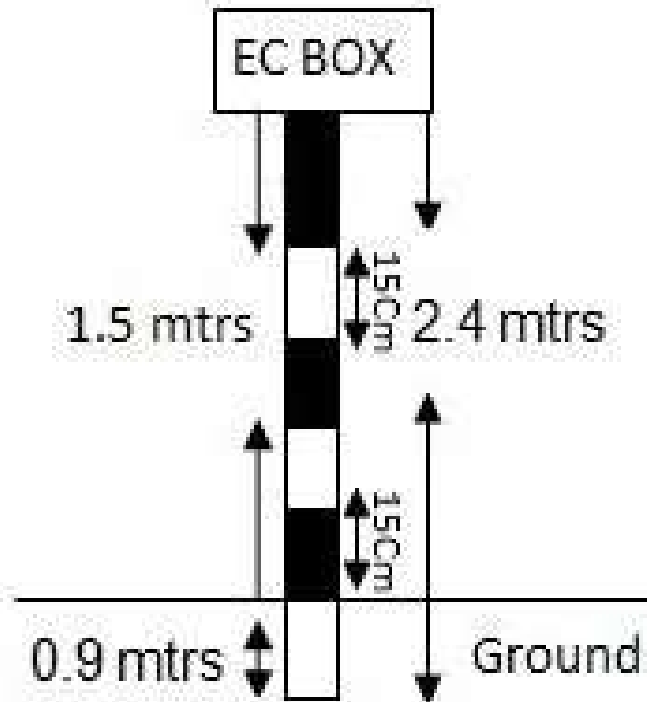
LC Gate Communication

1. **Electronic LC gate telephone system:** Electronic LC gate telephone system shall be conforming to RDSO Specification No. RDSO/SPN/TC/51-2021 Rev. 1.0 or latest.
2. **Magneto telephone with Electro-dynamic transducer:** Magneto telephone with electro-dynamic transducer shall be conforming to RDSO Specification No. IRS:TC 36-97 Amdt. 2 or latest.
3. **Desk Type Electronic Magneto Telephone:** Desk type electronic magneto telephone shall be conforming to RDSO Specification No. IRS:TC 79-2000 Amdt. 4 or latest.
4. **Desk Type 2wire 12 way DTMF Telephone:** Desk type 2 wire 12 way DTMF telephone shall be conforming to RDSO Specification No. IRS:TC 80-2000 Amdt. 3 or latest.

Chapter-04

Emergency Control Communication

1. **Emergency Control Room Equipment:** Emergency control room equipment shall be conforming to RDSO Specification No. IRS: TC: 61/93 Amdt. 1 or latest.
2. **4Wire/2Wire Portable Emergency Control Telephone:** 4Wire/2Wire portable emergency control telephone shall be conforming to RDSO Specification No. IRS: TC: 75/99 Amdt. 4 or latest.
3. **Light weight portable control telephone (4Wire/2Wire):** Light weight portable control telephone (4Wire/2Wire) shall be conforming to RDSO Specification No. IRS: TC-78/2020 Ver 1.1 or latest.
4. **Six pin Emergency plug and socket:** Six pin emergency plug and socket shall be conforming to RDSO Specification No. IRS: TC: 42/2020 Ver. 1.1 or latest.
5. **Auto dialing system for Emergency Socket:** Auto dialing system for emergency socket shall be conforming to RDSO Specification No. IRS: TC 83-20 Ver. 1.0 or latest.
6. **Emergency socket box of FRP material:** Emergency socket box of FRP material shall be conforming to RDSO Specification No. RDSO/SPN/TC/44/2002 Ver. 3.0 or latest.
7. **Provision of Emergency Communication (EC) sockets:**
 - 7.1. Emergency communication sockets shall be provided at regular intervals of 1 KM along the Railway track to establish communication from site to controller.
 - 7.2. Painting of EC post should be alternately black & white paint with 15 cm bands
 - 7.3. **Position of EC post from Centre of railway track:** 4m (permitted range 2.65m to max 5.5m)
 - 7.4. **Facing of EC socket:** towards control office side. Nearest EC socket post is identified by telephone symbol painted on OHE mast/decimeter post.



Chapter-05

VHF Sets

- 1. VHF Sets :** VHF Sets to be used on Indian Railways and its installation procedure shall be conforming to RDSO Specification No. RDSO/SPN/TC/107-2018 Ver. 2.1 or latest.
- 2. SMPS Charger 12 V/ 15A :**
 - i. Input: 230V AC
 - ii. Output: 12V DC/15A
 - iii. Charging: Float and Boost

Chapter-06

Synchronous Transfer mode (STM) / Primary Digital Multiplexer (PDMUX) and Accessories

1. Primary Digital Multiplexing Equipment (PDMUX):

- 1.1. Primary digital multiplexing equipment shall be conforming to RDSO Specification No. IRS: TC 68/2012 Rev. 0 or latest.
- 1.2. The Interface modules to be loaded with MUX shall be as per schedule.
- 1.3. The MUX shall be wired for all 30 channels by using 0.5mm dia. Twisted pair communication cable on Krone box/wago terminal box (Krone box/wago terminal box and necessary switch board cable will be supplied by Railways). All other materials required for wiring and for installing Krone box/wago terminal box shall be supplied by the contractor.

2. SMPS based power plant for Indian Railway telecom equipment: SMPS based power plant for Indian Railway telecom equipment shall be conforming to RDSO Specification No RDSO/SPN/TL/23/99 Ver. 4.0 or latest.

3. Synchronous Transfer mode (STM): SDH Add/drop (STM-I) short haul as per DOT generic specification No: G/SDH-04/01 Feb 95 with latest amendment having in built cross connected capability at junction stations. The equipment shall be able to work up to a fiber length of minimum 60KM and shall be fully equipped to carry 61E1s and shall be wired for 21E1s usable as a terminal multiplexer where ever required, expandable up to a capacity of 63E1s along with connecting cable and accessories upgradable to STM-4, make/model: TE3AS/TJ 1400 or latest.

Chapter-07

VoIP Based Train Control Communication System

1. **VoIP Based Train Control Communication System:** VoIP based train control communication system supply and installation shall be conforming to RDSO Specification No. RDSO/SPN/TC/99/2023 Ver. 3.0 or latest.
2. **Licenses:**
 - 2.1. Single license for main location and remote location server/devices.
 - 2.2. Station licenses of TCCS communication server of 1+2 configuration
 - 2.3. Port license of TCCS communication server in 1+2 configuration
 - 2.4. Conference room license of TCCS cum server of 1:4 room in 1+2 configuration
 - 2.5. TCCS VoIP voice logger board license.
 - 2.6. NMS device license of TCCS VoIP NMS server 100 device pack.
 - 2.7. Event notification gateway license of TCCS VoIP NMS server of 100 device pack.

Chapter-08

IP-MPLS Technology for Unified Communication

1. **IP-MPLS Technology for unified communication:** IP-MPLS technology for unified communication shall be conforming to RDSO's Technical Advisory Note (TAN) No. STT/TAN/IP-MPLS/2020 Ver. 2.0 or latest.
2. **Installation, Commissioning and Testing of IP-MPLS and peripheral Systems:**
 - 2.1. IP-MPLS routers include configuration testing, commissioning and installation of all the accessories like power cable from PDU to routers, earthing cable from equipment to rack bus bar, optical patch cords of required length for **LER & LSR routers**, CAT 6 patch cords of required length, 6A MCB's each for LER and LSR routers, wiring etc., required for routers shall be carried out as per site engineer instructions.
 - 2.2. Testing, installation and commissioning of **16 Port E1 card** for above LER routers along with supply fixing, termination and testing of patch panel/krone module, wiring, connectors and cable and all the accessories required for installations. The make of the modules shall be same as that of LER routers to ensure reliable function
 - 2.3. The make of the **2 x 10G adapter module** shall be the same as that of LER/LSR routers to ensure reliable functioning and the same shall be supplied with all the accessories. These modules can be supplied separately or in combo.
 - 2.4. **8 x 1G** (any combination one Nos of 8 x 1G or two Nos of 4 x 1G) adapter module for routers shall be the same make as that of LER/LSR routers to ensure reliable functioning and the same shall be supplied with all the accessories. These modules can be supplied separately or in combo.
 - 2.5. The make of the **2xSTM 1 adapter module** shall be the same as that of LER routers to ensure reliable functioning and the same shall be supplied with all the accessories
 - 2.6. The make of the **10G SFP+** modules shall be the same as that of LER/LSR to ensure reliable functioning and the same shall be supplied with all the accessories.
 - 2.7. The make of the **1G SFP module with 10Km range** shall be the same as that of LER/LSR to ensure reliable functioning and the same shall be supplied with all the accessories.

- 2.8. The make of the **STM-1 SFP module with 15 Km range** shall be the same as that of LER to ensure reliable functioning and the same shall be supplied with all the accessories
- 2.9. The make of the **10/100/1000 base-T copper ethernet transceiver SFP** modules shall be the same as that of LER to ensure reliable functioning and the same shall be supplied with all the accessories.

3. NMS System (Hardware, Software & Perpetual License):

- 3.1. Network management software with federated cloud architecture to be provided for scalability and flexibility to support large-sized NMS installations
- 3.2. Federated cloud architecture greatly should help in designing and implementing large-sized Network management software to support an unlimited number of network elements like routers, L3 switches, L2 switches, gateways, UPS, etc.
- 3.3. Centralized NMS should improve the security of the connected organizational branches/sites, provides transparency and helps in enhancing the business operations.
- 3.4. Federated NMS system also allows divisions to have complete control of their site. For incidents triggered to be quickly responded and resolved from the local site itself, federated NMS system at HQ provides independent control of the NMS at the Division.
- 3.5. Multi-tenancy and cloud federation should go hand in hand for NMS. While multi-tenant network management software allows NMS infrastructure to be shared with divisions simultaneously, federation helps in retaining the independent management of each divisions. Multi tenancy supports shared infrastructure and monitoring costs, easy upgrades and customization, whereas federation facilitates authorized access to complete NMS system from a single location i.e., HQ
- 3.6. Federated cloud architecture should provide fault tolerance to the large-sized NMS system. It enables the NMS systems of divisions to work efficiently even in the case of network failure. Even though the central site may not be able to access the independent divisions, NMS systems of these divisions can work independently. On resuming connection with the federated architecture, data of each division can be transferred to the HQ for analysis.

Chapter-09

Video Surveillance System (VSS)

1. IP Based Video Surveillance System: IP based video surveillance system shall be conforming to RDSO Specification No. RDSO/SPN/TC/65/2021 Ver. 6.0 with Amdt. 1 or latest.

2. Large Format LED Display Monitors at RPF post:

- i. Screen Size : 55" (inches) or larger
- ii. Video Resolution : Full HD (1920 x 1080)
- iii. Brightness : 350cd/m² or above
- iv. Contrast Ratio : 1100:1
- v. Viewing angle (H/V) : 170 degree
- vi. Response Time : 12 ms
- vii. Digital Input : HDMI
- viii. Analog Input : RGB/VGA/BNC
- ix. USB Port: 01 no.
- x. External Control : RJ45
- xi. Display Control: Monitor control on screen display, programmable with remote.
- xii. Regulatory approvals/ certifications: BIS/UL/EN/CE/IEC certification for safety and BIS/CE/FCC certifications for EMC and immunity.

3. Installation of Video Surveillance System (VSS):

- 3.1. The contractor should prepare a site plan showing exact location of VSS server, UPS, cameras, LFD, switches etc., at various stations/locations like for cameras, parking areas, entrance/exit points, platforms, yards, waiting halls, ticket counters, offices, foot over bridges, circulating areas etc. as per site requirement in consultation with Railways after the proper site survey. The proposed site plan should have an optimum number of cameras so as to cover railway station and from a security point of view. Installation of the VSS systems at railway stations shall be carried out only as per drawings and plans approved by Railways.
- 3.2. Seamless integration of the server(s), cameras, network devices, storage hardware, NMS/EMS and software etc.
- 3.3. Remote operation and monitoring of a cluster of stations from data centres, Enquiry room RPF thana/post, S&T control room, Divisional HQ and Zonal HQ through the Railway's. Contractor may also be required to

- extend fiber/network connectivity from the nearest station OFC room to stations, offices & RPF thana/post.
- 3.4. Integration of CCC application with existing VMS, proposed VMS, VA and EMS at API/SDK and application level with hardware software and licenses.
 - 3.5. Railway will only give connectivity to POP not further.
 - 3.6. To identify, develop and deliver the training (on site/OEM factory) to the railways staff for the VSS system.
 - 3.7. To demonstrate the functioning of all the modules of software and features of hardware components as and when required by Railways.
 - 3.8. Video analytics should also include additional capabilities in addition to the capabilities mentioned in RDSO specification.
 - 3.9. For integration existing LAN infra can be used. The contractor shall integrate the proposed VSS infra with the existing VSS infra (including software, server, storage etc.). The cost of licenses including installation, configuration and commissioning required for integration for VMS and VAS for existing VSS cameras will be paid by Railways. No additional cost other than covered in tender schedule will be paid.
 - 3.10. Fixing of casing capping, conduit pipe, cable trays and drawing of communication /power/STP/Fiber cable/wire through casing capping, conduit pipe, trays and splicing of fiber and making splice joint wherever required etc., as per the instruction of site engineer. All fitting materials are to be supplied by the contractor.

4. **Camera Bracket:** Installation of cameras at entrance and in platforms shall be with suitable brackets/ fixtures/ angles. These bracket shall be properly engineered and powder coated/ PU painted. Approval of engineer shall be obtained before supplying the material. Sample images are as below;



Chapter-10

Passenger Amenities

1. IP based Integrated Passenger Information System (IPIS): Integrated passenger information system shall be conforming to RDSO Specification No. RDSO/SPN/TC/108/2019, Ver. 1.0 or latest.

2. Digital Clock with GPS Synchronization: Digital Clock with GPS Synchronization shall be conforming to RDSO Specification No. RDSO/SPN/TC/62/2008 Rev. 3.0 or latest.

3. Audio Amplifier 500W.

- i. Frequency response: 50Hz–18,000Hz ± 3 dB
- ii. Signal to noise ratio: 60dB
- iii. Tone controls: Bass (100Hz) : ± 8 dB, Treble (10kHz) : ± 8 dB
- iv. Line output: 1V/1k Ω
- v. Speaker output: 2 Ω , 4 Ω & 8 Ω
- vi. Digital player: MP3 player with USB, SD, MMC card reader and Bluetooth
- vii. Power supply: AC: 220-240V 50/60Hz
- viii. Preferable make/model : Ahuja UBA 500DP, Heinrich HA 680F, Bosch PVA-2P500 or higher

4. Audio Amplifier 250W.

- i. Frequency response: 50-15,000Hz ± 3 dB
- ii. Signal to noise ratio: 60dB
- iii. Tone controls: Bass: ± 10 dB at 100Hz, Treble: ± 10 dB at 10kHz
- iv. Line output: 1V/1k Ω
- v. Speaker output: 4 Ω , 8 Ω , 70V & 100V
- vi. Digital player: MP3 player with USB, SD and MMC card reader
- vii. Power supply: AC: 220-240V 50/60Hz DC: 24V
- viii. Preferable brand/make: Ahuja SSA-250 DP, Heinrich HA 280F, Bosch PRS- 2P250-EU or higher

5. Counter Communication System: Counter communication system consisting of attendant unit, customer unit, power supply unit as per following specification.

- i. Output power: 2W in each amplifier
- ii. Microphone element: Electret condenser in both the units.
- iii. Auto mute 'ÓN': shall enable after every 30 seconds.

- iv. Power supply: AC: 220-240V, 50/60Hz.
- v. Preferable brand/make: Ahuja CCS-2300, Heinrich CIC100, Bosch BCS2300 or higher

6. Column Speaker.

- i. Input power: 15W RMS, 23W Max.
- ii. Power taps: 15/10/5/2.5W
- iii. Voltage: 100V
- iv. Frequency response: 150-10,000Hz
- v. SPL at 1kHz: 92dB/1W/1m
- vi. Speakers: 2 × 152.4 mm (6") × 101.6 mm (4")
- vii. Preferable make/model: Ahuja ASC-20T, Heinrich OCM 20T, Bosch LB2-UC15-D1 or higher

7. Unidirectional Speakers.

- i. Tappings: 5W, 10W, 15W, 20W, 25W, 30W
- ii. Frequency response: 240HZ-10000 Hz
- iii. Impedance type: 100 VLINE
- iv. Input channels: 30 W(RMS) 45W max
- v. Preferable make/model: Ahuja UHC-30XT, Heinrich HS 20T , Bosch LP1-UC20E-1 or higher

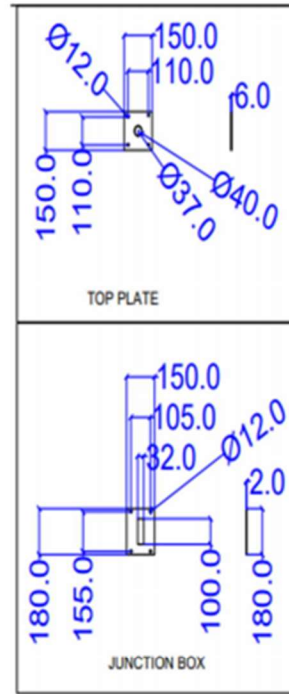
8. Microphone.

- i. Frequency response: 50-18,000Hz
- ii. Sensitivity: 2mV/Pa to 2.1mV/Pa
- iii. Impedance: 300Ω to 600Ω
- iv. Preferable make/model: Ahuja PRO-2200SC DX, Heinrich HM700H, Bosch LBB9099/10 or higher

9. Installation of passenger amenities:

- 9.1. The contractor should prepare a site plan showing exact location of coach guidance boards, train indication boards, at a glance display boards, multi-line display boards, PDC, clock, PA system , LFD etc. at stations, platforms, waiting halls, ticket counters, foot over bridges etc. as per site requirement in consultation with Railways after the proper site survey. The proposed site plan should have an optimum number of boards, so as to cover from a passenger's point of view. Installation of the IPIS at railway stations shall be carried out only as per drawings and plans approved by Railways.

- 9.2. Central data controller, computer, software, UPS, CCU rack, CDS (layer 3 switch), KVM switch and all required configuration for the same to be done with required accessories as per instruction of site engineer.
- 9.3. Double faced coach guidance display board, single line double faced train arrival/departure display board, at a glance display board, speakers under covered area and in waiting halls shall be installed as per instruction of site engineer. All fitting materials are to be supplied by the contractor.
- 9.4. Double-faced coach guidance display board, speakers in open area shall be installed as per instruction of site engineer. All fitting materials are to be supplied by the contractor. This includes supply and installation of GI pole. Drawing for which has been given below including requirement of cement, sand stone chipset.
- 9.5. Five-line single faced train arrival/departure display board shall be installed as per instruction of site engineer. All fitting materials are to be supplied by the contractor.
- 9.6. Platform data controller (PDC) shall be installed in suitable capacity 9U rack with 8-16 port LIU (wherever required) and rack mountable power sockets.
- 9.7. Fixing of casing capping, conduit pipe, cable trays and drawing of communication /power/STP/fiber cable/wire through casing capping, conduit pipe, trays and splicing of fiber and making splice joint wherever required etc., as per the instruction of site engineer. All fitting materials are to be supplied by the contractor.
- 9.8. Proposed IPIS system should connected with NTES in co-ordination with CRIS/NDLS.
- 9.9. The contractor is also free to integrate existing IPIS with new IPIS.



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Digital/ISDN & IP Ready EPABX System and SIP (IP) Exchange & accessories

1. Digital/ISDN and IP Ready EPABX System:

- 1.1. Digital/ISDN & IP ready EPABX system and attendant console – for more than 256 ports & up to 5000 ports shall be conforming to RDSO Specification No RDSO/SPN/TC/27/2007 Rev. 1.0 or latest.

2. SIP (IP) Exchange:

- 2.1. The system must be suitable with adequate interfaces to provide a control of the communication processes and computer telephony integration (CTI).

3. Specification for Main SIP Server: Physical attributes of SIP server shall be of reputed make.

- i. Processor: Latest generation intel xeon or better.
- ii. No of cores and No of processors: Minimum 16 cores in single processor or 2 nos. of 8 core processor (dual socket)
- iii. No. of threads: 2 threads per core
- iv. Frequency: 2.3 GHz or higher
- v. Memory: 32 GB or higher DDR4 SDRAM or latest
- vi. Operating system: Windows operating system or linux, latest with required no. of client licenses as specified by the Railway.
- vii. LAN/ ethernet: On board/ on slot gigabit ethernet (RJ45) with load balancing and failover support, IPv6 compliant. (minimum 4 nos. of 1G ports should be available as per site requirement)
- viii. Interface type: FC or iSCSI or SAS or FCoE or ethernet interface for connecting external storage devices.
- ix. Hard disk drive: hot pluggable enterprise SATA HDDs / hot pluggable SSD or SAS (7200 RPM or higher for SAS) HDD, 4x1000 GB, with minimum 03 nos. or higher internal drive bays. 8GB NV cache, mini card
- x. HDD RAID controller: Hardware based - SATA / SAS / SSD RAID controller with RAID 0/1/5 configuration.
- xi. DVD R/W drive (external/internal) & 3 or more USB Ports: Required
- xii. USB mouse and keyboard/KVM connector: required
- xiii. Power supply: dual, hot-plug, redundant -48 Volt DC
- xiv. Expansion slots: should have 2 PCI express expansion slots of which one should support Ver 1.0

- xv. It should be able to run 24x7 at ambient room temperature
- xvi. software : factory generated password 8 standard fans or more operating system UEFI BIOS boot mode with GPT partition open manage enterprise advance power saving active power controller
- xvii. Chassis type: 19" rack mountable with sliding rails and fittings to install into a rack.
- xviii. Regulatory approvals/ certifications: BIS/UL/EN/CE/IEC certification for safety and BIS/CE/FCC certifications for EMC and immunity.

4. Specification for Intercom SIP Server: Physical attributes of SIP server shall be of reputed make.

- i. Processor: Latest generation intel xeon or better.
- ii. No of cores and No of processors: Minimum 4 cores in single processor
- iii. No. of threads: 2 threads per core
- iv. Frequency: 2.3 GHz or higher
- v. Memory: 8 GB or higher DDR4 SDRAM expandable up to 64 GB
- vi. Operating system: Windows operating system or linux, latest with required no. of client licenses as specified by the Railway.
- vii. LAN/ ethernet: On board/ on slot 2 gigabit ethernet (RJ45) with load balancing and failover support, IPv6 compliant as per site requirement. Asset feature tracking and security management, remote wake up.
- viii. Interface type: FC or iSCSI or SAS or FCoE or ethernet interface for connecting external storage device. 3USB ports.
- ix. Hard disk drive: Hot pluggable enterprise SATA HDDs / Hot pluggable SSD or SAS (7200 RPM or higher for SAS) HDD, 2x1000 GB or higher, with minimum 04 nos. or higher internal drive bays.
- x. HDD RAID controller: Hardware based - SATA / SAS / SSD RAID controller with RAID 0/1/5 configuration.
- xi. DVD R/W drive(external/internal) & 3 USB ports: Required
- xii. USB mouse and key board/KVM connector: Required
- xiii. Power supply: Redundant -48 Volt DC
- xiv. Slots: 2 PCI/PCI express, video controller: To support VGA or above resolution, 18.5 inch LED monitor with industrial grade USB to serial converter.
- xv. It should be able to run 24x7 at ambient room temperature:
- xvi. Regulatory/approvals/ certifications: BIS/UL/EN/CE/IEC certification for safety and BIS/CE/FCC certifications for EMC and immunity.

- xvii. Chassis type: 19" rack mountable with sliding rails and fittings to install into a Rack.
- xviii. Power management: Screen blanking, hard disk and system idle mode in power on, set up password, power supply surge protected, and automatic server reboot.

5. Hardware and Software Configuration for Emergency Room Communication Console:

- 5.1. Core i7, 10th generation or latest, 500 GB SSD, PC with 2TB HDD/ 8 GB RAM/ Win 10 OS / 21" touch screen monitor, 3 years antivirus, standard accessories, UPS 600VA 30 mins backup, spike buster .
- 5.2. Must be supplied with features to rapidly respond to incidents, emergencies and support interoperable communication among users of all devices and also provide control of remote extensions through an easy to use on screen interface.
- 5.3. It should have features like end point status (presence), priority answer, silent monitor, voice reporting, zone page.
- 5.4. It should have managed group call / conference using a web based GUI facility.
- 5.5. The license for the same should be a part of the main server.
- 5.6. The emergency room conference resource should be from the preferably from the same telephony call manager system. Solution should have the facility to automatically dial out to connect up to 30 or more participants in a single conference. System should also have a 2 x 30 party managed conference. It should be possible to further divide 120 party conference bridges into any combination like 12 X 10 party, 6 x 20 party etc. if required. The conference should be secured i.e. the user should enter the password to join the conference.
- 5.7. Web based GUI should have facility to program/define multiple emergencies like fire, breakdown and other emergencies and should not have any limitations in terms of creating multiple emergencies in the future.
- 5.8. It should have the facility to add multiple pre-recorded messages in the application which can be played during emergencies on the phone and announcement system and also in the regular announcements in railways.
- 5.9. The conference management should be from a web based GUI interface without installing any tool or application on windows PC. Conference management should be from web based GUI. It should be possible to see the user status in real time like free/ busy / not connected etc. on the screen monitor.
- 5.10. It should have the ability to view video using streaming with HTML5.
- 5.11. It should have the ability to view video using adobe flash player.

- 5.12. The conference must be controlled by a user defined as operator from the web-based GUI.
- 5.13. The console operator should have following features as below:
 - i. The console operator must be able to add / remove members
 - ii. The console operator must be able to add other conference members
 - iii. The console operator must be able to mute / unmute (user, none, all).
 - iv. The console operator must be able to lock / unlock the conference
 - v. The console operator must be able to close the conference.
- 5.14. It must be possible to dial out a predefined group (or multi groups) of participants/numbers by simply pressing the pre-assigned virtual key on PC. During the conference he should be able to view the status of all the participants on a monitor in real time.
- 5.15. Each preset conference must have its own unique dial number such that when this group number is dialled all the number stations should ring simultaneously.
- 5.16. Any combination of stations and external numbers must be able to be defined as members of the group call.
- 5.17. Participants may join a conference in the audible or in the mute mode, if in mute mode, the right to speak must be selectively offered to attendees per their request by a special signal sent to the group operator by the attendees.
- 5.18. Attendees must be able to be added or excluded at any time by the group operator
- 5.19. The conference must be terminated when the group operator leaves (auto terminate if all members left are muted).
- 5.20. The console operator must be able to barge into an existing user call based on preemption predefined rules
- 5.21. Mute ring button when a call comes to the dispatcher phone, the dispatcher can mute the ring, the call will continue.
- 5.22. Add department attribute to user in the phone book, add a department name for the user. The dispatcher can do a search based on the department
- 5.23. Join incoming calls to an open conference when a call arrives to the dispatcher, he can add that call to an open conference
- 5.24. Stage conference from the dispatcher screen the dispatcher can create an ad-hoc conference from the dispatcher screen
- 5.25. Change access code the password of a conference can be changed by the dispatcher to block or allow callers to join a conference.

6. Specifications for 96 Port FXS Gateway Specifications for Self Survivable Gateway (Analog):

- 6.1. Gateway should have a minimum 96 analog ports slots based with full capacity of concurrent calls and should be from the same OEM of call manager.
- 6.2. Licenses for the same should be on the main server only.
- 6.3. Voice processing voice codecs:G.711,G.729A,G.723.1,GSM,iLBC; or any other protocols
- 6.4. Echo cancellation: G.168with 64ms echo tail or better
- 6.5. Dynamic jitter buffer; voice activity detector (VAD); and comfort noise generator (CNG) or better
- 6.6. Call handling configurable dialing plan up to 500 routing rules or more
- 6.7. Gateway configuration web based user interface
- 6.8. Remote provisioning HTTP/Web; remote configuration; remote software upgrade, alarm, performance data
- 6.9. Protocol – SIP (RFC3261,etc.), MGCP (RFC3435), 3GPP TS24.228, TS24.229 or equivalent
- 6.10. Standards caller-ID detection (FSK/DTMF), configurable call progress tone plan
- 6.11. Primary and backup the gateway can be configured and controlled in server clusters/one or more server
- 6.12. Ethernet connector RJ-45, 10/100/1000 base-T, 10/100 auto sensing. The gateway should function as a self-survivable unit when the ethernet connectivity at gateway end breaks.
- 6.13. Power input dual -48 VDC.
- 6.14. Non-operating temperature: -10 to 60°C; humidity: 5% to 90% (non-condensing)
- 6.15. Operating temperature: 0 to 40°C; humidity: 10% to 90%(non-condensing)
- 6.16. Power consumption 125 Watt (max.) or less
- 6.17. Dual gigabit ethernet
- 6.18. LED indicators power, system status, network status, line status (optional for line status) or as per OEM
- 6.19. The preferably gateway should be of same OEM as of call server.
- 6.20. It includes supply of patch panels/krone for termination.

7. Specifications for 48 Port FXS Gateway Specifications for Self Survivable Gateway (Analog):

- 7.1. Gateway should have a minimum 48 analog ports slots based with full capacity of concurrent calls and should be from the same OEM of call manager / communication server.
- 7.2. Licenses for the same should be on the main server only.

- 7.3. Voice processing voice codecs:G.711,G.729A,G.723.1,GSM,iLBC; or any other protocols
- 7.4. Echo cancellation:G.168with 64ms echo tail or better
- 7.5. Dynamic jitter buffer; voice activity detector (VAD); and comfort noise generator (CNG) or better
- 7.6. Call handling configurable dialing plan up to 500 routing rules or more
- 7.7. Fax processing fax relay
- 7.8. Gateway configuration web based user interface
- 7.9. Remote provisioning HTTP/Web; remote configuration; remote software upgrade, alarm, performance data
- 7.10. Protocol – SIP (RFC3261,etc.),MGCP (RFC3435), 3GPP TS24.228, TS24.229 or equivalent
- 7.11. Standards caller - ID detection (FSK/DTMF), configurable call progress tone plan
- 7.12. Primary and backup: The gateway can be configured and controlled in server clusters
- 7.13. Ethernet connector RJ-45, 10/100/1000 base-T, 10/100auto sensing. The gateway should function as a self-survivable unit when the ethernet connectivity at gateway end breaks.
- 7.14. Power input dual - 48 VDC/AC 230 50Hz for 48 port gateway, (as per site requirement).
- 7.15. Non-operating temperature: -10 to 60°C; humidity: 5% to 90% (non-condensing)
- 7.16. Operating temperature: 0 to 40°C; humidity: 10% to 90%(non-condensing)
- 7.17. Power consumption 125 Watt (max.) or less
- 7.18. Dual gigabit ethernet for 48 port gateway
- 7.19. LED indicators power, system status, network status, line status (optional for line status).or as per OEM
- 7.20. The preferable gateway should be of same OEM as of call server.
- 7.21. Includes supply of patch panels/krone modules for termination.

8. Specifications for 24 Port FXO Gateway Specifications for FXO Gateway Card

- 8.1. Gateway cards should have a minimum 16/24 ports slot based with full capacityof concurrent calls and should be from the same OEM of call manager / communication server licenses for the same should be on the main server only.
- 8.2. This FXO gateway card should be installed in gateway chassis.
- 8.3. Voice processing voice codecs:G.711,G.729A,G.723.1,GSM,iLBC; or any other protocols
- 8.4. Echo cancellation:G.168 with 64ms echo tail or better

- 8.5. Dynamic jitter buffer; voice activity detector (VAD);and comfort noise generator (CNG) or other features
- 8.6. Call handling configurable dialing plan up to 500 routing rules or more.
- 8.7. Fax processing fax relay or other method
- 8.8. Gateway configuration web based user interface
- 8.9. Protocol - SIP(RFC3261,etc.), MGCP(RFC3435), 3GPP or better
- 8.10. Dual input power supply 230V AC/ 48V DC for 24 port (as per site requirement)
- 8.11. Standards caller-ID detection (FSK/DTMF), configurable call progress tone plan
- 8.12. Non-operating temperature: -10 to 60°C; humidity: 5% to 90% (non-condensing)
- 8.13. Operating temperature: 0 to 40°C or higher humidity: 10% to 90%(non-condensing)
- 8.14. The preferably gateway should be of same OEM as of call server.
- 8.15. Includes supply of patch panels/krone modules for termination.

9. Specifications for 24 Port FXS Gateway Specifications for Self Survivable Gateway (Analog):

- 9.1. Gateway should have a minimum 24 analog ports with full capacity of concurrent calls and should be from the same OEM of call manager / communication server.
- 9.2. Licenses for the same should be on the main server only.
- 9.3. Voice processing voice codecs:G.711,G.729A,G.723.1, GSM, iLBC; or any protocols
- 9.4. Echo cancellation:G.168with 64ms echo tail or better
- 9.5. Dynamic jitter buffer ;voice activity detector (VAD) and comfort noise generator (CNG) or better
- 9.6. Call handling configurable dialing plan up to 500 routing rules or more
- 9.7. Fax processing fax relay
- 9.8. Gateway configuration web based user interface
- 9.9. Remote provisioning HTTP/Web; remote configuration; remote software upgrade, alarm, performance data
- 9.10. User features caller ID, call forward, call transfer, call forking, hotline, CRBT, do-not-disturb, speed dialing.
- 9.11. Protocol - SIP(RFC3261,etc.), MGCP(RFC3435), 3GPP TS24.228, TS24.229 or equivalent
- 9.12. Standards caller-ID detection (FSK/DTMF), configurable call progress tone plan
- 9.13. Primary and backup The gateway can be configured and controlled in server clusters/one or two server

- 9.14. Ethernet connector RJ-45, 10/100base-T, 10/100auto sensing. The gateway should function as a self-survivable unit when the ethernet connectivity at gateway end breaks.
- 9.15. Input 230V AC/-48 VDC for 24 port gateway (as per site requirement)
- 9.16. Non-operating temperature: -10 to 60°C; humidity: 5% to 90% (non-condensing)
- 9.17. Operating temperature: 0 to 40°C; humidity: 10% to 90% (non-condensing)
- 9.18. Power consumption: 125 Watt (max.) or less
- 9.19. Dual gigabit ethernet for 48 port gateway and single 10/100 for 24 / 8 port gateway
- 9.20. LED indicators power, system status, network status, line status (optional for line status).
- 9.21. The preferable Gateway should be of Same OEM as of Call Server.
- 9.22. Includes supply of Patch panels/Krone modules for termination

10. Specifications for 8 Port FXO Gateway Specifications for FXO Gateway Card

- 10.1. Gateway cards should have a minimum 8 ports slot based with full capacity of concurrent calls and should be from the same OEM of call manager / communication server licenses for the same should be on the main server only.
- 10.2. This FXO gateway card should be installed in gateway chassis
- 10.3. Voice processing voice codecs: G.711, G.729A, G.723.1, GSM, iLBC; or any other protocols
- 10.4. Echo cancellation: G.168 with 64ms echo tail or better
- 10.5. Dynamic jitter buffer; voice activity detector (VAD); and comfort noise generator (CNG) or other features
- 10.6. Call handling configurable dialing plan up to 500 routing rules or more.
- 10.7. Fax processing fax relay or other method
- 10.8. Gateway configuration web based user interface
- 10.9. Protocol - SIP (RFC3261, etc.), MGCP (RFC3435), 3GPP or better
- 10.10. Dual input power Supply 230V AC/ 48V DC for 8 port (as per site requirement)
- 10.11. Standards caller-ID detection (FSK/DTMF), configurable call progress tone plan
- 10.12. Non-operating temperature: -10 to 60°C; humidity: 5% to 90% (non-condensing)
- 10.13. Operating temperature: 0 to 40°C or higher humidity: 10% to 90% (non-condensing)
- 10.14. The preferably gateway should be of same OEM as of call server.
- 10.15. Includes supply of patch panels/krone modules for termination.

11. Specifications for 8 Port FXS Gateway

- 11.1. Gateway cards should have a minimum 8 ports with full capacity of concurrent calls and should be preferably of the same OEM of call manager / communication server licenses for the same should be on the main server only.
- 11.2. This FXO gateway Card should be Installed in Gateway Chassis
- 11.3. Voice processing voice codecs:G.711, G.729A,G.723.1, GSM, iLBC or better
- 11.4. Echo cancellation:G.168with 64ms echo tail;
- 11.5. Dynamic jitter buffer; voice activity detector (VAD); and comfort noise generator (CNG)
- 11.6. Call Handling configurable dialing plan up to 500 routing rules or more
- 11.7. Fax processing fax relay
- 11.8. Gateway configuration web based user interface
- 11.9. Protocol – SIP (RFC3261,etc.), MGCP (RFC3435), 3GPP TS24.228, TS24.229 or equivalent
- 11.10. Single 230V AC for 8 ports.
- 11.11. 10/100 Single ethernet for 8 port gateway.
- 11.12. Standards Caller-ID detection (FSK/DTMF), configurable call progress tone plan or better
- 11.13. Non-operating temperature: -10 to 60°C; humidity: 5% to 90% (non-condensing)
- 11.14. Operating temperature: 0 to 40°C; humidity: 10% to 90%(non-condensing)
- 11.15. The preferable gateway should be of same OEM as of call server.
- 11.16. Includes supply of patch panels/krone modules for termination.

12. Specifications for 2 Ports PRI Gateway

- 12.1. PRI gateway should have 2 PRI ports and should be from the same OEM of call manager / communication server.
- 12.2. PRI gateway should be embedded power full DSP technology, to support G.711, G.729A, G.723, echo cancellation G.168, DTMF relay RFC2833, fax relay and more.
- 12.3. PRI gateway should support digit translation, voice announcement, 2nd-stage dialing and RADIUS billing interface. E SIP protocol, frequency domain echo cancellation, iLBC codecs
- 12.4. Voice processing G.711, G.729A, G.723.1, GSM, iLBC; echo cancellation:
- 12.5. G.168 with 64ms echo tail; dynamic jitter buffer; VAD and CNG or better
- 12.6. Calling control called/calling party number translation; second stage dialing; voice detection; auto

- 12.7. Dialing with DTMF; ring back tone generation and detection; voice announcement
- 12.8. Voice proxy RTP voice proxy function for NAT/firewall traversal
- 12.9. Fax Relay transparent mode, fax relay.
- 12.10. Call handling configurable dialing plan, up to 500 routing rules or more
- 12.11. Configuration interface web utility
- 12.12. Remote management Telnet, HTTP, TR069 or better
- 12.13. PSTN ISDN PRI standard: ANSI, NI-2, DMS, 5ESS or better
- 12.14. SIP RFC3261, RFC2976, RFC3515, RFC3581 or better
- 12.15. DTMF tone detection generation and detection; DTMF relay: RFC2833, INFO (SIP) or any protocol
- 12.16. PRI gateway supports both web and text based configuration methods, and it also supports protocol for centralized remote management for configuration, firmware upgrade, log file download, statistics collection and event alarm.
- 12.17. Dual ethernet RJ-45, 10/100 Base-T
- 12.18. Trunking Interface RJ-45
- 12.19. Power supply dual 48 VDC, 1A (max.)
- 12.20. The preferably gateway should be of same OEM as of IP PBX UC call manager application.

13. Hardware and Software Specification for NMS

- 13.1. Network management server (nms) application should be preferably the same make as the OEM of the IP PBX system.
- 13.2. NMS(Network Management Server) Minimum requirement : 19 inch rack mountable, Intel Xeon Processor, 2.3 Ghz or higher,4 core or higher, 4MB cache, 8 GB or higher DDR4 RAM, 4 nos of Gigabit ethernet ports, 2x1TB HDD, RAID 1 configuration, USB keyboard, mouse, power supply works on 230 V AC. Windows server 2019 licensed or latest or linux. Standard accessories should be supplied. Reputed Make: HP/Dell/IBM or equivalent.
- 13.3. The NMS shall be a multi user system and based on graphical user interface.
- 13.4. The NMS shall be able to diagnose its own faults by running diagnostic software
- 13.5. The NMS shall provide the complete view of switches, SIP end phones, and gateways 400 network elements and the interconnecting links.
- 13.6. The NMS shall provide health monitoring reports of the network with settable periodicity @24 Hrs, 1 week and 1 month or as per site requirement.
- 13.7. It shall provide the graphical layout of the network element with modules drawn using different colours to indicate their status

- 13.8. Messaging system: the NMS shall have a messaging system which will generate and send alerts preferably via the internet through email or SMS (GSM and LTE suitable modem should be supplied with necessary perpetual license) to the designated personnel depending upon the location of NE, on generation of alarms.
- 13.9. It shall be possible to produce pre-defined reports.
- 13.10. NMS licensing should be device based. Network mapping and discovery software using Layer 2/ Layer 3 protocols for devices.
- 13.11. **Discovery Features :**
- i. Support for SNMP v1-3, IPv4/IPv6 address range, SNMP smart scan, hosts file
 - ii. Scheduled discovery scans
 - iii. Web based discovery
- 13.12. **Mapping Features:**
- i. Automated map creation
 - iv. Customizable topology maps
 - v. Display of device dependencies
 - vi. Multi-level topology views
- 13.13. **Monitoring Features:**
- i. SNMP v1-3, SSH and WMI support or better
 - ii. Real time monitoring
 - iii. MIB Walker, MIB explorer and MIB manager
 - iv. WMI application monitoring
 - v. Wireless Infrastructure monitoring, popup and audio visual alerting and reporting
 - vi. Custom monitoring with Java script or VBScript
 - vii. Threshold monitoring (performance, passive and flow)
 - viii. Blackout period to suspend specific actions during the scheduled period of time
- 13.14. **Management Console, Alerts Notification and Reporting Features:**
- i. Web and windows based management console
 - ii. Alert center for centralized alerts/notification escalation management.
 - iii. It should have support web alarm and should support, SMS and email notification so that it can be augmented in future.
 - iv. Configurable alert with popup and audio visual mode and notification escalation policies

- v. Mobile interface with one click login
- vi. Configurable role based management
- vii. Dashboard manager
- viii. Real time split second and historical graphs
- ix. Scheduling of recurring reports
- x. Report export to: email, Excel®, and PDF formats
- xi. Predefined and customizable reports
- xii. Configurable alert thresholds
- xiii. Inventory or other device specific information

13.15. Visual Mapping features:

- i. Based upon discovery, should be able to automatically generate integrated network topology maps showing both Layer 3 addressing and Layer 2 connectivity.
- ii. **Inventory features:** Agentless scans for inventory.
- iii. **Single point Console features for:** Managing network discovery, creation and administration of maps, to access detailed device inventory and configuration information.

13.16. User Defined Device Categories :

- i. It should provide the users to have the ability to define, edit, add or delete device categories from auto discovered connected devices.

13.17. Layer 2 Trace :

- i. It should support both LAN or WAN connectivity
- ii. It should display inbound and outbound interfaces for each network device in the path
- iii. It should provide Layer 2 trace feature to help network managers to rapidly pinpoint physical layer connectivity issues from the console.

13.18. IP/Mac Finder features :

- i. It should provide an IP/Mac finder tool to locate an IP or Mac address on a network from the console.
- ii. It should automatically discover, map and monitor cloud environments including Amazon web services and azure servers
- iii. Solution should monitor, report and alert on the status and performance of every metric your cloud service collects via its own native API

- iv. Solution should track cloud billing and show this report on a simple dashboard.
- v. Emergency room communication console

14. PC WorkStation/ Maintenance Console:

- 14.1. All in One computer 8 GB RAM or higher, processor generation 11th or higher, windows 10 PRO preloaded. i7 processor, graphic card 2GB, hard disk 1000GB with 180 GB SSD.
- 14.2. Display 24 inch or higher.
- 14.3. Suitable HDMI cable to connect TV.
- 14.4. Wi-Fi enabled.
- 14.5. Web cam and microphone in built ,
- 14.6. Anti-virus with 3 Years subscription.
- 14.7. MS office preloaded.

Note: This should work as common console for all the application.

15. Help Desk Specifications/Complain Management

- 15.1. The proposed solution must be embedded within the platform, and should be from the same OEM of the telephony system or any third party on existing or new server.
 - i. The system must be an All-in-one solution that provides a solution for UC&C. Bidders should supply a minimum 5 agent licence, one supervisor and 5 port IVR for the help desk.
 - ii. Single server deployment with intuitive and central management capabilities should support true multi media.
 - iii. Help desk managers must be able to easily prioritize customers and incoming contacts regardless of the media used.
 - iv. The same set of business and routing rules can be applied to voice, emails, and faxes if required.
 - v. The help desk must support multi-layer routing including priority, skill based, statistical, business rules, and customer defined values.(optional)
 - vi. Help desk must have embedded IVR, enabling managers to design routing plans and accurately assess help desk activity trends.
 - vii. The IVR application must be a GUI application that can be managed by the customer.
 - viii. The customer must have the ability to build new self-services applications like new IVR flow for new service.
 - ix. Customer must have the ability to define/change routing rules by himself based on the customer's profile.

- x. The help desk must support outbound, including preview, progressive and automated outbound dialing.
- xi. The supervisor must be able to see the status of help desk agents in real-time in his PC like logout, busy, free, release, non ACD etc. in graphical form in pie chart / bar chart.(optional)
- xii. Help desk facilities
- xiii. Real-time monitoring must provide supervisors with statistical information about the current status of the help desk with on line refresh (1sec). The application must include a predefined list of reports and the customer (end user) should be able to choose reports as needed.
- xiv. The real time application must provide the ability to build/change the workspace for each user and by user (not vendor or distributor).
- xv. The RT must provide the ability to move agents to/from different groups/queues for current login only.
- xvi. Historical reports must be able to collect all information from call entry to call termination. Call profile details for internal investigation purposes should be part of the contact centre solution.
- xvii. The help desk solution must have an embedded management information system (MIS) suite that monitors all help desk activities, generating reports that summarize the past performance of the system over a given time period, and providing statistical analysis of the help desk within a specified period. Real-time and historical reports provide.

15.2. Help desk agent should be able to do following activities from agent application installed on PC:

- i. Login/Logout from group
- ii. Release/resume
- iii. Ready
- iv. Release for break
- v. Release for meeting
- vi. Supervisor help
- vii. Agent board
- viii. Answer
- ix. Hold
- x. Retrieve
- xi. Hang Up
- xii. Integration capabilities with sales force, Microsoft dynamics, SAP CRM, Oracle and SIEBEL.

16. System Architecture

- 16.1. The system server should use an operating system like Windows, or Linux and should not have any additional licensing or proprietary overheads.
- 16.2. The call servers should work in load sharing mode i.e. user registration should be distributed between 2 or more servers so that in case of failure of one server, the users should automatically register on a secondary server without any manual intervention.
- 16.3. Programming of servers and gateways should be real-time synchronized.
- 16.4. The system shall support the latest SNMP (simple network management protocol) or any other protocol. It shall be possible to have access to systems from remote locations to monitor the status and to update the software or to take system backup.
- 16.5. System software shall allow independent shutdown of each unit/card. during the demounting and mounting of extension or trunk cards, no other unit/card shall be shut down (hot swapping).
- 16.6. In case of a capacity expansion or adding another location to the network there should be no interruption of the central system (reset, shut down etc.)
- 16.7. Programming changes should immediately become functional and there shall be no need to reset the system after programming. In case, the power supplied to the system is cut off entirely, the data available in the system should be protected and when the power supply is restored, the system should resume operating normally without any intervention and loss of data.
- 16.8. Any programming changes done in any server should be synchronised in all servers in real time.
- 16.9. The server topology shall be fully duplicated and decentralized control.
- 16.10. The redundancy architecture should be active mode so that the server system should be secured from any attack / threat from the network ensuring the high availability of communication services.
- 16.11. The interruption free switchover from the active - active control must take place without the existing two-way connections being interrupted.
- 16.12. The server system should have multi-level secured access for any administration preventing from attack/hack.
- 16.13. Server system should be enterprise grade with at least 99.9% availability in redundancy mode.
- 16.14. Proposed system should be capable of active-active geo-redundant configuration.
- 16.15. Proposed system should have 100% of the SIP entities and SIP endpoints have their signaling encrypted by TLS / AES128

- 16.16. Proposed system should be able to work with SIP based third party session border controller
- 16.17. Proposed system should be able to handle up to 250 locations or higher in a full deployment with up to 100,000 BHCC or higher of inter location calling for universal dial plan
- 16.18. The system architecture should allow for incremental application additions to the enterprise without modification to existing feature server software.
- 16.19. The system should allow for third party applications to be added in the open architecture.
- 16.20. System should allow direct registration / profile creation of SIP endpoints onto it and perform all functions of registrar/ redirect etc.
- 16.21. Proposed system should handle all network administration and management of the communications appliance as a single administration point.
- 16.22. For enhanced security IP PBX should be able to encrypt the IP calls end to end with AES- 128 bit or SRTP. The signaling from gateways to the IP PBX should also be encrypted.

17. Distributed Architecture over IP Network

- 17.1. The communication server offered shall support the IP distributed architecture platform.
- 17.2. The UC platform must have distributed architecture and centralized control for all the sites in the network.
- 17.3. The proposed solution must support hybrid cloud solution in order to guarantee business continuity with overall survivability regardless of a failure at any single location.
- 17.4. The proposed solution must enable part of the cluster to be hosted in private cloud.
- 17.5. The proposed solution must have built in redundancy using a cloud solution to provide automatic disaster recovery options.

18. Operating Ambient Conditions

- 18.1. The offered Server shall be compatible with the tropical climate prevalent in India.
- 18.2. The offered server shall be able to operate in ambient temperature range 5 - 40 degree celsius.
- 18.3. The server shall be able to operate in relative humidity of about 30-85%.

19. Communication (SIP) Server Services and Licenses:

- 19.1. **It should be possible to setup the following functions or web Services:**

- i. Unified communication solution
- ii. Recording and analysis of call data and assignment to originate or about all infrastructures
- iii. Voice mail and unified messaging services
- iv. Call centre solutions
- v. Multimedia workflow solutions
- vi. CTI and presence based communication services
- vii. Soft clients with Video calling and messaging facility.
- viii. Integration of cordless phones according to Wi-fi standard
- ix. Conference services with GUI based conference manager.
- x. Special solutions for the connectivity of front office systems for service areas.
- xi. Web collaboration solutions, instant messaging

19.2. **Standards and guidelines that have to be met**

- i. The communication server must meet the requirements of the regulatory authorities for telecommunications in India and recommendations of the ITU standards.
- ii. The server offered shall be SIP ready
- iii. The server should support open standards of SIP and VoIP (voice over internet protocol).
- iv. The IP communication server should support IPv6 standards from day 1.
- v. The system licenses should be highly flexible to deploy and it should be dynamic in nature to switch / assign services either for analog or IP subscribers or even trunks.
- vi. The proposed model should be the latest.
- vii. The products must comply with safety and EMC standards, including FCC, UL/TUV, CE, and the RoHS directive or equivalent.
- viii. The OEM of IP PBX / bidder should have ISO certification as mentioned in TEC No. : TEC/ GR/SW/PBX-005/01/SEP-16 (Latest TEC 60030:2016)
- ix. Vendors must submit TEC compliant approval certificate for GR issued by telecommunication engineering centre (TEC), department of telecommunication, Govt. of India tested with IPv4 & IPv6 for both SIP terminals and SIP trunks from day 1 for the particular model of IP-PBX with server and media gateway system quoted. Notarised copy of the same is required to submit along with the technical bid.
- x. Hardware of the offered IP telephony exchange of server-gateway architecture with redundancy system should be from same OEM or compatible, IP telephony system software, IP/SIP

phones, media gateways, auto attendance, help desk and voice mail should be preferably of same OEM of IP telephony exchange.

- xi. Dial digit length should be supported as per DoT/TRAI guidelines.
- xii. The server and gateways covered in this work shall be integrated with existing server available with zonal/divisional headquarters and same to be connected.

OR

- xiii. The existing server (tadiran aeonix/coral unified communication system) is equipped with analog license, IP endpoint license, 10 SIP trunk licenses in active-active cluster mode. The bidder is free to install his own software in the existing hardware. The server should be reprogrammed accordingly. The bidder is free to provide new hardwares and software for the remaining licenses and integrate with the existing exchange.

19.3. Communication Server capabilities

- i. The communication server should support VoIP- technology, integration of IP- based applications, IPv6 from day 1 and the usage of comfortable speech features above all kinds of communication infrastructures and connected voice terminals. The communication server has to combine the advantages of worlds (TDM and IP) with networking, carrier access and the flexible connection of analog, TDM- and IP-phones, mobile WLAN- and Wi- Fi devices and softphones within one server.
- ii. The communication server must build up a high reliability and should support open standard architecture running on a 64 Bit Linux/windows operating system on an Enterprise grade COTS Server.
- iii. The offered communication server should provide communication solutions over IP. The IP Phones should register directly on the server, not on any Gateway / Gatekeeper cards. No restrictions may evolve in terms of quality of service, reliability and security.
- iv. Quality of service and monitoring options should recognize functional restrictions within the IP network and solve them in a flexible manner.
- v. For securing availability, redundancy in network and module level is required for the communication server.

- vi. The offered communication server should provide multiple IP gateways to implement voice features and applications for IP networks. Therefore this architecture should be able to build up standalone systems, IP distributed Architecture and complex networks uniquely based on identical structures.
- vii. The IP distributed architecture with intelligent branch solutions should allow the connection of remote sites / buildings by a cost effective IP infrastructure and at the same time benefit from central applications and a central management.
- viii. Providing different solutions to support the availability of voice services
- ix. Support of CTI-Link according to CSTA
- x. Support of the following different standards concerning the connection of VoIP- terminals
- xi. Voice encoding the standards: G.711, G.729A, G.723.1 and any other standard codes.
- xii. The server should support QOS standards Level 2: IEEE 802.1p/Q and Level 3: TOS / diffserv
- xiii. Echo suppression complaint with G.168
- xiv. DTMF recognition complaint with Q.24
- xv. NAT-Traversal (Network address translators)
- xvi. STUN protocol (Simple Traversal of UDP through NATs) provide open interfaces and standard protocols for current and future applications
- xvii. Enable networking of systems via TDM and IP infrastructures.
- xviii. Distribution of system components and of remote plant components respectively over IP Infrastructures.
- xix. Integration of speech and data for multimedia workflow applications.
- xx. Encryption of signaling and language data of VoIP terminals and VoIP gateways.
- xxi. Administration through network management systems.
- xxii. The offered system must have session initiation protocol (SIP) as core trunk to provide interface connections to ITSP/ SIP service providers, 3rd party applications such and other IP based communication systems.
- xxiii. The server system should support the cluster/two or more communication servers over an IP infrastructure. The system should offer maximum availability (99.99%), with the switchover of call control processing functions to an alternate or redundant Server (or soft switch control point) in the event of significant fault. The redundancy scheme should conform to the model used in most computer systems: the complete "mirroring" of the information

(both static and dynamic data). There should not be any proxy server to achieve this functionality. The switch over between 2 redundant call control servers should not interrupt existing and established communications. The complete set of programs and software modules must be duplicated in real time in all geographic redundant servers/standby. In case of failure of the main server (hardware or software), the standby server must take over the control of existing and established communications instantaneously.

- xxiv. The management platform must provide a backup mechanism for all critical system information in both a manual and an automatic/scheduled archival

20. Telephony Minimum Features should be available

- 20.1. Class of service for extensions and trunk groups.
- 20.2. Abbreviated dialing (minimum 100 numbers)
- 20.3. Call consultation
- 20.4. Do not disturb
- 20.5. Appointment reminder
- 20.6. Call pick up
- 20.7. Last number redial
- 20.8. Hotline facility - internal and external
- 20.9. Call transfer
- 20.10. Automatic call back
- 20.11. Hunting groups
- 20.12. Alternate Tie / Trunk routing
- 20.13. Discriminative ringing
- 20.14. Call forwarding internal and external.
- 20.15. Call parking
- 20.16. CLIP facility with number and name presentation.
- 20.17. CLIP on DISA calls and DID / DIL calls
- 20.18. Music on hold, voice prompt instead of dial tone.
- 20.19. Call waiting, voice prompt for call waiting, no answer, faulty telephones etc.
- 20.20. DID, DIL, DISA and DOSA
- 20.21. System should support multimedia conferencing. Solutions including audio, video and data collaboration applications. The conferences should be password protected and provision for entry exit tones for added security. The list of participants should be visible to the desk phone user.
- 20.22. Personal station access: System shall give the user complete flexibility to login from any extension (of the same type assigned to him) by dialing his identification code. This shall allow the user to carry all

facilities available to him at the earlier location along with him including voice messaging indication to the new destination without affecting the MDF side and requiring any cable changes.

- 20.23. The personal conference solution should be from the same telephony server or any third party and have the facility to automatically dial out to connect up to 30 participants or more in a single conference. System should also have 2*30 or more party managed conference. It should be possible for any combination of multi-party bridges conferences like 12 X 10 party, 6 x 20 party etc. The conference bridge should be secured means to enter the conference bridge, the user should enter the password.
- 20.24. Selective extension voice logger (conversation recorder). Minimum 15 days storage. Concurrent 10 users call can record in the server.
- 20.25. Automatic call distribution (ACD) should be configured as per site requirement.

21. Unified Messaging System

- 21.1. It is envisaged to provide the users with a true unified communication client with single intuitive interface to access communications from one client including voice, video, voice messages, audio/video conferencing, telephony presence and communication history. It should provide the following minimum facilities:
- 21.2. The users should have access to all the telephony features available on IP phones like multiple call appearances and one button access to frequently used features, such as answer, conference, transfer, hold and redial etc.
- 21.3. Users should be able to use this client as standalone telephony client with headset & Mic
- 21.4. The user having integrated webcams should be able to make video calls as easily as making a phone call. Features should include audio/video features like call, transfer, forward, conference, hold, mute, call coverage
- 21.5. The users should be able to observe the presence of other users' telephones on the network.
- 21.6. The client should provide a capability to click to call from the numbers highlighted in the web browser
- 21.7. The soft phone client should be able to make a HD video call to the SIP based video desk phone

22. Call Detail Record (CDR)

- 22.1. The telephony system must have a CDR file for all calls made and received by an extension (either internal or external). Server should have

- CDR backup for all calls for at least one year. CDR should be in CSV /excel format and other formats should be downloadable from the server as and when required.
- 22.2. In case of server failure and the call passed to another server, the CDR record must continue on the other server with all the information. If the call was disconnected due to server failure, the CDR record for the call must be closed and saved.
- 22.3. The CDR must provide the following details:
- i. CDR must indicate the extension ID
 - ii. CDR must indicate the call start date
 - iii. CDR must indicate the call start time
 - iv. CDR must indicate the elapsed time
 - v. CDR must indicate the trunk group ID
 - vi. CDR must indicate the trunk ID
 - vii. CDR must indicate the caller ID
 - viii. CDR must indicate the ring time
- 22.4. It should be possible to send CDR online for immediate update and to external windows based billing system for complete recording of internal, external and network calls to generate various types of traffic reports if required.
- 22.5. Interfaces for subscriber & trunk and system networking to be supported
- 22.6. Server should support standard SIP or H.323 protocols for IP phones and trunks. System should support all terminals like analog with CLIP, IP, SIP, soft phone, conference room phones.
- 22.7. The IP Telephony server shall support the following:
- i. Euro ISDN standards interfaces with DSS 1 protocol SIP carrier gateway
 - ii. Analog protocol interfaces for connection of analog subscribers
 - iii. Interfaces for SIP subscribers and SIP trunks
 - iv. Interfaces for wireless IP subscribers and wireless SIP subscribers
- 22.8. Communication server should support soft client application for laptop/desktop with video conferencing and messaging capability.
- 22.9. The communication server must support the open standard SIP (session initiation protocol RFC3261) to support direct IP- links to third party applications and devices. System should support the following SIP RFCs:
- i. RFC 3261 (SIP: session initiation protocol)
 - ii. RFC 3262 (reliability of provisional responses in session initiation protocol)
 - iii. RFC 3263 (location)
 - iv. RFC 2327 (SDP- session description protocol)
 - v. RFC 1889 and 1890 (RTP/RTCP)
 - vi. RFC 3515 (REFER)
 - vii. RFC 2833 (DTMF over IP)

- viii. RFC 3264 (An offer/answer model with session description protocol (SDP))
- ix. RFC 3265 (Specific event notification)
- x. SIP RFCs shall be of latest version.

23. Security Features & System Administration

- 23.1. The offered management platform should provide a comprehensive set of applications designed to simplify system administration, provisioning and network management, fault and performance management operations.
- 23.2. The system must incorporate inbuilt advanced Security features like real-time media encryption, and access security gateways.
- 23.3. All signaling between the server and its gateway should be encrypted.
- 23.4. The system shall have inbuilt diagnostic features such as isolation/detection of faulty line/junction and restoration of faulty lines/junctions after rectification.
- 23.5. System should have a web & GUI based maintenance feature.
- 23.6. The system network should be centrally administered and maintained from an appropriately equipped network management system apart from the centrally performed operational tasks which could be performed using onsite operating terminals.
- 23.7. The offered system must have the ability to record and analyze traffic measurement data so that the quality of the communication network can be checked.
- 23.8. It must also be possible to integrate the communication server into a super ordinate management system via standardized interfaces (SNMP)
- 23.9. System should have remote maintenance, administrative and diagnostic capabilities with password protection from off-site locations. It should be possible to administer the system from anywhere in the LAN network.
- 23.10. Systems should have different levels of maintenance passwords for security purposes.

24. Specifications for Mobility License:

- 24.1. The system should support programmable simultaneous ringing at any two or more extensions/PSTN line/Cell phone/other SWR extensions (in any combination as per requirement at site) for incoming calls. As soon as the call is answered in any one of the ringing phones, ring to the other phones should be stopped. Conversation should be private only between calling and the answered phones. Also, users should exercise some basic features like receiving the call, transfer to their own desk.

25. Specifications for Soft Phone and its features

- 25.1. The soft client should be from the same OEM of IP telephony systems or any third party solution for the new server. Wi-Fi facility for smartphone to be provided by the user. Authentication of soft phone should be done from the server.
- 25.2. It should be freely downloadable from Google play / Apple store.
- 25.3. Soft client should be available for Windows PC, Android Phone and Mac-OS/IOS phone.
- 25.4. Make a call. (voice / video)
- 25.5. Hold.
- 25.6. Transfer.
- 25.7. 3 way audio conference.
- 25.8. Call forward.
- 25.9. View missed call.
- 25.10. Voice mail access.
- 25.11. Contacts synchronized with the PBX directory.
- 25.12. Presences (User Selectable).
- 25.13. Change status to: available, busy no answer, busy call waiting.
- 25.14. At least 20 speed dial soft buttons for internal, external, mobile number should be available.
- 25.15. Instant messaging to soft client users.
- 25.16. "Instant messaging - IM with another soft client user, search on IM sessions, save IM sessions.
- 25.17. Contacts synchronized with the PBX directory.
- 25.18. Record on demand (ROD).
- 25.19. Call divert.
- 25.20. Camp on.

26. Specifications for BASIC SIP PHONE Entry Level IP Telephone

- 26.1. Minimum 128x64 pixel graphical LCD or higher.
- 26.2. 2 VoIP account.
- 26.3. Two port Giga ethernet switch, integrated PoE.
- 26.4. Full-duplex speaker phone.
- 26.5. Redial, call return, auto answer.
- 26.6. Call forward, call waiting, call transfer.
- 26.7. Local 3-way conferencing.
- 26.8. Busy lamp field (BLF).
- 26.9. Message waiting indicator (MWI).
- 26.10. SIP v1 (RFC2543), v2 (RFC3261) or equivalent.
- 26.11. IPV4 / IPV6.
- 26.12. NAT transverse: STUN mode/ secure methods like SBC or VPN.
- 26.13. Proxy mode and peer-to-peer SIP link mode (optional).

- 26.14. Power over Ethernet (IEEE 802.3af).
- 26.15. Should supply suitable POE Injector.
- 26.16. The SIP phone preferable should be of same OEM as of IP-PBX and should support all features of IP-PBX.

27. Specifications for Medium IP Phone:

- 27.1. Speed: 10/100/1000.
- 27.2. It should have 3.5" or higher, 240x120 pixel graphical LCD with backlight or better display.
- 27.3. 6 VoIP accounts or higher.
- 27.4. Two port Giga ethernet switch, integrated PoE.
- 27.5. Full-duplex speaker phone.
- 27.6. Headset, wall mountable.
- 27.7. Remote phonebook.
- 27.8. Extended SIP functionality.
- 27.9. Call hold, mute, DND.
- 27.10. One touch speed dial, hotline.
- 27.11. Redial, call return, auto answer.
- 27.12. Call forward, call waiting, call transfer.
- 27.13. Group listening, emergency call.
- 27.14. Local 3-way conferencing or higher.
- 27.15. Direct IP call without SIP proxy.
- 27.16. Ringtone selection/import/delete.
- 27.17. Keypad lock, emergency call.
- 27.18. Set date time manually or automatically.
- 27.19. Dial Plan, browser, action URL & action URI.
- 27.20. RTCP-XR or any more features.
- 27.21. Full duplex hands free speakerphone with AE.
- 27.22. Codec: G.711(A/μ), G.729AB, G.726, G.723.1 or equivalent or better.
- 27.23. VAD, CNG, AEC, PLC, AJB, AGC management or better.
- 27.24. Configuration: browser/phone/auto provision.
- 27.25. Auto provision via FTP/TFTP/HTTP/HTTPS for mass deployment.
- 27.26. Auto provision with PnP.
- 27.27. Provisioning server redundancy supported.
- 27.28. Reset to factory, reboot.
- 27.29. Package tracing export, system log.
- 27.30. Zero-sp-touch.
- 27.31. Phone lock for personal privacy protection.
- 27.32. Busy lamp field (BLF).
- 27.33. Bridged line appearance (BLA).
- 27.34. Anonymous call, anonymous call rejection.
- 27.35. Message waiting indicator (MWI).

- 27.36. Voicemail, Call Park, call pickup.
- 27.37. Intercom, paging, music on hold, emergency call.
- 27.38. Call completion, call recording.
- 27.39. Hot-desking (Optional).
- 27.40. Dual port Gigabit ethernet.
- 27.41. 8 line keys with LED can be programmed for up to 21 features (3 page view) or more.
- 27.42. 8 feature keys: message, headset, redial, transfer, mute, conference, hold, hands free speaker phone.
- 27.43. 6 navigation keys or more.
- 27.44. Volume control keys.
- 27.45. Paperless label design.
- 27.46. 1xRJ9 handset port.
- 27.47. Wall mountable (optional).
- 27.48. Power over Ethernet (IEEE802.3af), class 2 or better.
- 27.49. Should supply suitable POE injector.
- 27.50. The SIP phone preferable should be of same OEM as of IP-PBX and should support all features of IP-PBX.

28. Specifications for IP VIDEO PHONE with POE Injector:

- 28.1. 7 inch (1024 x 600) capacitive adjustable touch screen, LCD screen, 720p30 HD video or better.
- 28.2. Should run on latest android.
- 28.3. Should have a removable two megapixel HD camera or higher.
- 28.4. Built-in Bluetooth 4.0+ or higher for headsets and pairing mobile device
- 28.5. Built in Wi-Fi (802.11b/g/n) or better.
- 28.6. Up to 6 VoIP accounts or more.
- 28.7. Minimum 20 on screen soft key or more should be configurable from telephony system web.
- 28.8. USB 2.0 port (2.0 compliant) for USB headset, media and storage applications.
- 28.9. HD voice: HD handset, HD speaker.
- 28.10. Audio codec: Opus, G.722, G.722.1, G.722.1C, G.711(A/μ), G.723, G.726,
- 28.11. G.729AB, iLBC or any other protocols.
- 28.12. Full duplex hands free speakerphone with AEC.
- 28.13. SIP v1 (RFC2543), v2 (RFC3261) or better.
- 28.14. UDP/TCP/DNS-SRV (RFC 3263) or better.
- 28.15. QoS: 802.1p/Q tagging (VLAN or better).
- 28.16. Dual port Gigabit Ethernet.
- 28.17. Power over Ethernet (IEEE 802.3af), class 3.
- 28.18. IPv4/IPv6.
- 28.19. SIP v1 (RFC2543), v2 (RFC3261).
- 28.20. Call server redundancy supported.

- 28.21. 5 points multi touch surface or more.
- 28.22. Screensaver and wallpaper.
- 28.23. LED for call and message waiting indication or any other option.
- 28.24. Dual port gigabit ethernet.
- 28.25. Power over Ethernet (IEEE 802.3af), class 3.
- 28.26. The SIP phone preferable should be of same OEM as of IP-PBX and should support all features of IP-PBX.
- 28.27. Should supply suitable POE injector.

29. Installation and commissioning of servers: Programming of 2 servers for location mentioned in schedule as per the site requirement. Programming of extensions (Analog, IP, SIP trunk) in the servers. Programming of analog extensions in gateways (96/48/24/8 port) at different locations over SWR. Programming of PRI gateways and IP/softphones as per site requirement.

1. Switches

- 1.1. 8 Port Layer 2 Managed POE Field Switch:** It should meet the requirements of clause no. 14.0(III) of RDSO Specification No. RDSO/SPN/TC/65/2021 Ver. 6.0 with Amdt. 1 or latest. It should include the required OEM SFP BX SM modules loaded and all the accessories required for installation.

Note:-Switch supplied should be of the latest model of any reputed make. OEM shall certify that service support will be extended up to completion of codal life.

- 1.2. 24 Port layer 2 Managed POE Switch:** It should meet the requirements of clause No.14.0(II) of RDSO Specification No. RDSO/SPN/TC/65/2021 Ver. 6.0 with Amdt. 1 or latest. It should have PoE 24 x 10/100/1000 BASE-T ports and 4x 1G (minimum) OEM BX SFP+ ports loaded. It should include the required OEM BX SM modules loaded, mounting kit and all the accessories required for installation.

Note:-Switch supplied should be of the latest model of reputed make. OEM shall certify that service support will be extended up to completion of codal life.

- 1.3. Layer 2 Switch Minimum 8+2 Port:** Manageable with 8 Nos 10/100/1000 Mbps Ethernet port, POE+ and single fiber 2 Nos 1G SFP Port with OEM BX SM SFP optical modules loaded with rack mounting kit and all the accessories required for installation.

- 1.4. 24 Port Managed Aggregation Switch:** It should meet the requirements of clause No. 14.0(I) of RDSO Specification No. RDSO/SPN/TC/65/2021 Ver. 6.0 with Amdt. 1 or latest. It should include the required OEM SFP BX SM Modules loaded, mounting kit and all the accessories required for installation.

Note:-Switch supplied should be of the latest model of reputed make. OEM shall certify that service support will be extended up to completion of codal life.

- 1.5. Layer 3, 24 Port Managed Switch:** It should be 19 inch rack mountable layer 3, 24 Port managed switch with 24 Nos of 10/100/1000 Ethernet ports with POE+ support with redundant power

supply, dedicated stacking module 4 x 10 GBE SFP ports for uplink including 4Nos of OEM 10 GBE BX SM SFP modules loaded along with mounting kit with all necessary accessories, shall be conforming to para number 4.0 of RDSO SPECIFICATION NO. RDSO/SPN/TC/83/2020 Rev 2.1 or latest mounting kit with all necessary accessories.

Note:-Switch supplied should be of latest model of reputed brand and should have service support up to completion of codal life.

- 1.6. 1G Ethernet and E1 to Optical signal and vice versa managed media convertor:** Supply and installation shall be conforming to RDSOSpecification No. RDSO/SPN/TC/103/2013 Rev. 2 or latest.

Note: Media converter supplied should be of latest model of reputed make and should have service support up to completion of codal life.

- 1.7. LAN Extender:** Supply of **LAN extender** shall be conforming to RDSO Specification No. RDSO/SPN/TC/82/2020 Rev. 2 or latest.

- 1.8. CAT-6 Patch Cord - 3/5/10 mtrs:** UTP CAT-6 cable, cable jacket low smoke zero halogen (LSZH), conductor dia 23 AWG. Make D-Link or equivalent.

- 1.9. Wall Mountable RJ- 45Socket:** Single port CAT-6 information outlet, face plate with SMB/Gang box for data outlets. Outlets should have inbuilt shutters and network keystone jack including all the accessories. It should comply with the standard colour coding of ethernet CAT-6 cable. Make Legrand, D-Link or equivalent.

- 1.10. RJ-45 Connector:** RJ-45 modular plug supports 4 twisted pairs, 8 positions, 8 connectors of 100 pcs/Pack. Transparent color. Contact terminal: Copper alloy. Finished: 03 MU micro inch gold plating. Use for 23-26 AWG stranded wires, meet wiring scheme T568A/T568B. It should be suitable for STP/UTP CAT-6 cable as per field requirements. Make D-Link or equivalent.

2. Network Racks:

- 2.1. 19" 6U 350mm X 600mm depth rack (Wall mountable):**

- i. Type : closed telecom rack wall/pole mountable.
- ii. Dimension: 350 mm (height) X 600mm (width) X 600 mm (depth)
- iii. Mounting: rack should have wall/channel/beam mounting with heavy brackets and fasteners of required shape and size as per

- site condition. It shall be insulated from the wall/channel/beam/shelter through insulators
- iv. Front Door: rack should have front door tough and transparent glass fitted on MS/CRCA sheet on sides with lock and key.
- v. Rear Door: MS/CRCA sheet.
- vi. Top & Bottom: rack top and bottom should be MS/CRCA steel made with cable entry provision with glands at both sides.
- vii. Fan Module: Compact fan module of 90 CFM working on 230VAC2 Nos with each rack properly fitted at top of rack.
- viii. Earthing Provision: rack should have earthing provisions.
- ix. Cable Manager: 1 No. horizontal and 1 No. vertical cable manager with cable loops to be provided with each rack.
- x. Power distribution unit (PDU): PDU is of 6 sockets of branded make with 6 amp MCB.
- xi. The rack should be fitted with one modem tray 19" back side of the rack should be closed with a removable panel.
- xii. The good quality powder coating light grey in colour shall be used for painting of the rack
- xiii. Rack should be minimum IP54 certified. Rack should also comply with EIA 310/DIN 41494 standards.

2.2. 19" 9 U rack 600 X 600mm depth rack (wall/pole mountable):

- i. Type: closed telecom rack wall/pole mountable.
- ii. Dimension: 600mm (width) X 600 mm (depth).
- iii. Mounting: rack should have wall/channel/beam mounting with heavy brackets and fasteners of required shape and size as per site condition. It shall be insulated from the wall/channel/beam/shelter through insulators.
- iv. Front Door: rack should have front door tough and transparent glass fitted on MS/CRCA sheet on sides with Lock and key.
- v. Rear Door: MS/CRCA sheet.
- vi. Top & Bottom: rack top and bottom should be MS/CRCA steel madewith cable entry provision with glands at both sides.
- vii. Fan Module: Compact fan module of 90 CFM working on 230VAC2 Nos with each rack properly fitted at top of rack.
- viii. Earthing provision: Rack should have earthing provisions.
- ix. Cable Manager: 1 No horizontal and 1 No vertical cable manager withcable loops to be provided with each rack.
- x. Power distribution unit (PDU): PDU is of 6 Sockets of branded make with 6 amp MCB.
- xi. The rack should be fitted with one modem tray 19" back side of the rack should be closed with a removable panel.

- xii. The good quality powder coating light grey in colour shall be used for painting of the rack.
- xiii. Rack should be minimum IP54 certified. Rack should also comply with EIA 310/DIN 41494 standard.

2.3. Specifications for 19" 24 U 600 X 600mm depth rack:

- i. Type : closed telecom rack floor mountable
- ii. Dimension: 600mm (width) X 600 mm (depth)
- iii. Mounting: Floor mounting with all the accessories required for installation
- iv. Front Door: Rack should have front door tough and transparent glass fitted on MS/CRCA sheet on sides with lock and key.
- v. Rear Door: MS/CRCA door plain having ventilation holes bottom side with dust filters.
- vi. Top & Bottom: rack top and bottom should be MS/CRCA steel made with cable entry provision with glands at both sides
- vii. Fan Module: compact fan module of 90 CFM working on 230VAC 2 Nos. with each rack properly fitted at top of rack.
- viii. Earthing Provision: rack should have earthing provisions. All the required materials for earthing is to be supplied with rack.
- ix. Cable manager: 1No horizontal and 1No vertical cable manager with cable loops to be provided with each rack.
- x. Power distribution unit (PDU): PDU is of 6 sockets branded with 6 amp MCB
- xi. Materials used: CRCA/MS with thickness varying from 1.6mm to 2.0mm.
- xii. The rack should be fitted with one modem tray 19" back side of the rack should be closed with a removable panel.
- xiii. The good quality powder coating light grey in colour shall be used for painting of the rack.
- xiv. OEM should have a valid ISO 9001 certification on the date of opening of bid.
- xv. Rack should be minimum IP54 certified. Rack should also comply with EIA 310/DIN 41494 standards.

2.4.Specifications for 19" 27 U 600 X 600mm depth rack:

- i. Type: closed telecom rack floor mountable.
- ii. Dimension: 600mm (width) X 600 mm (depth).
- iii. Mounting: floor mounting with all the accessories required for installation

- iv. Front Door: Rack should have front door tough and transparent glass fitted on MS/CRCA sheet on sides with lock and key.
- v. Rear Door: MS/CRCA door plain having ventilation holes bottom side with dust filters.
- vi. Top & Bottom: rack top and bottom should be MS/CRCA steel made with cable entry provision with glands at both sides.
- vii. Fan Module: compact fan module of 90 CFM working on 230VAC 2 Nos. with each rack properly fitted at top of rack.
- viii. Earthing provision: rack should have earthing provisions. All the required materials for earthing is to be supplied with rack.
- ix. Cable manager: 1No. horizontal and 1No. vertical cable manager with cable loops to be provided with each rack.
- x. Power distribution unit (PDU): PDU is of 6 sockets branded with 6 amp MCB.
- xi. Materials used: CRCA/MS with thickness varying from 1.6mm to 2.0mm.
- xii. The rack should be fitted with one modem tray 19" back side of the rack should be closed with a removable panel.
- xiii. The good quality powder coating light grey in colour shall be used for painting of the rack.
- xiv. OEM should have a valid ISO 9001 certification on the date of opening of bid.
- xv. Rack should be minimum IP54 certified. Rack should also comply with EIA 310/DIN 41494 standards.

2.5.19"42 U 600mm width X 600 mm depth rack:

- i. Dimension: 600mm (width) X 600 mm (depth).
- ii. Side panels: to be provided across the whole height of the rack should be open-able with a latching arrangement at top and bottom with key and lock arrangement
- iii. Front door: rack should have front door tough and transparent glass fitted on MS/CRCA sheet on sides with lock and key.
- iv. Rear side: rack shall be perforated for appropriate levels as per industry standard
- v. Top & Bottom: rack top and bottom should be MS/CRCA steel made with cable entry provision with glands at both sides.
- vi. Fan module: compact fan module of 90CFM working on AC power supply 4 Nos each rack properly fitted at top of rack.
- vii. Earthing provision: rack should have earthing provisions.
- viii. Cable manager: 2Nos horizontal and 2Nos vertical cable managers with cable loops to be provided with each rack with plastic loop.

- ix. Power distribution unit (PDU): adequate and redundant power distribution units with electronically controlled circuits for surge and spike protection, MCBs isolated input to ground and output to ground.
- x. Material used: CRCA/MS with thickness varying from 1.6mm to 2.0mm.
- xi. The rack should be fitted with one modem tray 19", rack should be 42U (1U = 44.45mm) in height.
- xii. The earthing kit consisting of copper bus bar with dimensions 20 inch length, 1.0 inch breadth & 5mm thickness (min.) having appropriate number of M6 tapped holes and 3 brass nut bolts and washers for fixing of earthing cables shall be fixed near the bottom of the rack.
- xiii. The good quality powder coating light grey in colour shall be used for painting the rack.

2.6. 19"42U 800 mm width X 1200mm depth rack:

- i. Racks manufactured out of steel sheet punched, formed, welded and powder coated.
- ii. Rack should be from ISO 14001, 27000 certified company & UL listed.
- iii. Standard for racks configuration will be welded frame with side panel and vented top cover.
- iv. Rack should have front transparent door and dual perforated door at rear.
- v. Rack should have 2 no's of removable side panel with slam latch with key & lock arrangement.
- vi. Rack should have provision to mount racks on floor
- vii. Rack should be 42U (1U = 44.45 mm) in height.
- viii. It should be 800mm width and 1200MM depth
- ix. Rack should include adapter kit 1No (loop type) and rack mount sliding rail for mounting of servers
- x. The rack unit supported by casters static load of at least 350Kgs and by levelers should support a static load of at least 750 Kgs.
- xi. Rack should have minimum IP 20 certified and conforms to 310 DIN 41494 or equivalent EIA /ISO / EN standard.
- xii. Rack should have adjustable mounting depth.
- xiii. 4Nos adjustable, 19" verticals with punched 9mm square hole and universal 12.7mm-15.875mm-15.875mm or as per manufacturer alternating hole pattern offers greater mounting flexibility, maximizes usable mounting space.
- xiv. Rack should have numbered U positions.

- xv. Rack should have 100% assured compatible 41494 (General industrial standard for equipment).
- xvi. Powder coated finish with seven tanks pretreatment process meeting IS standard.
- xvii. Rack should have proper grounding and bonding.
- xviii. Rack should have fan module mount provision on top cover.
- xix. Rack should have fan tray with 4 Nos 90 CFM fan.
- xx. Rack should have 1 No fixed shelf with 715mm depth for mounting non-rack mountable equipment & 1 No sliding key board tray.
- xxi. Rack should have server /IT rack mount 2Nos power dunit, 1Ph, 230V, 8A, 50/60Hz, 2U standard with 8 x intel multi pin 5A, inlet plug type 6A Indian round pin, 6A Fuse - PDU rating 1.8KVA/Side or higher feed-1.5Mt/ black
- xxii. Rack should have 2Nos horizontal cable and 2Nos vertical manger/organizer with plastic loops
- xxiii. The earthing kit consisting of copper bus bar with dimensions 20 inch length, 1.0 inch breadth & 5 mm thickness (min.) having appropriate number of M6 tapped holes and 3 brass nut bolts and washers for fixing of earthing cables shall be fixed near the bottom of the rack
- xxiv. Rack should have PIS:1554 Part-1.provision for cable entry exit from both top and bottom.
- xxv. Rack should have 1 packet of mounting hardware.
- xxvi. Supply and fixing of metal cable tray of 150 mm width and 2 meter length along with all accessories required for fixing from rack to MDF with laying and bunching of cables neatly, rack all doors should be removable type four exhaust fans, server's mounts and channel, key board tray, one horizontal Tray, one AC multiple (8 Nos of 5A sockets) earthing strip (Copper)-1 with fasteners.