

**Schedule 5(p)**  
**Telephony System**

# California High-Speed Rail Authority



## Standard Specifications TSCC Specifications SPEC-0020 – Telephony System Rev. 1.0

**Authored:**

A handwritten signature in black ink, appearing to read "Harshal Jadhav".

Harshal Jadhav, Telecommunication Systems Lead

12/22/2025

Date

**Checked:**

A handwritten signature in black ink, appearing to read "Thomas Newey".

Thomas Newey, Telecoms Lead

12/22/2025

Date

**Checked:**

A handwritten signature in black ink, appearing to read "Bruno Comperat".

Bruno Comperat, Deputy Director of Rail Engineering

12/23/2025

Date

**Approved:**

A handwritten signature in blue ink, appearing to read "Ryan Scott".

Ryan Scott, Director of Rail Engineering

12/23/2025

Date

**Released:**

A handwritten signature in blue ink, appearing to read "Amit Joshi".

Amit Joshi, Configuration Manager

12/23/2025

Date



**Document Revision History – Telephony System Specifications****Second Edition****December 2025**

| Revision | Date           | Revision Description          |
|----------|----------------|-------------------------------|
| 0.0      | September 2025 | First edition                 |
| 1.0      | December 2025  | Second edition for Addendum 2 |
|          |                |                               |
|          |                |                               |
|          |                |                               |
|          |                |                               |
|          |                |                               |
|          |                |                               |
|          |                |                               |
|          |                |                               |



# TABLE OF CONTENTS

|           |                                                             |           |
|-----------|-------------------------------------------------------------|-----------|
| <b>1</b>  | <b>INTRODUCTION .....</b>                                   | <b>5</b>  |
| 1.1       | SCOPE OF THE TECHNICAL SPECIFICATION.....                   | 5         |
| <b>2</b>  | <b>REFERENCE STANDARDS AND DOCUMENTS.....</b>               | <b>6</b>  |
| 2.1       | GENERAL .....                                               | 6         |
| 2.2       | DESIGN GUIDELINES.....                                      | 6         |
| 2.3       | STANDARDS .....                                             | 6         |
| 2.4       | OTHER DOCUMENTS .....                                       | 10        |
| <b>3</b>  | <b>TERMS, DEFINITIONS, AND ABBREVIATIONS .....</b>          | <b>11</b> |
| 3.1       | TERMS, DEFINITIONS AND ABBREVIATIONS .....                  | 11        |
| <b>4</b>  | <b>SYSTEM DESCRIPTION .....</b>                             | <b>12</b> |
| 4.1       | PURPOSE OF THE TELEPHONY SYSTEM .....                       | 12        |
| 4.2       | TELEPHONY SYSTEM DEFINITION .....                           | 12        |
| 4.3       | TELEPHONY SYSTEM OPERATIONAL CONTEXT .....                  | 12        |
| 4.4       | DESIGN LIFE .....                                           | 12        |
| <b>5</b>  | <b>SYSTEM REQUIREMENTS.....</b>                             | <b>13</b> |
| 5.1       | GENERAL REQUIREMENTS.....                                   | 13        |
| 5.2       | ENVIRONMENTAL CONDITIONS REQUIREMENTS.....                  | 13        |
| 5.3       | OPERATIONAL REQUIREMENTS FOR TELEPHONY SYSTEM .....         | 13        |
| 5.4       | FUNCTIONAL REQUIREMENTS FOR TELEPHONY SYSTEM.....           | 14        |
| 5.5       | PERFORMANCE REQUIREMENTS FOR TELEPHONY SYSTEM.....          | 22        |
| 5.6       | CYBERSECURITY AND SECURITY REQUIREMENTS.....                | 23        |
| <b>6</b>  | <b>INTERFACES REQUIREMENTS.....</b>                         | <b>24</b> |
| 6.1       | GENERAL REQUIREMENTS.....                                   | 24        |
| 6.2       | THIRD PARTY INTERFACES .....                                | 24        |
| 6.3       | EXTERNAL INTERFACES – STATION CONTRACTOR.....               | 24        |
| 6.4       | EXTERNAL INTERFACES – FACILITIES CONTRACTOR .....           | 24        |
| 6.5       | INTERNAL INTERFACES .....                                   | 25        |
| <b>7</b>  | <b>MATERIALS, PRODUCT AND COMPONENTS REQUIREMENTS .....</b> | <b>27</b> |
| 7.1       | GENERAL REQUIREMENTS.....                                   | 27        |
| 7.2       | SOFTWARE AND HARDWARE REQUIREMENTS .....                    | 27        |
| 7.3       | EMC REQUIREMENTS.....                                       | 27        |
| <b>8</b>  | <b>TOLERANCES .....</b>                                     | <b>28</b> |
| <b>9</b>  | <b>SCOPE OF SUPPLY AND DELIVERY .....</b>                   | <b>29</b> |
| 9.1       | GENERAL REQUIREMENTS.....                                   | 29        |
| 9.2       | SPECIFIC REQUIREMENTS .....                                 | 29        |
| <b>10</b> | <b>MANUFACTURING.....</b>                                   | <b>30</b> |
| 10.1      | GENERAL REQUIREMENTS.....                                   | 30        |



|           |                                                 |           |
|-----------|-------------------------------------------------|-----------|
| <b>11</b> | <b>INSTALLATION AND INTEGRATION.....</b>        | <b>31</b> |
| 11.1      | GENERAL REQUIREMENTS.....                       | 31        |
| <b>12</b> | <b>TESTING &amp; ACCEPTANCE .....</b>           | <b>32</b> |
| 12.1      | GENERAL REQUIREMENTS.....                       | 32        |
| 12.2      | SPECIFIC REQUIREMENTS FOR TELEPHONY SYSTEM..... | 32        |
| <b>13</b> | <b>SUBMITTALS.....</b>                          | <b>33</b> |
| 13.1      | GENERAL REQUIREMENTS.....                       | 33        |
| <b>14</b> | <b>QUALITY MANAGEMENT.....</b>                  | <b>34</b> |
| 14.1      | GENERAL REQUIREMENTS.....                       | 34        |
| <b>15</b> | <b>ADDITIONAL INFORMATION REQUESTED .....</b>   | <b>35</b> |
| 15.1      | GENERAL REQUIREMENTS.....                       | 35        |
| <b>16</b> | <b>LOGISTICS .....</b>                          | <b>36</b> |
| 16.1      | GENERAL REQUIREMENTS.....                       | 36        |



# 1 INTRODUCTION

## 1.1 Scope of the Technical Specification

- 1.1.1 The scope of this Technical Specification is to define the Authority's Requirements for the Telephony System.
- 1.1.2 This Technical Specification is based on the Authority's Design Criteria Manual (DCM) Chapter 12: Communication Systems and Train Control.
- 1.1.3 The functional architecture of the Telephony System is presented in Appendix A.
- 1.1.4 The requirements are formulated using the following words and their meanings:
  - **"Shall"**: Indicates a mandatory requirement that must be strictly implemented; a waiver from a mandatory requirement is permissible only with approval of a design variance.
  - **"Should"**: Indicates a preferred course of action; a design variance is not required if it is not exercised.
  - **"Must"**: Indicates an obligation or a mandatory requirement.
  - **"May"**: Indicates a permissible course of action within the limits of the standards; a design variance is not required if it is not exercised.



## 2 REFERENCE STANDARDS AND DOCUMENTS

### 2.1 General

2.1.1 The TSCC Contractor shall apply the in-force standards, guidelines and specifications provided in this technical specification for all stages of the design, test, manufacture, supply, delivery, assembly, installation, testing, commissioning, training, operations and maintenance.

2.1.2 All generic standards to be used are provided in: Technical Contract Requirements.

### 2.2 Design Guidelines

2.2.1 The latest version of the following Design Guidelines shall be applied:

| ID   | Code                   | Title                                                |
|------|------------------------|------------------------------------------------------|
| [R1] | Design Criteria Manual | Chapter 5 – Safety and Security                      |
| [R2] | Design Criteria Manual | Chapter 12 – Communication Systems and Train Control |
| [R3] | AREMA Standards        | Chapter 17 – High-Speed Rail Systems                 |

**TABLE 61 DESIGN GUIDELINES**

### 2.3 Standards

2.3.1 The TSCC Contractor shall fully consider and apply the following standards:

| ID    | Standard     | Title                                                                                                                                                                      |
|-------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [R4]  | EN 300 386   | Telecommunication network equipment; Electromagnetic Compatibility (EMC) requirements; Harmonized Standard covering the essential requirements of the Directive 2014/30/EU |
| [R5]  | EN 50121     | Railway Applications – Electromagnetic Compatibility                                                                                                                       |
| [R6]  | EN 50121-3-2 | Railway applications - Electromagnetic compatibility - Part 3-2: Rolling stock - Apparatus                                                                                 |
| [R7]  | EN 50121-4   | Railway applications - Electromagnetic compatibility - Part 4: Emission and immunity of the signaling and telecommunications apparatus                                     |
| [R8]  | EN 50121-5   | Railway applications - Electromagnetic compatibility Emission and immunity of fixed power supply installations and apparatus                                               |
| [R9]  | EN 50122-1   | Railway applications - Fixed installations - Electrical safety, earthing and the return circuit - Part 1: Protective provisions against electric shock                     |
| [R10] | EN 50125     | Railway applications - Environmental conditions for equipment                                                                                                              |
| [R11] | EN 50126-1   | Railway applications - The Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS) - Part 1: Generic RAMS Process                  |
| [R12] | EN 50126-2   | Railway applications - The Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS) - Part 2: Systems Approach to Safety            |
| [R13] | EN 50128     | Railway applications - Communication, signaling and processing systems - Software for railway control and protection systems                                               |



| ID    | Standard        | Title                                                                                                                                                                   |
|-------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [R14] | EN 50159        | Railway applications - Communication, signaling and processing systems - Safety-related communication in transmission systems                                           |
| [R15] | EN 50164        | Lightning Protection Components                                                                                                                                         |
| [R16] | EN 50164-3      | Lightning Protection Components (LPC) -- Part 3: Requirements for isolating spark gaps                                                                                  |
| [R17] | EN 55024        | Information technology equipment. Immunity characteristics. Limits and methods of measurement                                                                           |
| [R18] | EN 60065        | Audio, video and similar electronic apparatus - Safety requirements                                                                                                     |
| [R19] | EN 60118-4      | Hearing Aids - Part 4: Magnetic Field Strength in Audio-Frequency Induction Loops for Hearing Aid Purposes                                                              |
| [R20] | EN 60529        | Degrees of protection provided by enclosures (IP Code)                                                                                                                  |
| [R21] | EN 61000-6      | Electromagnetic compatibility (EMC) - generic standards                                                                                                                 |
| [R22] | EN 61000-6-2    | Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments                                                       |
| [R23] | EN 61000-6-4    | Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments                                                       |
| [R24] | EN 61508        | Functional safety of electrical/electronic/programmable electronic safety-related systems                                                                               |
| [R25] | EN 62262        | Degrees Of Protection Provided By Enclosures For Electrical Equipment Against External Mechanical Impacts (Ik Code).                                                    |
| [R26] | EN 62305        | Protection against lightning                                                                                                                                            |
| [R27] | ETSI EN 301 462 | Human Factors (HF); Symbols to identify telecommunications facilities for deaf and hard of hearing people                                                               |
| [R28] | ETSI Q.SIG      | ISDN Based Signaling Protocol                                                                                                                                           |
| [R29] | IEC 60304       | Standard colors for insulation for low-frequency cables and wires                                                                                                       |
| [R30] | IEC 61000-3-6   | Electromagnetic compatibility (EMC) - Part 3: Limits - Section 6: Assessment of emission limits for distorting loads in MV and HV power systems - Basic EMC publication |
| [R31] | IEC 61000-3-7   | Electromagnetic compatibility (EMC) - Part 3-7: Limits - Assessment of emission limits for the connection of fluctuating installations to MV, HV and EHV power systems  |
| [R32] | IEC 61000-5-2   | Electromagnetic compatibility (EMC) - Part 5: Installation and mitigation guidelines - Section 2: Earthing and cabling                                                  |
| [R33] | IEC 61643       | Low-voltage surge protective devices                                                                                                                                    |
| [R34] | IEEE 60068-2-1  | Environmental testing - Part 2-1: Tests - Test A: Cold                                                                                                                  |
| [R35] | IEEE 60068-2-30 | Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)                                                                               |



| ID    | Standard                      | Title                                                                                                     |
|-------|-------------------------------|-----------------------------------------------------------------------------------------------------------|
| [R36] | IEEE 802.1Q                   | IEEE Standard For Local And Metropolitan Area Networks--Bridges And Bridged Networks                      |
| [R37] | IEEE 802.1x                   | Port-based Network Access Control (PNAC)                                                                  |
| [R38] | IEEE 802.3                    | 10/100 BASE-T specification                                                                               |
| [R39] | IEEE 802.3af                  | Power over Ethernet (PoE)                                                                                 |
| [R40] | IEEE 802.3at                  | Power over Ethernet Plus (PoE+)                                                                           |
| [R41] | IETF RFC 1825 & RFC 1829      | Internet Protocol Security (IPSec)                                                                        |
| [R42] | IETF RFC 2131                 | Dynamic Host Configuration Protocol (DHCP)                                                                |
| [R43] | IETF RFC 2865                 | Remote Authentication Dial In User Service (RADIUS)                                                       |
| [R44] | IETF RFC 3261 & RFC 2543      | SIP - Session Initiation Protocol                                                                         |
| [R45] | IETF RFC 3411 & RFC 3418      | Simple Network Management Protocol (SNMPv3)                                                               |
| [R46] | IETF RFC 4510                 | Lightweight Directory Access Protocol (LDAP)                                                              |
| [R47] | IETF RFC 5246                 | Secure Sockets Layer (SSL)                                                                                |
| [R48] | IETF RFC 791                  | IP – Internet Protocol                                                                                    |
| [R49] | ITU-T G.652/G.655/G.656/G.657 | Fiber Optic Cable Specification                                                                           |
| [R50] | ITU-T G.703                   | G.703 Digital Interface                                                                                   |
| [R51] | ITU-T G.711/G.729/G.723       | Audio Data Compression                                                                                    |
| [R52] | ITU-T G.8010                  | Architecture of Ethernet layer networks                                                                   |
| [R53] | ITU-T G.803                   | Architecture of transport networks based on the synchronous digital hierarchy (SDH)                       |
| [R54] | ITU-T H.323                   | H.323 Call Signaling and Control Protocol                                                                 |
| [R55] | ITU-T Q.23                    | Dual-tone multi-frequency signaling (DTMF)                                                                |
| [R56] | ITU-T Q.931                   | ISDN Connection Control Protocol                                                                          |
| [R57] | ITU-T Y.1540                  | Internet protocol data communication service - IP packet transfer and availability performance parameters |
| [R58] | ITU-T Y.1541                  | Network performance objectives for IP-based services                                                      |
| [R59] | Microsoft Windows API         | Telephony API (TAPI) and Java Telephony API (JTAPI)                                                       |
| [R60] | NFPA 130                      | Fixed Guideway Transit and Passenger Rail Systems                                                         |
| [R61] | NFPA 780                      | Standard for the Installation of Lightning Protection Systems                                             |
| [R62] | TIA/EIA/TSB122-A              | Telecommunications IP Telephony Equipment Voice Gateway Loss and Level Plan Guidelines                    |





| ID    | Standard    | Title                                          |
|-------|-------------|------------------------------------------------|
| [R63] | ANSI A117.1 | Accessible and Usable Buildings and Facilities |
| [R64] | 2010 ADA    | 2010 ADA Standards for Accessible Design       |

**TABLE 62 LIST OF APPLICABLE STANDARDS**

## 2.4 Other Documents

2.4.1 The following documents shall be referred:

|       | Document                | Title                                 |
|-------|-------------------------|---------------------------------------|
| [R65] | Schedule 16             | Scope of Work                         |
| [R66] | Schedule 5(a) SPEC-0005 | Cybersecurity specification           |
| [R67] | Schedule 3              | Safety, Security and RAM Requirements |

**TABLE 63 OTHER DOCUMENTS**



### **3 TERMS, DEFINITIONS, AND ABBREVIATIONS**

#### **3.1 Terms, Definitions and Abbreviations**

- 3.1.1 All the terms, definitions, and abbreviations are provided in the Glossary of Terms, Abbreviations and Definitions.



## 4 SYSTEM DESCRIPTION

### 4.1 Purpose of the Telephony System

- 4.1.1 The purpose of the Telephony System shall be to ensure clear and reliable communication between all the locations involved in the California High-Speed Rail System operations for maintaining efficient and safe operations, coordinating emergency responses, ensuring effective staff communication, and providing aid to passengers.

### 4.2 Telephony System Definition

- 4.2.1 The Telephony System shall provide effective landline communication across the California High-Speed Rail (CHSR) System.
- 4.2.2 The Telephony System shall ensure CHSR staff's internal voice communications and links with the public network and emergency services.
- 4.2.3 The use cases for the Telephony System are as follows:
- Operational communication- To enable real-time voice communication for train operations, train control, traction, and control room activities that are critical to the safe and efficient running of trains.
  - Emergency communication- To allow instant communication during abnormal or dangerous situations to coordinate response and minimize impact on safety and service.
  - Passenger safety and security communication- To provide communication channels for passengers to request assistance or report safety/security concerns, and for staff to respond promptly.
- 4.2.4 The types of telephones based on their use cases to be provided shall include:
- Operational communication- Manual-dial IP telephones shall be used by all operational staff of the CHSR System for the operational railway traffic management in a safe and reliable way.
  - Emergency communication- An auto-dial telephone (blue light telephone) shall be provided to allow personnel to make emergency communication with the OCC.
  - Passenger safety and security communication- A Passenger Help Point (PHP) shall be provided at platforms to allow passengers to communicate with the OCC or Station operator.

### 4.3 Telephony System Operational Context

- 4.3.1 The mission of the Telephony System is to facilitate clear and reliable communication between the various stakeholders involved in the California High-Speed Rail System operations in compliance with the operational needs.

### 4.4 Design Life

- 4.4.1 The design life requirements of the Telephony System shall be 30 years.
- 4.4.2 The design life requirements of the Telephony System shall allow for the pertinent evolution and technological change of the Telephony System throughout its life to ensure it remains fit for purpose.
- 4.4.3 The TSCC Contractor shall ensure that Telephony System components with shorter design lifespans shall be managed by scheduled technology refresh strategies and spares management plans.
- 4.4.4 The TSCC Contractor shall ensure that the manufacturers will be able to produce Telephony System components (with equal or compatible technical specifications) for the entire design life required.



## 5 SYSTEM REQUIREMENTS

### 5.1 General Requirements

- 5.1.1 The Telephony System shall be designed in accordance with the requirements described in this specification.
- 5.1.2 The Telephony System shall be comprised of the following sub-systems:
- Softphone (Telephony GUI on Integrated Control and Supervision System (ICSS) workstation).
  - Auto-Dial Telephones.
  - Passenger Help Points (PHPs).
  - Manual-Dial Telephones.
  - Voice Recording System (VRS).
  - Voice Mail System.
  - Telephony Management System.
- 5.1.3 The TSCC Contractor's Telephony System design shall support both voice and data. The data refers to all non-audio digital information the Telephony System must transmit — from call control signals to emergency alerts, device status, logs, and integration data for PA, CCTV, FRMCS, and ICSS.
- 5.1.4 The TSCC Contractor's Telephony System design shall consider on-premises solutions (physical, virtualized) bearing in mind that the proposals shall be based on state-of-the-art high-speed railroad technology.
- 5.1.5 The Telephony System equipment shall be placed in locations where it does not infringe the movement of people.
- 5.1.6 The Telephony System shall have direct dial access to and from the Public Switched Telephone Network (PSTN) for voice calls.
- 5.1.7 Government Emergency Telecommunications Service access shall be provided via the Telephony System.

### 5.2 Environmental Conditions Requirements

- 5.2.1 The TSCC Contractor's Telephony System design shall be appropriate for, and resilient to, the local environmental and climatic conditions at each installation site.
- 5.2.2 The equipment provided shall be protected from damage or degradation in performance due to shock or vibration as experienced in the railway environment.
- 5.2.3 The indoor telephone equipment shall have a minimum ingress protection rating of IP30 in accordance with EN 60529.
- 5.2.4 The outdoor telephone equipment shall have a minimum ingress protection rating of IP65 in accordance with EN 60529.
- 5.2.5 The outdoor telephones shall be weatherproof and vandal resistant.

### 5.3 Operational Requirements for Telephony System

- 5.3.1 The TSCC Contractor's Telephony System design shall ensure compliance with the California HSR planned operations and shall allow the operation and maintenance of the main line and related local facilities as per the Authority's concept of operations.



- 5.3.2 The Telephony System shall provide communications between CHSR alignment locations, and also to yards, depots, operation and maintenance facilities, passenger stations, OCC, and trains.
- 5.3.3 The Telephony System shall allow communications between, at least:
- Operation control center (OCC).
  - Stations.
  - Staff offices within maintenance workshops, depot, train care facilities.
  - Technical rooms.
  - Traction power facilities.
  - Wayside facilities and shelters.
  - Elevators.
  - any other facility as required by the Authority.
- 5.3.4 The different locations where Telephony System will be deployed, will be linked together via the DCN.
- 5.3.5 All types of traffic shall be recorded via the voice and data recording system.
- 5.3.6 The TSCC Contractor shall design a comprehensive numbering plan to ensure that any operational telephone set must be able to reach any other set wherever located.
- 5.3.7 The Telephony System shall provide facilities to protect against malicious activities on the network, both internally and externally, including attacks from viruses, hacking, hijacking, spoofing and other malicious activities that may compromise the integrity of the network.

## **5.4 Functional Requirements for Telephony System**

### **5.4.1 General**

- 5.4.1.1 The Telephony System shall provide communication for operational staff and emergency communication outlets for passengers.
- 5.4.1.2 The Telephony System shall be based on redundant and centralized Main IP PABXs at the OCC to manage all the internal (on-net) and external calls (off-net) for the CHSR System.
- 5.4.1.3 The Telephony System shall be provided with Satellite IP PABXs at Stations and Depot.
- 5.4.1.4 The Main IP PABXs and the Satellite IP PABX shall be connected together via the Digital Communication Network (DCN).
- 5.4.1.5 When the DCN or the Main IP PABXs are faulty, telephone sets at stations/facilities must be provided with local basic voice communication services via the Satellite IP PABX.
- 5.4.1.6 The Telephony System shall have access to the PSTN to make external calls as well as have access to 911 and the emergency services.
- 5.4.1.7 The capacity of the connection from the Telephony System to the PSTN and to other external systems shall be determined based on anticipated usage, both inbound and outbound, using standard traffic engineering principles.

### **5.4.2 Telephony Service Features**

- 5.4.2.1 The services provided by the Telephony System shall support all communication types used by modern railway organizations and provided by modern professional telephone networks.



5.4.2.2 The Telephony System shall allow modification of services through an appropriate system software configuration.

5.4.2.3 The Telephony System shall support:

- Abbreviated dialing.
- Automatic callback.
- Call diversion/ call forward.
- Calling party name display.
- Call pick up, call recording, call transfer, call waiting, conference call.
- Direct Inward Dialing, Direct Outward Dialing.
- Distinctive Ringing.
- Do Not Disturb.
- Hands-free.
- Last Number Redial.
- Network Call Transfer.
- Voice Mail and voice mail retrieval.
- Call hold, speed dial, follow me, caller ID.

5.4.2.4 The Telephony System shall support QoS support.

5.4.2.5 The Telephony System shall be able to assign levels of service to network users and the facility for interconnection with other systems on the railway and to external networks.

5.4.2.6 The system shall provide facilities to implement call-type restrictions for designated telephone instruments, to meet the operational requirements of the Authority.

5.4.2.7 It shall be possible to manage user access to external networks by invoking call barring features.

5.4.2.8 Call barring shall be possible at individual user level for incoming and outgoing calls, as well as for national and international call barring requirements for individual locations and instruments.

5.4.2.9 The TSCC Contractor shall develop the call access matrix, Class of Services (CoS), and Quality of Service (QoS) together with the Authority.

5.4.2.10 The TSCC Contractor shall develop and prepare a comprehensive, flexible and well-defined numbering scheme and call routing facilities.

5.4.2.11 The TSCC Contractor shall propose a standard class of services for the Authority's approval.

5.4.2.12 The assignment of the Class of Services (CoS) to any telephone extension shall be configurable.

5.4.2.13 The final definition and configuration of CoS shall be subject to the approval of the Authority.

### 5.4.3 Softphone

5.4.3.1 The Softphone is a software-based telephone application that enables operators to initiate and receive voice calls from the operator workstation over the communication network.

5.4.3.2 The Softphone shall be integrated with the ICSS workstation. Once integrated, the Telephony System shall allow all the operator positions to perform all telephony functionalities in a similar manner.

5.4.3.3 The Softphone roles capability shall include (not limited to):

- Incoming access to a predetermined subset of telephones and outgoing access to a predetermined subset of telephones. Subsets may overlap.



- Allow calls to be made to endpoints by pressing a single speed dial button. Multiple screens of buttons are acceptable.
- Allow calls to be received, indicated by the flashing of the appropriate speed dial button and an audible alert.
- Allow different audible alerts to be associated with different incoming calls to provide a means of alerting the OCC to different priority calls.

5.4.3.4 The Softphone shall be configured for different operator workstation roles, which are accessible via separate logins to allow users to assume a particular pre-configured 'role' on the system via logging in to an ICSS HMI.

5.4.3.5 The pre-configured roles shall be designed to load a particular set of displays on an ICSS HMI, which shall allow calls to/from a pre-determined set of end-user devices.

5.4.3.6 Each role shall have access to the PSTN to make external calls as well as have access to 911 and the emergency services.

5.4.3.7 The following functionalities shall be supported (not limited to):

- An alphanumeric keyboard (including \* and #).
- Functional buttons for short code calls.
- SMS functionalities.
- Push To Talk (PTT) button.
- Multiple simultaneous role handling.

5.4.3.8 Functional buttons for extended functions like:

- Call mute.
- Call hold.
- Call forward.
- Call transfer.
- Call history.
- Electronic directory / Phone book.
- Conference.
- Call wizard for simple composition of functional numbers.

#### 5.4.4 Auto-Dial Telephone

5.4.4.1 Auto-dial or 'lift to call' telephones are devices that, when lifted, automatically dial one or more users, typically a specified telephone configured for a particular role.

5.4.4.2 Calls to auto-dial telephones shall only be permitted from the appropriate ICSS workstations.

5.4.4.3 Auto-dial telephones shall, at a minimum, be provided:

- At emergency access points and emergency egress locations.
- In safety refuge areas.
- On station platforms at the middle and ends of the length of each station platform.
- At traction power facilities.
- In a tunnel (if required according to NFPA 130).





- 5.4.4.4 Auto-dial telephones shall be marked by a blue light above each device.
- 5.4.4.5 Auto-dial telephones shall be weatherproof and vandal-resistant.
- 5.4.4.6 Auto-dial telephones shall be available for use, as required, without the need for access keys.
- 5.4.4.7 All auto-dial telephones shall be remotely monitored and report faults via the Telephony Management System.
- 5.4.4.8 Auto-dial telephones shall be available for use, as required, without the need for access keys.
- 5.4.4.9 The location and operational use of all auto-dial telephones shall be assessed to ensure that, once installed, users shall not be exposed to any safety risks.
- 5.4.4.10 Upon an Auto-dial telephone use, an alarm shall sound in the OCC, and the images of the CCTV camera monitoring that location shall be immediately displayed in the OCC.

#### **5.4.5 Passenger Help Point (PHP)**

- 5.4.5.1 As part of the Telephony System, all stations and elevators shall be equipped with Passenger Help Points (PHPs) to allow communication between the operators and passengers upon their request.
- 5.4.5.2 A single push of the activation button shall cause the PHP to dial a call automatically. A clear and highly intelligible voice communication shall be established between the PHP and the operator position.
- 5.4.5.3 Upon PHP use, an alarm shall sound in the OCC, and the images of the CCTV camera monitoring that location shall be immediately displayed in the OCC.
- 5.4.5.4 Calls arriving at the OCC, which are not answered within a user-defined, configurable period of 30 seconds to 120 seconds, shall be rerouted to the pre-defined operator position. The re-route destination shall be configurable.
- 5.4.5.5 A "Discrete Listening Function" shall be available to the OCC operator. The PHP shall be capable of a "discrete listening function" to be activated remotely by an operator. The audio transmission shall be one-directional from the PHP to the listener, and no visual indication is to be present for ambient listening on the PHP.
- 5.4.5.6 The PHPs shall support active noise cancellation and acoustic echo cancellation to ensure clear voice communication in noisy environments.
- 5.4.5.7 All PHPs shall be remotely monitored and report faults via the Telephony Management System.
- 5.4.5.8 The location and operational use of all PHPs shall be assessed to ensure that, once installed, no users shall be exposed to any safety risks.
- 5.4.5.9 The Height of installation for PHPs shall be adapted to people with disabilities.
- 5.4.5.10 The PHPs shall be fitted with an audio frequency induction loop (Telecoil or T-Coil) to provide better reception for hearing-impaired passengers wearing hearing aids. The audio frequency induction loops shall comply with EN 60118-4 standard.
- 5.4.5.11 Signage indicating the presence of Audio Frequency Induction Loop shall be compliant with ADA Accessibility Guidelines (ADAAG) and ANSI A117.1, including the appropriate internationally recognized symbol for induction loops where applicable.

#### **5.4.6 Manual-Dial Telephones**

- 5.4.6.1 Manual-Dial telephones shall be used by all operational and maintenance personnel of the CHSR System.



5.4.6.2 Manual-dial telephones shall be provided within all California High-Speed Rail facilities, including but not limited to:

- OCC.
- Station rooms.
- Staff offices within stations, Depot, Maintenance facilities, Train care facilities.
- Technical rooms.
- Traction power facilities.
- Wayside facilities and shelters.
- Meeting rooms.
- Ticketing offices.

5.4.6.3 Manual-dial telephones shall support a handset with 12 push-button keypad.

5.4.6.4 Manual-dial telephones shall support adjustable volume control for the speaker and ringer.

5.4.6.5 Manual-dial telephones shall support:

- minimum of 10 programmable function keys for assignment of features or additional extension circuits.
- minimum of 24 memories for speed dialing.
- Hands-free operation through built-in speaker and microphone.
- LCD display.
- Visual display of details for all simultaneous incoming and outgoing calls.
- display of call duration.
- Call waiting facility.
- Conference facility.
- System clock display.
- On-hook dialing.
- A visual notification for received messages.
- Automatic answering.

5.4.6.6 Manual-Dial telephones shall support HD video transmission for face-to-face communication.

5.4.6.7 Manual-Dial telephones shall be compliant with the right type of PoE standard, according to the telephone set consumption.

#### 5.4.7 **Voice Recording System (VRS)**

5.4.7.1 The Telephony System shall function as the CHSR central platform for logging and recording voice and data communications across all interconnected communication systems, not limited to telephony services. This shall include integration with the Voice Recording System (VRS) to capture and store all relevant communications and associated metadata, including timestamps, source/destination identifiers, and call/session details, for operational, safety, and audit purposes.



- 5.4.7.2 The Voice Recording System (VRS) shall enable the recording and logging of the following as a minimum:
- All telephone conversations to/from the OCC.
  - Passenger Help Point calls.
  - All Future Rail Mobile Communication System (FRMCS) calls and data.
  - All Dispatch Console calls and data, including Emergency Responder Communication calls and data.
  - All live PA system announcements.
- 5.4.7.3 All calls involving operator positions shall be time-stamped at the start of the call, with time and date synchronized with the Network Timing System (NTS).
- 5.4.7.4 The recording system shall provide seamless recording 24 hours a day, 7 days a week for the IP-PABXs.
- 5.4.7.5 The VRS shall be sized sufficiently to accommodate any other systems that require voice recording.
- 5.4.7.6 The overall storage capacity shall be adequate for storage of a minimum of 90 days of voice and video recordings.
- 5.4.7.7 The VRS shall support different recording formats. In addition, all supported recording formats shall be compatible with COTS audio players.
- 5.4.7.8 The VRS shall be designed based on the optimal compression ratio for the voice recording. The compression ratio shall not degrade the quality of the recorded audio beyond the audibility to the human ear, and for digital voice profiling.
- 5.4.7.9 The VRS shall support centralized collection, indexing, and secure archival of all recorded media and metadata in a searchable format, accessible only to authorized users for incident investigation, compliance audits, and system diagnostics.
- 5.4.7.10 Authorized Operator selectable functions shall provide the facility to;
- View the call log.
  - Listen to the real-time ongoing call.
  - Listen to recorded calls.
  - Play, pause, stop, fast forward, rewind, skip forward, skip reverse.
  - Playback single or multiple calls simultaneously.
  - Fast search based on items including, but not limited to, channel number, incoming number, outgoing number, call type, date, and time.
  - It shall be able to search using partial incoming or outgoing numbers.
  - Replay the same recorded file on a continuous basis until stopped by the Operator.
  - Playback stored and archived recordings without affecting the normal recording process.
  - Enable playback to be listened to simultaneously by up to four additional local or remote Operators.
  - Allow the creation of audio sequences from multiple calls.
  - Depending on access rights, live monitoring of ongoing calls shall be possible.
  - Facility to 'bookmark' a call for later searches.
- 5.4.7.11 Managed user access and export functionality shall be provided.



- 5.4.7.12 The VRS shall provide the possibility to configure filters for searching and playback of stored recordings by relevant Call Detail Records (CDR).
- 5.4.7.13 Each Call Detail Record shall contain the following minimum information:
- Phone number of the subscriber originating the call (calling party, A-party).
  - Phone number receiving the call (called party, B-party).
  - Starting time of the call (date and time).
  - Call duration.
  - Identification of the telephone exchange or equipment writing the record.
  - A unique sequence number identifying the record.
  - Additional digits on the called number are used to route the call.
  - Disposition or the results of the call, indicating, for example, whether the call was connected.
  - Route (interface) by which the call entered the exchange.
  - Route (interface) by which the call left the exchange.
  - Call type (voice, SMS, video, data, etc.).
  - Any fault condition encountered/rejected calls/blocked calls.
  - Involved parties for any type of multiparty call.
  - Radio cell information (optional).
  - Other railway-related information based on FRMCS.
- 5.4.7.14 Recorded communications shall include a means of ensuring no tampering of each audio stream has taken place in a manner suitable for evidence in a court of law.
- 5.4.7.15 In accordance with California Government Code §34090.6 and guidelines issued by the California Secretary of State - Records Management Program, all recorded and logged data including voice, video, data, and metadata shall be retained for a minimum period of 2 years or longer if required by agency policy, regulatory obligations, or operational needs. The system shall also support secure deletion of records after the retention period expires, in accordance with approved records management practices.
- 5.4.8 Telephony Management System**
- 5.4.8.1 The telephony management system shall include a comprehensive software application with a graphical environment to allow operation, configuration, and monitoring of the Telephony System of each location.
- 5.4.8.2 The telephony management system shall manage all the telephony equipment performing the following actions (not limited to):
- Configuration of the Telephony System features.
  - Supervising the state of all the equipment.
  - Analyzing alarms and taking the necessary actions.
  - Managing the system modifications.
  - Providing statistics related to telephone traffic (general, or per position).
  - Coordinating the software upgrade.



- Creation, configuration, and removal of users and assigning roles and access permissions.

5.4.8.3 A database shall be built for defining the Telephony System configurations. Any change to the database shall automatically be updated onto suitable storage devices such that an updated version of the configuration shall be available should there be a system or power failure.

5.4.8.4 The telephony traffic management statistics shall be compiled and stored on a hard disk.

5.4.8.5 The telephony management system shall provide a real-time network statistics dashboard that presents key operational and performance indicators across all telephony subsystems, including but not limited to IP PABXs and telephony endpoints. The dashboard shall support customizable views and user-defined thresholds to highlight system health, alarms, and usage patterns.

5.4.8.6 The telephony management system shall support both automated and ad hoc reporting capabilities, including:

- Real-time metrics such as traffic volume, session status, and resource utilization.
- Periodic performance reports (e.g., hourly, daily, weekly, monthly) with trend analysis, peak usage statistics, and Service Level Agreement compliance indicators.
- Usage reports per subsystem, user category, and telephony location.
- Export of reports in common formats such as PDF, CSV, and XML for integration with external systems.

The TSCC Contractor shall ensure that reports and dashboards are accessible via a secure web-based interface, support role-based access controls, and retain historical data in accordance with the Authority's data retention policy.

5.4.8.7 Any failure of any element of the Telephony System shall be indicated without delay at the telephony management system, which shall allow gathering, classifying, and logging alarm events from any system element. This management system shall allow the configuration of user profiles, new extensions, permissions, etc.

5.4.8.8 All equipment shall be monitored to ensure that a failure at the card level can be detected and reported to the internal fault diagnostics system and the ICSS System.

5.4.8.9 The telephony management system shall provide the monitoring of the Telephony line for disconnection and faults.

5.4.8.10 The telephony management system shall provide the monitoring of hardware status of auto-dial telephones and PHPs, such as off-hook, damage to the microphone or speaker, etc.

5.4.8.11 The self-test feature shall be used to monitor the hardware status of auto-dial telephones and PHPs in a timely and real-time manner. The self-test feature shall identify the faulty components of auto-dial telephones and PHPs.

#### 5.4.9 Voice Mail System

5.4.9.1 The voice mail system shall be integrated with the IP-PABXs such that access to the voice mail system shall be via the IP-PABX.

5.4.9.2 The voice mail system shall be provided for callers to leave voice messages if the call is not answered.

5.4.9.3 The voice mail system shall provide voice mailboxes for users to retrieve, record, playback, and broadcast voice messages.



- 5.4.9.4 Calls to extensions assigned with voice mail boxes shall be automatically forwarded to the voice mail system when the call is not answered or the called subscriber is busy.
- 5.4.9.5 Calls forwarded to the voice mail system shall be greeted by playing a greeting voice message. The default greeting message shall include the extension number of the called party.
- 5.4.9.6 The TSCC Contractor shall develop the voice mail system default greeting messages, which shall be submitted to the Authority for approval.
- 5.4.9.7 The caller shall be guided with the voice message playback to leave their message in the voice mail box assigned to the called party.

## **5.5 Performance Requirements for Telephony System**

### **5.5.1 General**

- 5.5.1.1 The Telephony System shall be 100% non-blocking for all calls.
- 5.5.1.2 The Telephony System shall support modern high-quality audio codecs, enabling wideband or higher voice fidelity to deliver high-definition (HD) voice communications.
- 5.5.1.3 The Telephony System shall present dial tone, where dial tone is to be presented, within 2 seconds.
- 5.5.1.4 The Telephony System shall signal internal calls within 5 seconds of dialing/autodialing.
- 5.5.1.5 The auto-dial telephone and PHP calls shall have a higher Grade of Service than the normal calls when calling between other telephone lines.
- 5.5.1.6 For calls to/from the OCC operator positions and emergency service through the PSTN, the Telephony System shall also be 100% non-blocking.
- 5.5.1.7 The audio quality of live calls and recorded calls that are replayed shall have a Mean Opinion Score (MOS) of 3.9 or greater as defined in ITU-T Recommendation P.800.
- 5.5.1.8 The Telephony System shall include the hardware, software, and licensing for the complete CHSR System requirements, plus 25 percent additional capacity for endpoints of all types being used.
- 5.5.1.9 The Telephony System shall be flexible to accommodate changes and expansions without service interruption.
- 5.5.1.10 The Telephony System shall be capable of establishing calls through different call routes to overcome any possible failure.
- 5.5.1.11 The Telephony System software maintenance and upgrades/updates/configuration shall be carried out over the Digital Communication Network (DCN) and not require the system to be taken out of operation.
- 5.5.1.12 The TSCC Contractor shall propose traffic capacity criteria for the Telephony System based on operational requirements of similar-sized projects.
- 5.5.1.13 The final call handling capacity shall be subject to the Authority's approval.
- 5.5.1.14 All voice recordings shall be captured in high audio quality and shall include accurate time and date stamps, synchronized with the Network Timing System (NTS).
- 5.5.1.15 The PHPs shall be equipped with an ambient noise level sensor for background noise cancellation. Noise cancellation shall reduce  $\geq 15$  dBA below background noise up to 75 dBA at a distance of  $\leq 1.5$  meters and at a height of 1.5 meters while supporting Speech Transmission Index  $\geq 0.75$ .



### 5.5.2 Safety Requirements

- 5.5.2.1 The Telephony System shall comply with the safety requirements defined in the Authority's System Safety Plan.

### 5.5.3 RAM Requirements

- 5.5.3.1 The TSCC Contractor shall be responsible to perform all the activities as specified in Schedule 1 and the Authority's RAM Management Plan.

## 5.6 Cybersecurity and Security Requirements

- 5.6.1 The TSCC Contractor's design and implementation plan for the Telephony System shall be in full compliance with the Cybersecurity Technical Specification
- 5.6.2 The Telephony System shall have a nominated System Owner accountable for the ownership and mitigation of identified cybersecurity risks.
- 5.6.3 The System Owner shall ensure that threat modelling and risk assessment activities include appropriate resources and SMEs.
- 5.6.4 The Telephony Systems design and implementation plan shall be co-engineered with the TSCC Contractor's cybersecurity team and interfacing system teams to ensure threats are identified and mitigated throughout the project's lifecycle
- 5.6.5 Common Voice Over IP vulnerabilities shall be considered during the design of security controls for the Telephony System, including:
- Caller spoofing
  - Eavesdropping
  - Denial of Service attacks
  - Social engineering
  - Infrastructure-based attacks, including ransomware, malware, and system compromise
- 5.6.6 Secure protocols shall be used to protect the confidentiality and integrity of Voice Over IP traffic; the protocols shall use the approved encryption algorithms defined in the cybersecurity specification; protocols such as SRTP or SIP shall leverage approved cryptographic key exchange protocols in conjunction with AES encryption.
- 5.6.7 Voice over IP endpoints, including phones and other connected devices, shall be authenticated in accordance with the authentication and cryptographic requirements outlined in the cybersecurity specification.





## 6 INTERFACES REQUIREMENTS

### 6.1 General Requirements

6.1.1 The interfaces are classified as following:

- Third Party interfaces: interfaces between TSCC systems and systems provided by Third Party (excluding CHSR contractors)
- External interfaces: interface between TSCC systems and systems provided by CHSR contractors (Civils Packages, Stations contractor, Facilities contractor, Solar PV and BESS contractors)
- Internal Interfaces: Interfaces between systems within the TSCC scope

6.1.2 The TSCC Contractor shall develop design considering the identified Third Parties, External and Internal interfaces to ensure the required functionalities and performance described in this specification.

6.1.3 The TSCC Contractor shall, if necessary, propose any additional interfaces required to ensure the functionalities and performance described in this specification.

### 6.2 Third Party Interfaces

6.2.1 The TSCC Contractor shall be responsible for connection to the incoming Public Switched Telephone Network (PSTN) lines, obtaining the necessary approvals, coordinating with the relevant local authorities, cabling, civil works, and any related works regarding the connections to the PSTN.

6.2.2 The Telephony System shall interface with the PSTN system to allow communication between the CHSR Telephony System and the external PSTN network (off-net calls), in both normal and emergency scenarios.

### 6.3 External Interfaces – station contractor

6.3.1 Visible equipment in public areas (auto-dial telephones or PHPs) shall be integrated harmoniously with the architecture of the station.

6.3.2 The TSCC Contractor shall interface with the station contractor regarding the installation of PHPs inside the elevators and ensure their connection to the interface control box through the elevator traveling cable.

### 6.4 External Interfaces – facilities contractor

6.4.1 Visible equipment (auto-dial telephones or PHPs) shall be integrated harmoniously with the architecture of the facilities.

6.4.2 The TSCC Contractor shall interface with the facilities contractor regarding the installation of PHPs inside the elevators and ensure their connection to the interface control box through the elevator traveling cable.

6.4.3 The TSCC Contractor shall install all Telephony core network equipment in the OCC being provided by the facilities contractor.

6.4.4 The TSCC Contractor shall provide to the facilities contractor:

- Equipment dimensions
- Equipment clearances requirements
- Equipment mounting and fixings requirements
- Cable routes/containment requirements
- Equipment loadings
- Installation and maintenance requirements
- Equipment heating loads





- Equipment cooling loads
- Equipment hydraulic requirements

6.4.5 To be provided by facilities contractor to accommodate the TCSS equipment installation and operational/maintenance requirements:

- Room dimensions and layouts
- Room facilities (Plumbing, HVAC, Lighting, Fire Protection Systems, Doors, electricity)
- Room raised floor system
- Delivery access routes.
- Maintenance access routes

## **6.5 Internal Interfaces**

### **6.5.1 Interface with Digital Communications Network (DCN)**

6.5.1.1 The Telephony System shall have an interface with the Digital Communication Network (DCN) for connecting the Main IP-PABXs in OCC and the Satellite IP-PABXs in stations.

6.5.1.2 The Telephony System shall use DCN to transmit voice and video calls.

### **6.5.2 Interface with CCTV System**

6.5.2.1 The Telephony System shall have an interface with the CCTV system, as any PHP and auto-dial telephone call shall activate the embedded and/or nearest CCTV camera to the location. The images of the CCTV camera monitoring that location shall be immediately displayed to the operators via the ICSS Workstation.

### **6.5.3 Interface with Integrated Control and Supervision System (ICSS)**

6.5.3.1 The Telephony System shall have an interface with the ICSS system on standard protocols (e.g., SNMP) to allow status monitoring of the Telephony System equipment.

6.5.3.2 The Telephony System shall interface with ICSS to manage voice calls from manual-dial telephones, auto-dial telephones, and PHPs on the ICSS workstations.

6.5.3.3 The ICSS shall include a facility to enable the patching of calls between the Telephony System and programmed WCS devices.

### **6.5.4 Interface with Wireless Communication System (WCS)**

6.5.4.1 The Telephony System shall interface with the WCS to allow calls between telephones and WCS devices.

6.5.4.2 The VRS, as a part of the Telephony System, shall have an interface with the WCS to record and securely store all voice communications and logging information.

6.5.4.3 The VRS shall store all voice communications, including talk group calls, emergency calls, and point-to-point calls. Recordings shall include all metadata, such as caller identity, timestamp, call duration, priority level, and associated talk group call ID.

### **6.5.5 Interface with Network Timing System (NTS)**

6.5.5.1 The Telephony System shall have an interface with NTS for time synchronization and time display.

### **6.5.6 Interface with the Public Address and Customer Information System (PACIS)**

6.5.6.1 The Telephony System shall have an interface with PACIS to allow announcements from authorized telephones to the Public Address System (PAS).



- 6.5.6.2 The VRS as a part of the Telephony System shall have an interface with the PACIS to record all the live announcements via the PAS.

#### **6.5.7 Interface with Wireless Communication Systems (WCS)**

- 6.5.7.1 The Telephony System shall have a redundant interface with the Future Radio Mobile Communication System (FRMCS, a subsystem of the WCS). Telephony System acts as the central switching system for phone calls. The telephony system handles internal traffic between stations and acts as the gatekeeper to the outside world.
- 6.5.7.2 The FRMCS Dispatch Consoles shall be integrated with the Telephony System, which acts as the central recording and logging system for all Dispatch Consoles and FRMCS voice, data and metadata.
- 6.5.7.3 The Telephony System shall provide the voice, data and metadata recording and logging capabilities of the FRMCS.

#### **6.5.8 Interface with Enterprise Asset Management Systems (EAMS)**

- 6.5.8.1 The Telephony System shall provide static Asset Information and dynamic Asset Information to the EAMS for maintenance activities and asset lifecycle management activities.

#### **6.5.9 Interface with Low Voltage Power System**

- 6.5.9.1 The Telephony System shall interface with an Uninterruptible Power Supply (UPS) with minimum 12 hours backup to get the required power to feed the Telephony System equipment.



## **7 MATERIALS, PRODUCT AND COMPONENTS REQUIREMENTS**

### **7.1 General Requirements**

- 7.1.1 All materials supplied by the TSCC Contractor shall conform to the requirements and test methods of the relevant EN standards or other applicable recognized standards. Refer to 2.4.
- 7.1.2 All materials supplied shall be of sufficient grade and quality to meet the design life requirements.

### **7.2 Software and Hardware Requirements**

- 7.2.1 The Telephony System IP-PABXs and/or servers shall have redundant architecture, including hardware, software, network, power supply, cabling, cooling, data backup, and disaster recovery planning and physical security, so that the Telephony System survives during any one failure of hardware, power supply, cabling, and software.
- 7.2.2 The TSCC Contractor's Telephony System design shall support the expansion and scalability requirements while meeting or exceeding its RAMS to include redundancy, availability, and degraded modes of operation requirements.
- 7.2.3 The Telephony System equipment and devices shall be connected to the UPS of the facility where they are located (OCC, station, etc.).
- 7.2.4 All central servers may be on-premises or virtualized machines to ease systems evolution, complying with the Cybersecurity requirements.
- 7.2.5 The operating system of all the network devices shall be provided with the latest stable release.
- 7.2.6 All the application software shall be upgraded to the latest stable release and shall support all the requirements specified.

### **7.3 EMC Requirements**

- 7.3.1 The Telephony System shall be fully immune and protected from any Electromagnetic Interference (EMI) with the traction power, multi-tubular cabling, and Radio Frequency Interference (RFI). The EMI emissions shall be mitigated in accordance with applicable standards (EN 50122 or equivalent)



## **8 TOLERANCES**

Not applicable to Telephony System.



## 9 SCOPE OF SUPPLY AND DELIVERY

### 9.1 General Requirements

9.1.1 The TSCC Contractor shall supply and deliver all components related to the Telephony System.

### 9.2 Specific Requirements

9.2.1 The Telephony System scope of supply and delivery shall include (not limited to):

- Servers.
- Main IP PABXs.
- Satellite IP PABXs.
- Softphone application/software.
- Auto-Dial Telephones with blue light indicator.
- PHPs with audio frequency induction loops.
- Manual- dial IP telephones.
- Voice Recording System (VRS).
- Billing System (if required).
- Telephony Management System.
- Voice Mail System
- HW/SW licenses.
- Software architecture, including full specification of protocols used.
- Auxiliary elements, tools, and gear.
- Spare parts.
- Maintenance laptops

9.2.2 The TSCC Contractor shall provide the exact site locations of each Telephony System equipment, using layout drawings.

9.2.3 The cables used in the Telephony System shall be low-smoke, flame-retardant, halogen-free type.

9.2.4 The TSCC Contractor shall provide the Telephony System cable schedule and layout.



## **10 MANUFACTURING**

### **10.1 General Requirements**

10.1.1 General manufacturing requirements are defined in the Scope of Work.



## **11 INSTALLATION AND INTEGRATION**

### **11.1 General Requirements**

11.1.1 General installation and integration requirements are defined in the Scope of Work and Schedule 3.



## **12 TESTING & ACCEPTANCE**

### **12.1 General Requirements**

12.1.1 General testing and acceptance requirements are defined in the Scope of Work and Schedule 3.

### **12.2 Specific Requirements for Telephony System**

12.2.1 The TSCC Contractor shall perform an Erlang calculation study to dimension the Telephony System, IP PABXs capacity, and to determine the number of lines and channels to be requested in the PSTN connections.

12.2.2 Network failure and Main IP PABXs failure test cases shall be performed to validate the function of the local communication service via the Satellite PABX.

12.2.3 Integration test with interfacing systems shall be recorded and reported.





## **13 SUBMITTALS**

### **13.1 General Requirements**

13.1.1 General submittal requirements are defined in the Scope of Work.



## **14 QUALITY MANAGEMENT**

### **14.1 General Requirements**

14.1.1 General quality management requirements are defined in the Agreement and associated Schedules.



## 15 ADDITIONAL INFORMATION REQUESTED

### 15.1 General Requirements

- 15.1.1 In addition to the mandatory requirements outlined in this specification, the Authority reserves the right to request from the TSCC Contractor and Supplier information pertaining to the performance of proposed or supplied elements under similar service conditions, with particular emphasis on railroad management aspects which may influence Telephony System reliability, availability, and maintainability characteristics.



## 16 LOGISTICS

### 16.1 General Requirements

16.1.1 General logistics requirements are defined in the Agreement.

### APPENDIX A TO EXHIBIT 5(P) TELEPHONY SYSTEM

