

Schedule 5(h)

Integrated Control and Supervision System Specifications (ICSS)

California High-Speed Rail Authority



Standard Specifications

TSCC Specification

SPEC-0012 – Integrated Control and Supervision System Specifications (ICSS)

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TABLE OF CONTENT

1	INTRODUCTION	5
1.1	SCOPE OF THE TECHNICAL SPECIFICATION.....	5
2	REFERENCE STANDARDS AND DOCUMENTS.....	6
2.1	GENERAL	6
2.2	DESIGN GUIDELINES.....	6
2.3	TSI	6
2.4	STANDARDS	6
2.5	OTHER DOCUMENTS	8
3	TERMS, DEFINITIONS, AND ABBREVIATIONS	10
3.1	TERMS, DEFINITIONS AND ABBREVIATIONS	10
4	SYSTEM DESCRIPTION	11
4.1	PURPOSE OF THE ICSS	11
4.2	ICSS DEFINITION	11
4.3	ICSS OPERATIONAL CONTEXT	12
4.4	DESIGN LIFE	13
5	SYSTEM REQUIREMENTS.....	14
5.1	GENERAL REQUIREMENTS.....	14
5.2	ENVIRONMENTAL CONDITIONS REQUIREMENTS.....	14
5.3	OPERATIONAL REQUIREMENTS FOR ICSS	15
5.4	FUNCTIONAL REQUIREMENTS FOR ICSS	16
5.5	PERFORMANCE REQUIREMENTS FOR ICSS	31
5.6	CYBERSECURITY AND SECURITY REQUIREMENTS.....	32
6	INTERFACE REQUIREMENTS	35
6.1	GENERAL REQUIREMENTS.....	35
6.2	EXTERNAL INTERFACES – STATION CONTRACTOR.....	35
6.3	EXTERNAL INTERFACES - FACILITIES CONTRACTOR.....	36
6.4	INTERNAL INTERFACES	36
7	MATERIALS, PRODUCT AND COMPONENTS REQUIREMENTS	38
7.1	GENERAL REQUIREMENTS.....	38
7.2	SOFTWARE AND HARDWARE REQUIREMENTS	38
7.3	EMC REQUIREMENTS.....	40
8	TOLERANCES	41
9	SCOPE OF SUPPLY AND DELIVERY	41
9.1	GENERAL REQUIREMENTS.....	41
9.2	SPECIFIC REQUIREMENTS FOR ICSS.....	41
10	MANUFACTURING.....	42
10.1	GENERAL REQUIREMENTS.....	42



11	INSTALLATION AND INTEGRATION.....	42
11.1	GENERAL REQUIREMENTS.....	42
12	TESTING & ACCEPTANCE	42
12.1	GENERAL REQUIREMENTS.....	42
12.2	SPECIFIC REQUIREMENTS FOR ICSS.....	42
13	SUBMITTALS.....	43
13.1	GENERAL REQUIREMENTS.....	43
13.2	SPECIFIC REQUIREMENTS FOR ICSS.....	43
14	QUALITY MANAGEMENT.....	43
14.1	GENERAL REQUIREMENTS.....	43
15	ADDITIONAL INFORMATION REQUESTED	43
15.1	GENERAL REQUIREMENTS.....	43
16	LOGISTICS	43
16.1	GENERAL REQUIREMENTS.....	43



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 Integrated Control and Supervision System (ICSS).
- 1.1.2 The functional architecture of the ICSS is presented in Appendix A.
- 1.1.3 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: Schedule 16.

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 21 DESIGN GUIDELINES

2.3 TSI

2.3.1 There are no applicable TSIs for the Integrated Control and Supervision System (ICSS).

2.4 Standards

2.4.1 The TSCC Contractor shall fully consider and apply the following standards.

ID	Standard	Title
[R4]	EN 11205	Acoustics -- Noise emitted by machinery and equipment -- Engineering method for the determination of emission sound pressure levels in situ at the work station and at other specified positions using sound intensity
[R5]	EN 50121 series	Railway Applications – Electromagnetic Compatibility
[R6]	EN 50122 series	Railway applications - Fixed installations - Electrical safety, earthing and the return circuit
[R7]	EN 50124	Railway applications - Insulation coordination
[R8]	EN 50125	Railway applications - Environmental conditions for equipment
[R9]	EN 50126	Railway applications — The specification and demonstration of reliability, availability, maintainability and safety (RAMS)
[R10]	EN 50128	Railway applications - Communication, signaling and processing systems - Software for railway control and protection systems
[R11]	EN 50129	Railway applications — Communication, signaling and processing systems — Safety related electronic systems for signaling
[R12]	EN 50159	Railway applications - Communication, signaling and processing systems - Safety-related communication in transmission systems



ID	Standard	Title
[R13]	EN 50289-1-6	Communication cables - Specifications for test methods - Part 1-6: electrical test methods - Electromagnetic performance
[R14]	EN 61000-6 series	Electromagnetic compatibility (EMC) - generic standards
[R15]	EN 60947-4 et 2 series	Low-voltage switchgear and control gear
[R16]	EN 60269-2	Low-voltage fuses - Part 2: Supplementary requirements for fuses for use by authorized persons
[R17]	EN 62305	Protection against lightning
[R18]	EN 50164	Lightning Protection Components
[R19]	EN 50173 series	Information technology - Generic cabling systems
[R20]	EN 50174	Information technology - Cabling installation
[R21]	EN 50310	Application of equipotential bonding and earthing in buildings with information technology equipment
[R22]	EN 55024	Information technology equipment. Immunity characteristics. Limits and methods of measurement.
[R23]	EN 60297-3	Mechanical structures for electronic equipment - Dimensions of mechanical structures of the 482,6 mm (19 in) series - Part 3-100: basic dimensions of front panels, subracks, chassis, racks and cabinets
[R24]	EN 61034 series	Measurement of smoke density of cables burning under defined conditions
[R25]	EN 61508 series	Functional safety of electrical/electronic/programmable electronic safety-related systems
[R26]	EN/IEC 62682	Management of alarms systems for the process industries
[R27]	IEEE 1220	IEEE Standard for Application and Management of the Systems Engineering Process
[R28]	ISO/CEI 15288	Systems engineering - Systems life cycle processes
[R29]	EN 45011	General requirements for bodies operating product certification systems.
[R30]	EN 60038	CENELEC standard voltages
[R31]	ISO 9001	Quality management systems - Requirements
[R32]	ISO 9000	Quality management systems - Fundamentals and vocabulary
[R33]	ISO 9241	Ergonomics of Human-Computer Interaction
[R34]	ISO 11064 series	Ergonomic design of control centres
[R35]	IEC 60331	Tests for electric cables under fire conditions
[R36]	IEC 60364 series	Low-voltage electrical installations
[R37]	IEC 60068 series	Environmental testing
[R38]	IEC 62395	(Parts 1 & 2) Electrical resistance trace



ID	Standard	Title
[R39]	IEC 60870 -5	heating systems for industrial and commercial
[R40]	NFPA 130	applications
[R41]	IEC 62443	Industrial Control System security
[R42]	IEEE 802.1Q	Networking standard that supports virtual local area networking (VLANs) on an IEEE 802.3 Ethernet network
[R43]	IEEE 802.3	Standard for Ethernet networks
[R44]	IEEE 802.1P	The 802.1p method is a Quality of Service (QoS) process defined within the IEEE 802.1Q standard.
[R45]	ISA 112	SCADA standards
[R46]	IEC 61131	PLC standards
[R47]	EN 50125-3	Railway applications – Environmental conditions for equipment – Part 3: Equipment for signaling and telecommunications
[R48]	EN 12464-1	Light and lighting – Lighting of workplaces – Part 1: Indoor workplaces

TABLE 22 LIST OF APPLICABLE STANDARDS

2.5 Other Documents

2.5.1 The following documents shall be referred to:

ID	Document	Title
[R49]	Schedule 16	Scope of Work
[R50]	Schedule 3	Safety, Security and RAM Requirements
[R51]	Schedule 5	Wireless Communication Systems Technical Specification
[R52]	Schedule 5	Cybersecurity Technical Specification
[R53]	Schedule 5	Hazard Detection and Early Warning System Technical Specification
[R54]	Schedule 5	Fire Protection System Technical Specification
[R55]	Schedule 5	Enterprise Asset Management System Technical Specification
[R56]	Schedule 5	Non-Traction Power Supply Technical Specification
[R57]	Schedule 5	Operation Center Arrangement Display drawings
[R58]	Schedule 5	Telephony System Technical Specification
[R59]	Schedule 5	Public Address and Customer Information System Technical Specification
[R60]	Schedule 5	Network Timing Systems Technical Specification
[R61]	Schedule 5	CCTV System Technical Specification
[R62]	Schedule 5	Electronic Access Control Systems Technical Specification
[R63]	Schedule 5	Digital Communication Network Technical Specification



[R64]	Schedule 5	Fiber Optical Cable Technical Specification
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TABLE 23 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 Schedule 5(t) SPEC-0024 – Glossary of Terms, Abbreviations and Definitions.

3.1.2 Below are a few ICSS-specific definitions used in this specification.

- ICSS HMI: The ICSS HMI refers to the graphical interface through which operators interact with the ICSS. It provides real-time visualization of system status, alarms, events, and control functions in a user-friendly and intuitive format, enabling effective monitoring and control of all integrated subsystems.
- ICSS Workstation: The ICSS Workstation is a computer terminal equipped with all necessary peripherals required to deliver the functionality of sub-systems integrated into the ICSS via ICSS HMI.
- LOTO: Lockout-Tagout is a control-inhibit applied to equipment to disable control during unsafe conditions or maintenance works. Removal of a LOTO requires authorization.
- Control: An operator command to initiate a change of state of in controlled equipment or a change of behavior in a controlled system.



4 SYSTEM DESCRIPTION

4.1 Purpose of the ICSS

- 4.1.1 The purpose of the Integrated Control and Supervision System (ICSS) is to monitor and control the California High-Speed Rail System. It is designed to assist operational personnel in closely overseeing critical railroad systems and promptly responding to any disruptions, ensuring that transportation services remain uninterrupted.

4.2 ICSS Definition

- 4.2.1 The ICSS shall provide integrated monitoring and control functions to facilitate the real-time overall control and supervision of the operation and maintenance of the parts of the CHSR System.

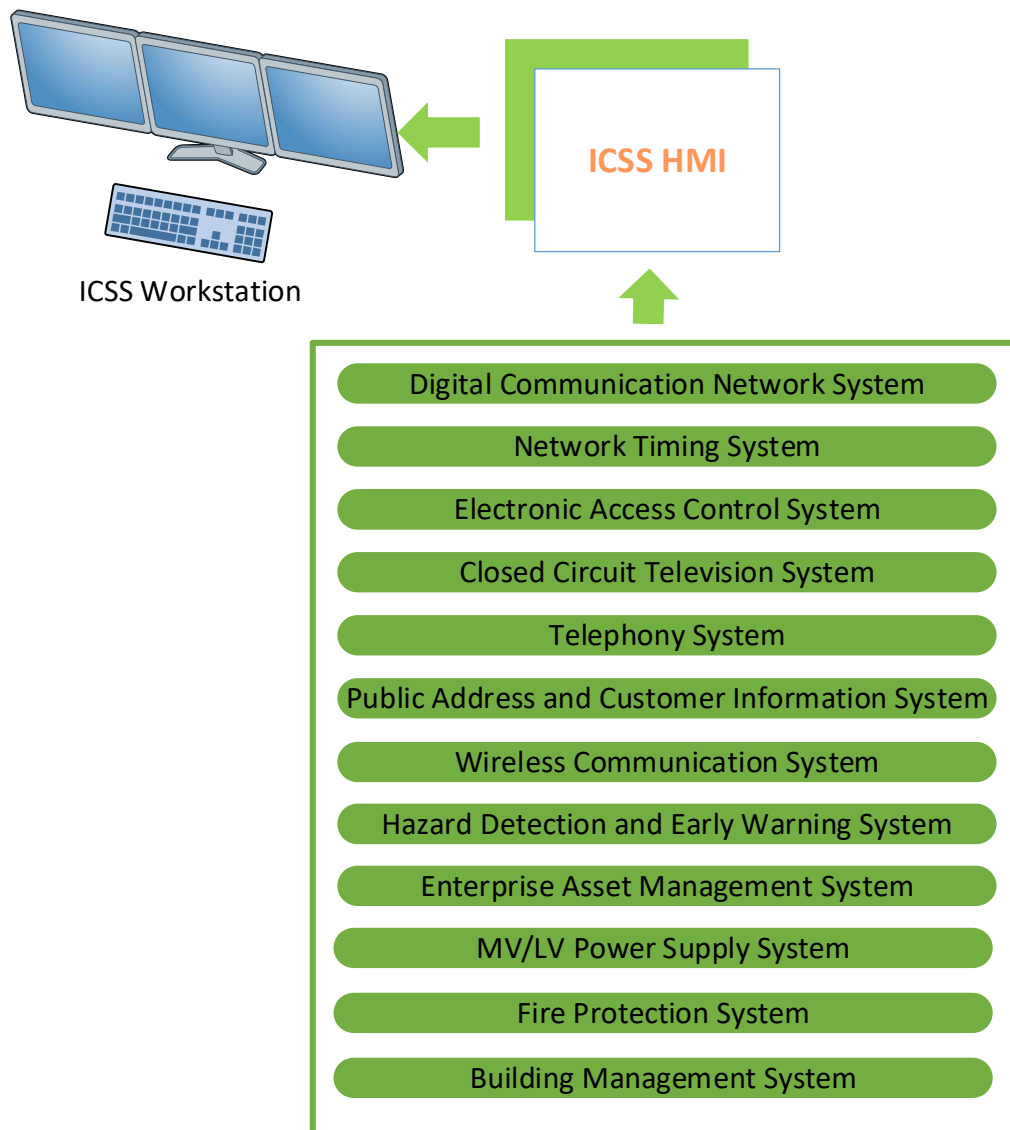


FIGURE 4. ICSS HMI ARCHITECTURE EXAMPLE**4.3 ICSS Operational Context**

- 4.3.1 The mission of the ICSS is to facilitate full and seamless control and/or monitoring of sub-systems, plant and equipment throughout the California High-Speed Rail System.
- 4.3.2 The ICSS shall be used operationally by various user groups, from various locations, to support high-speed rail operations.
- 4.3.3 The ICSS shall support a diverse set of operational use groups including, but not limited to:
- Train Controllers / Dispatchers
 - OCC Supervisors / Duty Managers / Operations Managers
 - Station Controllers / Station Masters
 - Incident Controllers / Emergency Response Coordinators
 - Maintenance Controllers
 - Train Control & Telecoms Technicians
 - Civil / Building Maintenance Personnel
 - Network / IT Administrators
 - Fire Protection System Operator
 - Security / CCTV Operators
 - Asset Managers
 - Training Supervisors
- 4.3.4 The ICSS HMI (Human Machine Interface) shall be the primary method of operator control for the systems where operational control is required.
- 4.3.5 The ICSS HMI shall, as a minimum, provide all normal operator functions that are available within each of the controlled systems.
- 4.3.6 The ICSS HMI shall provide all necessary operator functionalities to enable full operation of the interfaced sub-systems such that, during business-as-usual rail service operations, the operator shall not be required to use the interfaced sub-systems' equipment directly.
- 4.3.7 The ICSS system shall interface to the following systems as a minimum, to provide required alarm and status monitoring and/or operational control functionality.

No.	System	Alarm and Status Information	Operational Control
1	Digital Communication Network	Yes	No
2	Network Timing System	Yes	No
3	Electronic Access Control System	Yes	Yes
4	Closed Circuit Television System	Yes	Yes
5	Telephony System	Yes	Yes
6	Public Address and Customer Information System	Yes	Yes
7	Wireless Communication System	Yes	No
8	Hazard Detection and Early Warning System	Yes	No
9	Enterprise Asset Management System	Yes	No
10	MV/LV Power Supply System	Yes	Yes
11	Fire Protection System	Yes	No



12	Building Management System (Stations, Facilities, Substations, and Shelters)	Yes	Yes
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TABLE 24 ICSS INTEGRATED SUB-SYSTEMS.

- 4.3.8 Communication interfaces shall be provided to all systems and equipment via the Digital Communication Network (DCN) for the transfer of event and alarm data, and allow the ICSS to have monitoring and control functionalities over the connected system.
- 4.3.9 In addition to the control and monitoring of assets, the ICSS platform shall integrate the HMI functionality required for the day-to-day operation of each interfaced system, including but not limited to functions defined in Section 5.4 of this document.
- 4.3.10 All sub-system statuses and alarms having the potential to impact on a sub-system's functionality, operation, and availability shall be provided to the ICSS.
- 4.3.11 The ICSS shall perform alarm triage, including normalization, deduplication, correlation, and suppression, and shall compute a service-impact-based priority so that the operator is alerted to the highest-priority incident.
- 4.3.12 All information required to fulfil a subsystem's operational tasks shall be available on the ICSS HMI.
- 4.3.13 The ICSS shall disburse sub-system statuses and alarms for all interfaced sub-systems to the Enterprise Asset Management System for data collection, maintenance programming, and record.

4.4 Design Life

- 4.4.1 The TSCC Contractor shall design and implement the ICSS for a design life of 30 years.
- 4.4.2 The design life requirements of the ICSS shall allow for the pertinent evolution and technological change of the ICSS throughout its life to ensure it remains fit for purpose.
- 4.4.3 The TSCC Contractor shall ensure that ICSS components with shorter design lifespans and software 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 ICSS components (with equal or compatible technical specifications) for the entire design life required.



5 SYSTEM REQUIREMENTS

5.1 General Requirements

- 5.1.1 The ICSS shall be designed in accordance with the requirements described in this specification.
- 5.1.2 The TSCC Contractor shall determine and supply all necessary ICSS equipment required to support the system functionality and interfaces at the following locations:
- Operation Control Center.
 - Stations.
 - Depots.
 - Train Care Facilities.
 - Workshops and Maintenance Facilities.
 - Substations.
 - Wayside locations and Shelters.
 - any other locations necessary to support the operations and maintenance of the CHSR System.
- 5.1.3 The ICSS shall be supplied with redundant core equipment and with necessary hardware and software at the OCC to meet the functional and performance requirements defined in this specification.
- 5.1.4 Each ICSS workstation shall be a multi-screen, audio-enabled configuration for operators to control and monitor various connected systems utilizing a common display format.
- 5.1.5 The ICSS workstations shall be located at all control positions as specified in 5.1.2 of this document.
- 5.1.6 The TSCC Contractor shall provide printing facilities at all locations necessary to support the operations and maintenance of the CHSR System, subject to the Authority's approval.
- 5.1.7 The TSCC Contractor shall provide printing facilities in all control rooms, printer rooms, maintenance rooms, and other rooms equipped with ICSS workstations supplied by the TSCC Contractor throughout the CHSR System.
- 5.1.8 The printers shall print both black and white and color information in A4 and A3 formats.
- 5.1.9 The printers for control rooms and printer rooms shall be multi-functional laser devices.

5.2 Environmental Conditions Requirements

- 5.2.1 The TSCC Contractor's ICSS design shall be appropriate for, and resilient to, the local environmental and climatic conditions at each installation site.
- 5.2.2 The ICSS equipment shall be designed for operation in an indoor office-like environment with HVAC, clean power supply, and dust control.



- 5.2.3 The ICSS equipment shall operate within the following environmental conditions:
- Temperature (operational): +5 °C to +40 °C
 - Temperature (storage/transport): –10 °C to +55 °C
 - Relative Humidity: 5% to 85% non-condensing
 - Air Pressure: 86 kPa to 106 kPa (up to 1000 m altitude)
 - Pollution Level: IEC 60664-1 Pollution Degree 2 (office environment)
- 5.2.4 The ICSS equipment shall not be subject to excessive vibration or shock, except for normal levels associated with office furniture and equipment movement.
- 5.2.5 The ICSS equipment shall be designed to operate without degradation of performance under normal office acoustic and lighting conditions.
- 5.2.6 The ICSS equipment shall comply with the climatic and environmental classification for indoor stationary equipment as defined in EN 50125-3.
- 5.2.7 The ICSS workstation areas shall be provided with suitable lighting levels (minimum 300–500 lux at desk level, glare-free) to ensure clear visibility of displays, operator controls, and alarm indicators, in compliance with EN 12464-1.
- 5.2.8 ICSS displays and operator interfaces shall remain legible under both normal and emergency lighting conditions, ensuring continued operational usability during power outages or degraded lighting scenarios.

5.3 Operational Requirements for ICSS

- 5.3.1 The TSCC Contractor's ICSS 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 Concept of Operations.
- 5.3.2 The ICSS shall monitor and control all interfaced system equipment necessary to allow effective management of the CHSR System.
- 5.3.3 ICSS shall serve as the platform for OCC operators to perform real-time monitoring and operational control of system equipment. All maintenance activities and detailed diagnostic functions shall remain the responsibility of the dedicated management systems provided with each respective subsystem.
- 5.3.4 The ICSS application shall, as a minimum, provide all operator functions available within each of the interfaced systems listed in Section 5.4 and elsewhere within the specification required to achieve day-to-day operation.
- 5.3.5 The ICSS shall perform controls over other systems determined and defined as part of a systems integration process, and as agreed with the Authority.
- 5.3.6 The ICSS HMI shall undergo an ergonomic design approach in line with ISO 11064.
- 5.3.7 The ICSS HMI shall present system status through graphical displays, alarms, trends, and reports in an intuitive and user-friendly format.
- 5.3.8 The ICSS shall allow multi-level access based on operator roles and responsibilities.



5.4 Functional Requirements for ICSS

5.4.1 General Overview of Function

- 5.4.1.1 All ICSS system equipment and software shall be proven in use in a similar railroad environment and be able to provide a demonstrably stable and reliable platform.
- 5.4.1.2 The TSCC Contractor shall provide ICSS RTUs/PLCs (Remote Terminal Units/Programmable Logic Controllers) at all locations containing interfacing systems or equipment that do not have a DCN connection for monitoring and/or control by the ICSS.
- 5.4.1.3 The TSCC Contractor shall liaise with all station and facilities contractors to ensure that all interfaces and data requirements are captured and managed to ensure successful integration of the ICSS.
- 5.4.1.4 The ICSS HMI shall, as a minimum, provide all operator functions available within each of the interfaced systems required to achieve day-to-day operation.
- 5.4.1.5 Any subsystem functionality required by the operator shall be incorporated in the ICSS such that the presentation of the functions and features is consistent across the ICSS HMI.
- 5.4.1.6 The TSCC Contractor shall ensure liaison with all station and facility contractors and the Authority to determine control functionality detail across all connected systems.
- 5.4.1.7 The ICSS shall be designed to ensure that the total failure of the ICSS at any single location, including full loss of the ICSS within the OCC, shall not affect the ability to perform ICSS control and monitoring over the rest of the systems or CHSR System.
- 5.4.1.8 The ICSS shall be configured such that no single point of failure can cause failure of the monitoring and control functions of the System at its workstations.

5.4.2 HMI Functionality

- 5.4.2.1 The ICSS workstations shall be provided with several monitors that work as one desktop area.
- 5.4.2.2 The desktop area shall be able to be subdivided into split screens in order to simultaneously display multiple graphical displays as required by the operator. Split screens shall be resizable by the operator for optimal use of the desktop area.
- 5.4.2.3 The ICSS HMI design for visual displays and operator interaction, including video feed interaction and audio interface functionality, shall be in accordance with the ergonomic and human factors.
- 5.4.2.4 All ICSS functionality and level of control and authority available at any given workstation shall be determined and/or limited by the operator's login profile utilizing Role Based Access Controls.
- 5.4.2.5 The level of control and authority of individual ICSS operator profiles shall be pre-defined by the system administrator and correspond to the control levels as per the CHSR Concept of Operations.
- 5.4.2.6 The system administrator shall have the authority required to manage and configure all operator profiles.



- 5.4.2.7 The HMI functionality for the ICSS shall allow full control over and access to all ICSS functionality and data. This shall include, but not be limited to:
- Controls.
 - Event and alarm management and functionality.
 - Automation/scheduling functionality.
 - Printing.
 - Database and Views configuration and management.
 - Access authority management.
 - Backup and archiving management.
 - Control inhibition.
 - Lockout/Tagout (LOTO).
 - Alarm inhibition.
 - Object state forcing.
 - Software functions available within each of the sub-systems (as required to achieve day-to-day operation).
- 5.4.2.8 The HMI shall allow the operator to apply a LOTO procedure to any controlled equipment.
- 5.4.2.9 The HMI shall display an indication of the applied LOTO on the corresponding equipment symbol.
- 5.4.2.10 The removal of LOTO shall be performed through an additional confirmation procedure to be approved by the Authority during detailed design.
- 5.4.2.11 All tagged, LOTO, and inhibited equipment shall be listed in an operator navigable view, with filtering capabilities.
- 5.4.2.12 A test facility shall be provided to enable control outputs to be exercised for a dummy circuit breaker at any selected RTU/PLC.
- 5.4.2.13 The TSCC Contractor shall undertake all necessary software development in order to integrate the ICSS and sub-system functionality, as required by the Authority, into the ICSS Platform. These shall include, but not be limited to:
- Drivers.
 - SDK (Software Development Kit).
 - API (Application Programming Interface).
 - Database integration.
 - GUI (Graphical User Interface) integration.
 - Peripheral integration.
- 5.4.3 Graphical Display**
- 5.4.3.1 The ICSS HMI Graphical User Interface shall provide a readily navigable series of display pages to enable efficient operator usage of the ICSS connected systems, to enable efficient control and monitoring of the CHSR System.
- 5.4.3.2 These display pages shall include, but not be limited to:
- Geographical location dynamic displays showing the site layout or train layout, in plan view and elevation, onto which the location of each item of monitored equipment is to be



superimposed, along with the associated equipment description and identification numbers. The geographical coordinates shall be included in this view, if applicable.

- Coordinated plan views representing all systems in a respective location.
- Sub-system views.
- Event/status/health and alarm lists.
- Dynamic graphical displays.
- Dynamic symbols.
- Equipment tags.
- Executive summary of the CHSR System status for a quick display of key data.
- Synoptic and schematic views of all controlled and monitored systems.
- Help pages.

- 5.4.3.3 It shall be possible to filter coordinated plan views for symbols pertaining to selected systems and equipment types.
- 5.4.3.4 Display pages and symbol libraries shall be submitted to the Authority for review and approval.
- 5.4.3.5 Access to all functions shall be quick, and “hot spots” shall be used as gateways between functions and/or views.
- 5.4.3.6 Monitored points shall be dynamically presented through appropriate symbols and analogue displays.
- 5.4.3.7 The ICSS workstation display icons, graphic displays, and pictorial representations shall be harmonized across all sub-systems integrated into the ICSS.
- 5.4.3.8 The state of a displayed symbol shall always reflect the real-time field status and shall highlight, by means of a change in color and an alarm, if the equipment has “lost communication” with the ICSS.
- 5.4.3.9 The sound file and volume for audio alerts shall be configurable by the operator.
- 5.4.3.10 The user interface shall feature simple point and click actions that minimize the use of the keyboard.
- 5.4.3.11 The user interface shall be designed and developed so as to provide a consistent look and feel to the operator for all functionality within the ICSS, as defined in ISO 11064-5.

5.4.4 DCN Monitoring Functionalities

- 5.4.4.1 The functionality integrated into ICSS HMI shall allow monitoring of the DCN system, refer to STS Digital Communication Network.
- 5.4.4.2 The ICSS shall be able to gather information from the DCN system for equipment diagnostics in the CHSR System.
- 5.4.4.3 The ICSS HMI shall display:
- The DCN equipment description, identification, and equipment label in each location.
 - Operational state of the DCN equipment in each location.
- 5.4.4.4 The ICSS HMI shall provide:
- Hierarchical view of the network map.



- Network topology and logical connections between the various levels of the hierarchy.
- Function for equipment identification.
- Indication of faulty DCN equipment or system faults.

5.4.5 NTS Monitoring Functionalities

- 5.4.5.1 The functionality integrated into ICSS HMI shall allow monitoring of the NTS system, refer to STS Network Timing System.
- 5.4.5.2 The ICSS shall be able to gather information from the NTS for equipment diagnostics in the CHSR System.
- 5.4.5.3 The ICSS HMI shall display:
- The NTS equipment description, identification, and equipment label in each location.
 - Operational state of the NTS equipment in each location.
- 5.4.5.4 The ICSS HMI shall provide:
- Function for equipment identification.
 - Indication of faulty NTS equipment or system faults.

5.4.6 EACS Operation and Monitoring Functionalities

- 5.4.6.1 The functionality integrated into ICSS HMI shall allow control and monitoring of the EACS system, refer to STS Electronic Access Control System.
- 5.4.6.2 The ICSS shall be able to gather information from the EACS for equipment diagnostics in the CHSR System.
- 5.4.6.3 The ICSS HMI shall display:
- The EACS equipment description, identification, and equipment label in each location.
 - Operational state of the EACS equipment in each location.
- 5.4.6.4 The ICSS HMI shall provide:
- Function for equipment identification.
 - Indication of faulty EACS equipment or system faults.
- 5.4.6.5 The ICSS shall be able to exchange information with EACS equipment for:
- Intrusion alarm notifications on the ICSS HMI.
 - Door management (opening/closing/automatic camera switching) on the ICSS HMI.
- 5.4.6.6 On the occurrence of an Intruder Detection or Access Control security alarm, the ICSS Workstation operator at the relevant Control Room shall be alerted to the location of the alarm, and the nearest CCTV shall be triggered to display the real-time image.

5.4.7 CCTV Operation and Monitoring Functionalities

- 5.4.7.1 The functionality integrated into ICSS HMI shall allow control and monitoring of the CCTV system, refer to Schedule 5(k) Closed Circuit Television System.
- 5.4.7.2 The ICSS shall be able to gather information from the CCTV system for equipment diagnostics in the CHSR System.



- 5.4.7.3 The ICSS HMI shall display:
- The CCTV equipment description, identification, and equipment label in each location.
 - Operational state of the CCTV equipment in each location.
- 5.4.7.4 It shall be possible to view live video streams and pre-recorded video across the CHSR System, regardless of geographical location, from any ICSS workstation.
- 5.4.7.5 The number of tiles (each displaying an individual camera feed) per display screen at each ICSS HMI shall be quantified during the detailed design for the Authority's approval.
- 5.4.7.6 The ICSS HMI shall work in conjunction with a keyboard and pointing devices for selecting the camera and system icons so as to provide the interaction between the operator and the CCTV system for picture selection, camera control, and fault information.
- 5.4.7.7 The ICSS HMI shall also work in conjunction with an integrated joystick for the control of PTZ cameras.
- 5.4.7.8 The ICSS HMI shall, as a minimum, provide the following fully programmable functions listed below. Available functionality shall be dependent on the operator profile:
- Equipment identification.
 - Indication of faulty CCTV equipment or system faults.
 - Pan, tilt, and zoom control, where appropriate.
 - Selection of each camera to be displayed.
 - Automatic panning on a group or individual basis.
 - Reprogramming and auto-sequence of camera images.
 - Manual control of Network Video Recorder functions, such as playback of recordings.
 - Manual selection by the Operator for any single video image or a combination of video images for display simultaneously.
 - Automatic selection in accordance with a pre-set configuration in the event of an alarmed condition, such as the CCTV images in the event of an intrusion detection alarm.
 - Manual selection by the Operator of any sequence of camera images with each image displayed in time sequence with a variable dwell time pre-set by the Operator.
 - Monitoring and annunciation of CCTV system alarms.
 - Operator to create/manage layout or tiles.
- 5.4.7.9 The ICSS shall conform to ONVIF (Open Network Video Interface Forum) to ensure compatibility with future updates in camera firmware and the addition of new cameras conforming to ONVIF.
- 5.4.7.10 The ICSS HMI shall automatically project onto a designated tile the real-time image associated with an alarm trigger and initiate alarm-triggered recording, for the following scenarios as a minimum:
- Fire detection.
 - Intrusion detection (using CCTV video analytics).
 - Intrusion detection (using EACS).
 - Passenger Help Point call.
 - Any other condition requiring immediate operator attention.

5.4.8 Telephony Operation and Monitoring Functionalities

- 5.4.8.1 The ICSS shall allow industry-standard telephony operator functionalities via the ICSS HMI.



- 5.4.8.2 The functionality integrated into ICSS HMI shall allow control and monitoring of the Telephony system to allow full compliance with the Telephony system requirements, refer to STS Telephony System. This shall include, but not be limited to:
- Monitoring and annunciation of Telephones and system alarms.
 - Full control of the Telephony system to enable all normal and emergency call handling functionalities.
- 5.4.8.3 Call handling shall include, as a minimum, the following features with visual and audible prompts provided to the operator at the Control Room ICSS HMI, as appropriate to the call function to be processed:
- Call queuing in order of call arrival.
 - Call prioritization for emergency services and user-defined requirements.
 - Intrusion, standard, private, night service, and manager/secretary call facilities.
 - Incoming call answering, outgoing call, conference call.
 - Call Hold and Call Park.
 - Call Terminations.
 - Call back and call forward.
 - Call Transfer to the recipient via the external systems accessible to the Telephony system, including the PSTN, the Administrative Telephone Network.
 - Display of each user's telephone status (availability).
 - Display of Call Line Identity.
 - Display and scrolling through the telephone directory.
- 5.4.8.4 It shall be possible to make and receive outgoing and incoming calls, route calls based on the selection of a destination by entering an extension number.
- 5.4.8.5 It shall be possible to handle various forms of number dialing, including short-code and preconfigured single-button dialing.
- 5.4.8.6 The ICSS shall be able to gather information from the Telephony system for equipment diagnostics in the CHSR System.
- 5.4.8.7 The ICSS HMI shall display:
- The Telephony equipment description, identification, and equipment label in each location.
 - Operational state of the Telephony equipment in each location.
- 5.4.8.8 The ICSS shall allow Operators to switch between waiting calls by holding an ongoing call and taking another call.
- 5.4.8.9 The ICSS shall provide the function for telephony equipment identification on the ICSS HMI.
- 5.4.8.10 The ICSS HMI shall notify the Operators that a call is being made from a specific location, including manual-dial telephones, PHPs (Passenger Help Points), and auto-dial telephones.
- 5.4.8.11 The ICSS shall be able to send commands to the PHPs, thereby allowing discrete ambient listening at the station.
- 5.4.8.12 When the caller presses the call button at the PHPs or lifts up the auto-dial telephone, a notification /ring tone shall be sent to a hunting group, and the associated CCTV camera stream (from the nearby camera) is automatically displayed on ICSS HMI.



5.4.9 PACIS Operation and Monitoring Functionalities

- 5.4.9.1 The functionality integrated into ICSS HMI shall allow control and monitoring of the PACIS, refer to STS Public Address and Customer Information System.
- 5.4.9.2 The ICSS shall be able to gather information from the PACIS for equipment diagnostics in the CHSR System.
- 5.4.9.3 The ICSS HMI shall display:
- The PACIS equipment description, identification, and equipment label in each location.
 - Operational state of the PACIS equipment in each location.
- 5.4.9.4 The ICSS HMI shall, as a minimum, provide the following functions listed below for the Public Address System. Available functionality shall be dependent on the operator profile:
- Equipment identification.
 - Indication of faulty PA equipment or system faults.
 - Operator to make direct live announcements to one or several zones/stations (group selection).
 - Operator to initiate automatic digitally pre-recorded announcements at once to one or several zones/stations (group selection).
 - Creation, modification, and deletion of pre-recorded messages.
 - Selection and broadcast of priority pre-recorded messages.
 - Broadcast pre-recorded announcements automatically repeated in a cyclical sequence.
 - Capability to enable or disable broadcast functionality in order to activate/deactivate PA broadcast for the selected zone.
 - Manage one zone and/or multiple zones based on Operator selection.
- 5.4.9.5 The ICSS HMI shall, as a minimum, provide the following functions listed below for the Customer Information System. Available functionality shall be dependent on the operator profile:
- Equipment identification.
 - Indication of faulty CIS equipment or system faults.
 - Operator to send live or pre-defined visual messages on displays.
 - Selection of an individual, a group, or all the PIDs in one location or in all the locations.
 - Operator to type instant messages.

5.4.10 WCS Monitoring Functionalities

- 5.4.10.1 The functionality integrated into ICSS HMI shall allow monitoring of the WCS, refer to Schedule 5(r) Wireless Communication System.
- 5.4.10.2 The ICSS shall be able to gather information from the WCS for equipment diagnostics in the CHSR System.
- 5.4.10.3 The ICSS HMI shall display:
- The WCS equipment description, identification, and equipment label in each location.
 - Operational state of the WCS equipment in each location.
- 5.4.10.4 The ICSS HMI shall provide:
- Function for equipment identification.
 - Indication of faulty WCS equipment or system faults.



5.4.11 HDEWS Monitoring Functionalities

- 5.4.11.1 The functionality integrated into ICSS HMI shall allow monitoring of the HDEWS, refer to Schedule (g) Hazard Detection and Early Warning System.
- 5.4.11.2 The ICSS shall be able to gather information from the HDEWS for equipment diagnostics in the CHSR System.
- 5.4.11.3 The ICSS HMI shall display:
 - The HDEWS equipment description, identification, and equipment label in each location.
 - Operational state of the HDEWS equipment in each location.
- 5.4.11.4 The ICSS HMI shall provide:
 - Function for equipment identification.
 - Indication of faulty HDEWS equipment or system faults.

5.4.12 EAMS Monitoring Functionalities

- 5.4.12.1 The functionality integrated into ICSS HMI shall allow monitoring of the EAMS, refer to Schedule 5(d) Enterprise Asset Management System.
- 5.4.12.2 The ICSS shall be able to gather information from the EAMS for equipment diagnostics in the CHSR System.
- 5.4.12.3 The ICSS HMI shall display:
 - The EAMS equipment description, identification, and equipment label in each location.
 - Operational state of the EAMS equipment in each location.
- 5.4.12.4 The ICSS HMI shall provide:
 - Function for equipment identification.
 - Indication of faulty EAMS equipment or system faults.
- 5.4.12.5 The ICSS shall send alarms, events, and status data having a maintenance implication to the EAMS for all interfaced systems. The alarm and status information shall be transmitted by the ICSS to the EAMS upon a change of state.
- 5.4.12.6 Associated events or fault alarms intended to automatically trigger an action within the EAMS (e.g., generation of a notification) shall be identified on the I/O Lists provided to EAMS, specifying the action required. These shall be coordinated with the station and facility contractors and proposed for the Authority's review and approval during the design stage.
- 5.4.12.7 For alarms and events sent to the EAMS, the asset numbering and alarm tag identification shall also be consistent with the numbering implemented in the EAMS database.
- 5.4.12.8 The addition, modification, and removal of assets and alarms to be sent to the EAMS shall be carried out by the ICSS administrator by means of a user-friendly Graphical User Interface in the ICSS, and verifiable on the EAMS Graphical User Interface. All configuration changes shall be logged in both systems.

5.4.13 Medium/Low-Voltage Power Supply Operation and Monitoring Functionalities



- 5.4.13.1 The functionality integrated into ICSS HMI shall allow control and monitoring of the MV+ LV PS, refer to Schedule 5(j) Medium Voltage and Low Voltage Power Supply Systems.
- 5.4.13.2 The ICSS shall be able to gather information from the MV+LV PS for equipment diagnostics in the CHSR System.
- 5.4.13.3 The ICSS HMI shall display:
- The MV+ LV PS equipment description, identification, and equipment label in each location
 - Operational state of the MV+ LV PS equipment in each location.
- 5.4.13.4 The ICSS shall, at least, monitor the following MV+LV PS equipment:
- MV switchgear (if available)
 - LV switchgear.
 - Transformers.
 - UPS.
 - Battery.
 - Generator.
 - Local renewable energy source (if available)
 - Inverter.
 - Rectifier.
 - Metering device.
- 5.4.13.5 The ICSS HMI shall, as a minimum, provide the following functions listed below for the MV+LV PS. Available functionality shall be dependent on the operator profile:
- Equipment identification.
 - Indication of faulty MV+LV PS equipment or system faults.
 - Real-time monitoring of equipment operational status (ON/OFF, available, standby, unknown).
 - Display of electrical parameters (voltage, current, frequency, load, power factor, etc.).
 - Alarm annunciation and categorization (critical, major, minor).
 - Event logging and time-stamped fault records.
 - Control commands where authorized (start/stop, reset, changeover, etc.).
 - Indication of supply source status (normal mains, UPS, generator, battery backup).
 - Trend monitoring of key parameters for performance and predictive maintenance.
 - System interlocks and protection status display.
 - Remote acknowledgement and clearance of alarms (based on operator profile).
 - Graphical single-line diagram view of power system topology and switching status.
 - Redundancy and failover status of MV+LV PS/UPS systems.
 - Reporting function (historical data, alarms, energy consumption).
- 5.4.13.6 The ICSS shall, at least, provide switching commands for the following MV+ LV PS equipment:
- MV switchgear (if available)
 - LV switchgear
- 5.4.13.7 The ICSS shall, at least, provide testing commands for the following MV+ LV PS equipment:
- UPS
 - Battery
 - Energy generation equipment



- 5.4.13.8 The ICSS shall retrieve timestamped measurement data from the MV+ LV PS system at least for:
- Commercial metering (Distributed System Operator interface)
 - Metering MV+ LV PS systems parameters at MV and LV levels
 - Metering of future equipment
- 5.4.13.9 The ICSS shall ensure that at any one time only one operator may select and control one control output circuit or a group of output circuits.
- 5.4.13.10 The ICSS to MV+ LV PS communications protocol shall be capable of supporting secure select and execute type commands, time synchronization from the host, and time-tagged event-based reporting. The protocol shall comply with the requirements of IEC 60870-5-104.
- 5.4.13.11 The MV+ LV PS digital inputs shall be time tagged at source (i.e., within the MV+ LV PS IED/RTU/PLC) to a resolution of 1ms. This time tag will be transmitted with the event to the ICSS.
- 5.4.14 BMS Operation and Monitoring Functionalities**
- 5.4.14.1 The functionality integrated into ICSS HMI shall allow control and monitoring of Building Management Systems.
- 5.4.14.2 The ICSS scope for control and monitoring of BMS includes the Mechanical and Electrical (M&E) equipment provided by station contractors, facility contractors, and the Contractor.
- 5.4.14.3 The ICSS shall be interfaced with the external BMS systems (i.e., BMS provided by station and facility contractor) at the OCC through a connection to the DCN.
- 5.4.14.4 The TSCC Contractor shall be interfaced with the internal BMS system (i.e., BMS provided by TSCC Contractor) at the OCC through a connection to the DCN. Alternatively, if needed, the TSCC Contractor shall provide a Remote Terminal Unit (RTU) or Programmable Logic Controller (PLC) to connect with the BMS equipment located at the Shelters and Substations.
- 5.4.14.5 The ICSS shall be able to gather information from the BMS for equipment diagnostics in the CHSR System.
- 5.4.14.6 The ICSS HMI shall display:
- The BMS equipment description, identification, and equipment label in each location.
 - Operational state of the BMS equipment in each location.
- 5.4.14.7 The ICSS shall, at least, control and/ or monitor the following BMS equipment provided:
- Fire Protection System
 - Elevators
 - Escalators
 - Lighting
 - HVAC
 - Hydraulic
 - Low Voltage Power Supply



5.4.14.8 The ICSS HMI shall, as a minimum, provide the following functions listed below for the BMS. Available functionality shall be dependent on the operator profile:

- **Fire Protection System**
 - Equipment identification (panels, detectors, suppression devices).
 - Indication of faulty fire system equipment or active alarms.
 - Display of fire zones and alarm locations on graphical floor plans.
 - Event logging and time-stamping of fire alarms, resets, and faults.
 - Indication of system interlocks (e.g., HVAC shutdown, elevator recall).
- **Elevators**
 - Equipment identification (car number, shaft, control panel).
 - Real-time status (in service, out of service, fault, floor position).
 - Alarm indication for faults or entrapments.
 - Event logging of operational states and faults.
 - Remote commands where permitted (e.g., shutdown, fire service mode).
- **Escalators**
 - Equipment identification (escalator ID, location).
 - Status monitoring (running, stopped, fault, direction).
 - Alarm indication for faults or emergency stops.
 - Event logging of faults and operational changes.
 - Control functionality where authorized (start/stop/reset).
- **Lighting System**
 - Equipment identification (zones, panels, circuits).
 - Indication of faulty lighting circuits or failures.
 - Status monitoring (ON/OFF, auto/manual, emergency lighting).
 - Energy consumption monitoring where applicable.
 - Remote control where permitted (switching on/off, dimming).
- **HVAC System**
 - Equipment identification (AHUs, chillers, pumps, VAVs, thermostats)
 - Monitoring of operating parameters (temperature, humidity, pressure, airflow).
 - Fault alarms (filter clogged, compressor trip, high temperature, etc.).
 - Trend monitoring of key parameters for performance optimization.
 - Control commands where authorized (start/stop/reset, mode change).
- **Hydraulic Systems**
 - Equipment identification (pumps, pressurization units, tanks).
 - Monitoring of operational status (running, standby, fault).
 - Indication of alarms (low pressure, leakage, pump trip).
 - Event logging of changes and faults.
 - Remote control where authorized (start/stop/reset).
- **Low Voltage Power Supply**
 - Equipment identification (switchgear, transformers, UPS).
 - Real-time monitoring of supply status (energized, fault, standby).
 - Display of electrical parameters (voltage, current, load, frequency).
 - Alarm annunciation (faults, overloads, trip conditions).
 - Graphical single-line diagram representation.



- Trend monitoring of load and energy consumption
- Remote commands where applicable

5.4.14.9 The TSCC Contractor shall coordinate with station and facility contractors for interfacing requirements (i.e., specifications, protocols, connections, etc.).

5.4.15 Alarms

5.4.15.1 Alarms and indications for each interfaced system shall be provided to the ICSS.

5.4.15.2 Alarms and events shall be displayed and timestamped.

5.4.15.3 The TSCC Contractor shall design ICSS alarms in accordance with EN/IEC 62682 standard.

5.4.15.4 All alarm indications shall be flashing when requiring immediate attention and steady if less urgent attention is necessary.

5.4.15.5 Alarms shall be provided for any conditions affecting normal operation of the ICSS and its interfaces.

5.4.15.6 The alarm indications shall display at a minimum:

- the type: operation, safety and security, maintenance.
- the severity: emergency, alert, critical, error, warning, notice, info, debug.
- the origin subsystem(s): PACIS, CCTV...
- the recipient: OCC Supervisor, ICSS Operator... They are the responsible users intended to react/respond to the alarm occurrence.

5.4.15.7 The TSCC Contractor shall submit an alarm management plan and design to the Authority for approval.

5.4.16 Alarm Type

5.4.16.1 The following alarm types shall be at least managed by the ICSS:

- Operational alarms: corresponding to a failure of a piece of equipment that can disturb the operation of the line.
- Safety and Security alarms: corresponding to an abnormal situation occurring that has the potential to affect safety or security (i.e., distress alarms sent by the passengers, vandalism to equipment...).
- Maintenance alarms: corresponding to maintenance activities.

5.4.16.2 The qualification of alarms into above mentioned types shall be done by the TSCC Contractor and submitted to the Authority for approval.

5.4.17 Alarm Severity

5.4.17.1 The alarm severity levels shall be at a minimum:

- Level 1 severity - None: associated with events (i.e., no alarm is raised by the ICSS, e.g., notice, info, debug).
- Level 2 severity - Minor: related to events that the ICSS operator needs to know but does not request a quick reaction (i.e., warning).
- Level 3 severity - Major: alarms related to events requesting quick reaction for service affecting reasons (Impact on Traffic) (i.e., error).



- Level 4 severity - Critical: alarms related to events requesting immediate actions for safety and service (impact on traffic and safety), such as fire detection (i.e., emergency, alert, critical).

5.4.17.2 Alarms' severity shall be easily configurable by dedicated maintenance operators without third-party involvement.

5.4.17.3 The definition of severity shall be done by the TSCC Contractor and submitted to the Authority for approval.

5.4.18 Alarm Management

5.4.18.1 The TSCC Contractor shall provide an alarm management function, including alarm routing for the subsystems interfaced with the ICSS.

5.4.18.2 Alarm management shall be designed in such a way that the ICSS operator's workload is never exceeded.

5.4.18.3 The TSCC Contractor shall design the ICSS to manage alarm avalanches without any alarm loss. Alarm avalanche is a situation where a single or minor event triggers a massive cascade of alarms, which may overwhelm operators with a flood of notifications, making it difficult to identify the root cause and react appropriately.

5.4.18.4 The TSCC Contractor shall manage the alarm avalanches based on alarm families, i.e., all subsequent alarms to the occurrence of a particular alarm must be hidden to avoid any inconsistency of treatment by operators.

5.4.18.5 The TSCC Contractor shall also manage the alarm avalanches based on scenarios, i.e., the consequences of an alarm occurrence on other equipment must be considered to present comprehensive alarms to the operators.

5.4.18.6 The TSCC Contractor shall provide an alarm avalanche management plan (hierarchization, scenarios) to the Authority for approval.

5.4.18.7 Alarms' history shall be available on all operators' workstations and shall be displayed with filter functions allowing sorted lists.

5.4.19 Archiving, Reporting and Printing

5.4.19.1 Every ICSS system's faults, alarms, and events shall be recorded and archived.

5.4.19.2 Online data storage of at least one month shall be provided through an archiving function, enabling users to access and browse the previous 30-day records at any time.

5.4.19.3 The archiving function (using a commonly used format such as syslog so that standard off-the-shelf tools can be used for managing data, analytics) shall also store records in a suitable manner to allow transfers of each month's records to external processors or to suitable media for archival storage.

5.4.19.4 The archiving function shall at least provide the following features:

- Separate physical media units required for each month's records.
- A simple means of retrieval and display of the archival information is required.
- Enough media for at least 12 months of records shall be provided.



- 5.4.19.5 The archiving system shall use a storage array encryption algorithm to ensure data security.
- 5.4.19.6 Security assessments shall be guaranteed through authentication with very restricted access to repositories and password policies.
- 5.4.19.7 All devices shall be protected by Uninterruptible Power Supply (UPS) systems with autonomy to perform an ordered switch off to reduce data loss.
- 5.4.19.8 The ICSS shall provide a reporting function allowing the ICSS operator to edit/modify, create, enable, disable, and delete reports and report templates.
- 5.4.19.9 The ICSS shall include a database facility that shall maintain and update records of alarms, events, controls, and the status of all the selected equipment. This database shall be updated as a real-time activity and shall be accessible from any ICSS workstation.
- 5.4.19.10 Historical data storage (using a commonly used format such as syslog so that standard off-the-shelf tools can be used for managing data, analytics) and software backup systems shall be provided, designed to ensure that stored data is retained in an efficient manner and allows rapid search against selectable criteria. The storage facilities shall also ensure that historical records can be rebuilt in a readable data form.
- 5.4.19.11 The printing function shall be available on all ICSS operator workstations.
- 5.4.19.12 All generated reports shall be printable for all operators.
- 5.4.19.13 All equipment failures description shall be printable.

5.4.20 **Playback**

- 5.4.20.1 The ICSS shall provide a Playback function based on recorded events and pictures for later viewing, post-inquiring, or training.
- 5.4.20.2 The Playback function shall allow ICSS operators to select starting points, playback speed (typically 0.1, 0.5, x1, x2, x10, x100), pause, and reverse.
- 5.4.20.3 Outputs shall be available as screen displays and playback. It shall be possible to filter outputs by time span, activity type, and event priority.

5.4.21 **Training Simulator**

- 5.4.21.1 The ICSS shall provide a dynamic training function/simulator of the CHSR System operations for the training of the ICSS operators.
- 5.4.21.2 The ICSS simulator shall provide a real-time simulation of all ICSS interfaces.
- 5.4.21.3 Within the ICSS simulator, the operator position shall be the same as the one in the OCC control room.
- 5.4.21.4 The ICSS simulator shall, at a minimum, allow the trainer to:
 - Write, edit, and play scenarios.
 - Switch on/off equipment.
 - Run the replay mode of a real situation or a training session.
 - Manage several trainees at the same time.
- 5.4.21.5 The ICSS shall, at least, allow the trainee to:



- React and operate as if he was in real operation.
- Run a replay of his training session.

5.4.21.6 The ICSS simulator shall consist, at a minimum, of:

- server with the same database as the active system.
- RTU representing the same type of I/O's.
- trainee workstations.
- teacher workstation.
- Printer.

5.4.22 Maintenance Management

5.4.22.1 The ICSS shall include all necessary tools and licenses to allow configuration and modification of the database and the workstation views.

5.4.22.2 Configuration of any distributed ICSS equipment shall be possible from the OCC.

5.4.22.3 ICSS Maintenance workstations shall be provided with:

- Capability to perform configuration and modification of the ICSS HMI and database configuration.
- Capability to perform maintenance and diagnostic activities for all ICSS equipment.
- A Network Management System (NMS) to facilitate ICSS internal network monitoring, management, maintenance functions, network bandwidth allocation, routing setup, traffic monitoring, VLAN settings, IP address allocation, and other functions.

5.4.22.4 All configuration and management functions shall be subject to sufficient login privileges.

5.4.22.5 Maintenance laptop computers shall be provided with diagnostic, testing, and maintenance software for the RTU/PLC/IED.

5.4.22.6 The maintenance laptops shall also be provided with diagnostic and testing software for interfaced system protocols.

5.4.23 Video wall in OCC for CCTV

5.4.23.1 The TSCC Contractor shall provide a video wall in the OCC for displaying CCTV video images.

5.4.23.2 The video wall shall enable OCC operators to monitor live CCTV feeds from stations, depots, trains, and other wayside facilities.

5.4.23.3 The video wall shall support both continuous surveillance and event-based display.

5.4.23.4 The video wall shall be capable of displaying CCTV video images either upon command from the ICSS workstation or automatically upon activation of a coordinated event (e.g., a CCTV image triggered by a passenger help point activation, fire alarm, etc.).

5.4.23.5 The system shall allow operators to configure layouts dynamically (e.g., single large view, multi-camera grid, picture-in-picture).

5.4.23.6 The video wall shall support 24x7 operation with high availability and reliability.

5.4.23.7 The operators shall be able to select and display any CCTV camera feed on the video wall from the ICSS workstation.



- 5.4.23.8 The operators shall be able to define and recall preset display layouts.
- 5.4.23.9 The video wall shall allow zooming, panning, and rearranging of feeds in real-time.
- 5.4.23.10 The video wall shall be based on the latest technology in Direct View LED.
- 5.4.23.11 The video wall shall be modular and scalable to allow future expansion of display area or resolution.
- 5.4.23.12 The system shall support the addition of new CCTV sources without major hardware/software replacement.
- 5.4.23.13 The video wall shall support display of CCTV video at a minimum resolution of 4K, higher resolutions (e.g., 8K) shall be supported where commercially available.
- 5.4.23.14 The displayed video shall be free from distortion, jitter, or synchronization issues.
- 5.4.23.15 Brightness, contrast, and color reproduction shall be uniform across the entire video wall.
- 5.4.23.16 The size and configuration of the video wall shall be determined based on ergonomic studies and shall be submitted to the Authority for review and approval prior to implementation.

5.5 Performance Requirements for ICSS

5.5.1 System Performance and Capacity

- 5.5.1.1 When a new graphic picture is called up for display on a Workstation, the response time from the finish of the entry of the command requesting the display until the conclusion of the drawing of the display, including all data items, shall not exceed 4 seconds.
- 5.5.1.2 Where several pictures are called simultaneously, then the maximum response shall not be greater than 8 seconds for all the Workstation's displays. These displays may be either identical or different in content.
- 5.5.1.3 Where text Information is called, the screen shall start writing within 2 seconds from the entry of the command and be completed with a screen containing 1000 characters, including blanks, in not more than 4 seconds. Multiple screen requests are possible, and this shall be in such a way that all screens complete writing within 8 seconds.
- 5.5.1.4 The maximum propagation and response times specified shall be achieved under worst-case system loading conditions.
- 5.5.1.5 Under normal or degraded modes, the CPU loading of any core equipment shall be less than 35% on average when measured over a period of 5 minutes.
- 5.5.1.6 Under emergency conditions, the CPU loading of any core equipment shall be less than 70% on average when measured over a period of 5 minutes.
- 5.5.1.7 Buffering shall be controlled so that a full buffering condition will not cause the system to become unavailable.

5.5.2 Response Times

- 5.5.2.1 The initialization of the ICSS application on the workstations shall last less than 1 minute.



- 5.5.2.2 The initialization time of the ICSS application on the real-time data servers (Hot & Stand-by) shall be less than 2 minutes.
- 5.5.2.3 The ICSS initialization after hardware reset shall not exceed 10 minutes.
- 5.5.2.4 The elapsed time between the change of an attribute of remote equipment and its display on the HMI (OCC workstations and Local Workstations) shall not exceed 1.5s.
- 5.5.2.5 The elapsed time between the validation of an order from the ICSS HMI and the control's arrival at the input level of remote equipment shall not exceed 1.5s.
- 5.5.2.6 Switching time between real-time redundant servers shall not exceed 5s.
- 5.5.2.7 The Acknowledgement of an alarm (Elapsed time between its request from the ICSS HMI and the update of the list of alarms on all workstations) shall not exceed 0.5s.
- 5.5.2.8 The feedback to ICSS operator action (Elapsed time between an operator request from the ICSS HMI and the display on the workstation reporting that it has been considered) shall not exceed 1.5s.

5.5.3 **Expandability and Scalability**

- 5.5.3.1 The ICSS shall be a fully flexible and scalable system, which shall be upgradable with only configuration data and modular software modification to incorporate future integration of any functionality, equipment, and as required by Section 5.4 of this document.
- 5.5.3.2 The ICSS shall be able to be upgraded and/or modified to incorporate any other changes which may be required during the lifetime of the system.
- 5.5.3.3 The ICSS shall be open and modular in nature to provide maximum adaptability and flexibility during the life of the system.
- 5.5.3.4 The TSCC Contractor shall provide details of any future proposed updates to the core equipment foreseen within the lifetime of the system.
- 5.5.3.5 The TSCC Contractor shall provide documentary evidence as to how changes to the core operating equipment, including all hardware and software, post commissioning, are to be managed during the lifetime of the system, determining effective strategies to combat the system obsolescence.

5.5.4 **Safety Requirements**

- 5.5.4.1 ICSS shall comply with the safety requirements defined in the Schedule 1 and the Authority's System Safety Plan.

5.5.5 **RAM Requirements**

- 5.5.5.1 The TSCC Contractor shall be responsible for performing all the activities as specified in the Schedule 1 – Safety, Security and RAM Requirements.

5.6 **Cybersecurity and Security Requirements**

5.6.1 **Security and Confidentiality**



- 5.6.1.1 The ICSS design, procurement activities, configuration, and operation shall be fully compliant with the California HSR Cybersecurity Technical Specification. All technical security controls, access controls, logging requirements, patching cadence and procedures, incident-response procedures, cryptographic requirements, backup and restoration strategies, and assurance measures shall be co-engineered with the TSCC Contractor's Cybersecurity Lead.
 - 5.6.1.2 All ICSS components, including servers, RTUs/PLCs shall be treated as networked endpoints and subject to the Authority's cybersecurity compliance reviews, threat modeling, and supply chain risk assessments.
 - 5.6.1.3 The ICSS must have an accountable System Owner who shall be the risk owner of all cybersecurity risk associated with the ICSS.
 - 5.6.1.4 The system shall be protected against threat-based cybersecurity risks identified during threat modelling exercises and risk assessment activities facilitated by the TSCC Contractor's Cybersecurity Lead as outlined in the California HSR Cybersecurity Technical Specification. The System Owner shall be responsible for ensuring that appropriate technical SMEs and system design experts attend threat modelling exercises and inform risk assessment activities. Threat modelling exercises shall consider the threats described in the California HSR Technical Specification and information gathered by the Cybersecurity Lead from threat sources.
 - 5.6.1.5 All interfaces with other systems shall be secured in compliance with the cybersecurity technical specification, with detailed documentation that demonstrates how the security objectives are achieved, where systems are in different cybersecurity zones, connectivity shall be facilitated by appropriately design security conduits that are reviewed by the Cybersecurity Lead.
 - 5.6.1.6 The ICSS System Owner shall maintain a risk register containing cybersecurity risks and mitigating actions, risk updates shall be provided to the Cybersecurity Lead periodically.
- 5.6.2 Access Authority**
- 5.6.2.1 For system security, the ICSS shall be equipped with a configurable user access authentication system that shall restrict the actions that can be performed by different operators on the different devices in the system, according to operator profiles. The user access authentication system shall be integrated with the centralized authentication and directory services to enable centralized identity and access management as outlined in the California HSR cybersecurity specification.
 - 5.6.2.2 The ICSS shall enforce a strong password policy and multi-factor authentication, as described in the California HSR Technical Specification.
 - 5.6.2.3 The system shall implement Role-Based Access Control to enforce the minimum set of permissions for different operator profiles; each operator shall only have the required access to perform their duties. Further detail on access control is provided in the cybersecurity specification.
 - 5.6.2.4 The ICSS System Owner shall design roles that enable the implementation of Role-Based Access Control such that:



- Control roles (e.g., OCC Operators) shall be granted full supervisory control of assigned sub-systems.
- Monitor-only roles (e.g., Maintenance staff, Emergency Services) shall be restricted to alarm and alert viewing only.
- Managerial roles (e.g., Operations and Maintenance Managers) shall be restricted to data analytics, trend monitoring, and reporting functions only.

5.6.2.5 Role-Based Access Control privileges shall be enforced in accordance with the principle of least privilege, with segregation of duties applied between operational, maintenance, and administrative functions. The user access management system shall have the following typical functions:

- Definition of user profiles.
- Definition of users.
- Profiles management:
 - Add/remove profiles.
 - Defining profile permissions.
 - Mapping profiles to directory service profiles/groups/roles
- Users' management:
 - Add/remove users.
 - Centralized authentication service integration.
 - Centralized directory service integration

5.6.2.6 The system administrator shall work with the centralized access management team to ensure that roles are mapped between the ICSS and Directory Services to enable on-boarding and off-boarding of users to the user access management system. The access authority system shall ensure that only one “logged in” operator has authority over a defined area of control and alarm acknowledgement, at any one time.

5.6.2.7 The access authority design shall include liaison with the Authority, and the Access and Authority Strategy shall be submitted for review and approval by the Authority.

5.6.3 Remote Access Security

5.6.3.1 The diagnostic and maintenance access, and any other remote access, shall be on-boarded to a centrally managed remote access solution as defined in the California HSR Cybersecurity Technical Specification, the System Owner shall work with the Cybersecurity and network teams to facilitate and configure this connectivity.

5.6.3.2 Remote access sessions shall be managed and activities performed during remote access shall be monitored and automatically recorded in the event log, these logs shall be available for audit purposes as required.



6 INTERFACE REQUIREMENTS

6.1 General Requirements

6.1.1 The interfaces are classified as the following:

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

6.1.2 The preferred communication interfaces to other systems and equipment shall be through a communication protocol via the DCN, direct to Core Equipment, Controllers, RTU, PLC, or IED provided as part of the interfaced systems and equipment.

6.1.3 For interfaced systems or equipment that do not possess a DCN connection, but that require a connection to the ICSS, the TSCC Contractor shall allow for this requirement by hardwiring the interface to the ICSS RTU/PLC.

6.1.4 All communications links and interfaces between the ICSS and interfaced systems shall use IP-based communications via the DCN.

6.1.5 All communications links and interfaces shall operate with open and standard protocols.

6.1.6 Where the use of proprietary protocols is unavoidable, the TSCC Contractor shall make the protocol details freely available to the Authority and to be shared with the interfacing contractors.

6.1.7 ICSS RTU/PLC with I/O Cards and serial interfaces (Modbus and/or other protocols) shall be provided with converter devices, where necessary to interface to other systems and equipment, where communication via IP protocols is not possible.

6.1.8 ICSS RTU/PLC shall communicate with core ICSS equipment over open protocols.

6.1.9 It shall be the responsibility of the TSCC Contractor to implement a logical and structured IP addressing policy that they agree with the Authority during the detailed design stage, without conflicting with existing equipment.

6.1.10 The TSCC Contractor shall provide necessary design information and coordinate with each interfacing party, recording the agreed interface design parameters, including IP addresses, subnets, VLANs, protocols, I/O Lists, and other requirements to achieve interface resolution.

6.1.11 The ICSS shall be fed via the UPS and not be directly exposed to network energy so that it is not affected by energy fluctuations or blackouts.

6.1.12 Power distribution within rooms, wayside enclosures, and the TSCC Contractor's specific equipment cabinets shall be the responsibility of the TSCC Contractor.

6.2 External Interfaces – station contractor

6.2.1 The ICSS shall interface with station BMS Mechanical and Electrical (M&E) equipment provided by station contractor. The interface shall fulfill functionality as described in Section 5.4.14.

6.2.2 The TSCC Contractor shall coordinate with the station contractors regarding the space provisioning and mounting arrangement for ICSS equipment.



- 6.2.3 The TSCC Contractor shall coordinate with the station contractors for the provisioning of cable containment.
- 6.2.4 The TSCC Contractor shall arrange interface meetings/strategy to define the interfaces and HMI functions.

6.3 External interfaces - facilities contractor

- 6.3.1 The ICSS shall interface with facility BMS Mechanical and Electrical (M&E) equipment provided by facility contractors. The interface shall fulfill functionality as described in Section 5.4.14.
- 6.3.2 The TSCC Contractor shall install all ICSS equipment in the OCC and facilities being provided by the facilities contractor.
- 6.3.3 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
- 6.3.4 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

6.4 Internal Interfaces

6.4.1 Digital Communication Network (DCN)

- 6.4.1.1 The ICSS interface with DCN shall fulfill functionality as described in Section 5.4.4.
- 6.4.1.2 The ICSS shall utilize the DCN for communication with all subsystems.

6.4.2 Network Timing System (NTS)

- 6.4.2.1 The ICSS interface with NTS shall fulfill functionality as described in Section 5.4.5.
- 6.4.2.2 The ICSS interface with NTS for time synchronization of ICSS servers, HMI, and controllers.

6.4.3 Electronic Access Control System (EACS)

- 6.4.3.1 The ICSS interface with EACS shall fulfill functionality as described in Section 5.4.6.

6.4.4 Closed Circuit Television System (CCTV)

- 6.4.4.1 The ICSS interface with the CCTV system shall fulfill functionality as described in Section 5.4.7.

6.4.5 Telephony System



- 6.4.5.1 The ICSS interface with the Telephony system shall fulfill functionality as described in Section 5.4.8.
- 6.4.6 **Public Address and Customer Information System (PACIS)**
 - 6.4.6.1 The ICSS interface with PACIS shall fulfill functionality as described in Section 5.4.9.
- 6.4.7 **Wireless Communication System (WCS)**
 - 6.4.7.1 The ICSS interface with WCS shall fulfill functionality as described in Section 5.4.10.
- 6.4.8 **Hazard Detection and Early Warning System (HDEWS)**
 - 6.4.8.1 The ICSS interface with HDEWS shall fulfill functionality as described in Section 5.4.11.
- 6.4.9 **Enterprise Asset Management System (EAMS)**
 - 6.4.9.1 The ICSS interface with EAMS shall fulfill functionality as described in Section 5.4.12.
 - 6.4.9.2 The ISCC shall provide static Asset Information and dynamic Asset Information to the EAMS for maintenance activities and asset lifecycle management activities.
- 6.4.10 **Medium/Low Voltage Power Supply (MV+LV PS)**
 - 6.4.10.1 The ICSS interface with MV+LV PS shall fulfill functionality as described in Section 5.4.13.
 - 6.4.10.2 The ICSS equipment shall receive LV power from UPS.
- 6.4.11 **BMS and electromechanical equipment system at Substations**
 - 6.4.11.1 The ICSS interface with BMS equipment provided at substations shall fulfill functionality as described in Section 5.4.14.



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 section 2.4.
- 7.1.2 All materials supplied shall be of sufficient grade and quality to meet the design life requirements.
- 7.1.3 Any failure of a single element within the ICSS shall be isolated to prevent propagation and shall not affect the operation of other elements.
- 7.1.4 The redundancy of the ICSS shall guarantee:
 - no interruption of display.
 - no interruption of the communication with connected systems.
 - no interruption to full functionality.
- 7.1.5 The redundancy solution shall allow uninterrupted operation, that is, in case of shutdown of one system, the operation continues without interruption with the intervention of the ICSS back-up.
- 7.1.6 The ICSS shall be able to transfer data to and from any point in the ICSS network.
- 7.1.7 Failure of any equipment element or node within the ICSS network shall not affect the operation of any selected equipment.
- 7.1.8 The operating system shall be the currently supported version of existing commercial operating systems.
- 7.1.9 In the event of a communications failure between a station and the equipment located in the OCC, the ICSS equipment and the connected selected equipment shall continue to run as normal in a standalone mode.
- 7.1.10 Security access to ICSS archives shall be guaranteed through authentication at the centralized security management database level, with very restricted access to repositories and password policies.

7.2 Software and Hardware Requirements

7.2.1 ICSS Servers

- 7.2.1.1 The ICSS 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 ICSS survives during any one failure of hardware, power supply, cabling, and software.

7.2.2 ICSS RTU

- 7.2.2.1 Dual redundant RTU CPU, power supply, and COM modules shall be able to be connected directly via modular analogue I/O modules to the equipment and indirectly via digital communication interface modules to the network.
- 7.2.2.2 Both monitor and control shall be performed through the RTUs interface to the plant via digital and analogue inputs/outputs. This data shall be transferred to the central ICSS simultaneously.
- 7.2.2.3 The RTUs shall also be provided with analogue and digital control outputs to switch equipment such as circuit breakers.
- 7.2.2.4 The RTU shall be assembled from modular units, e.g. power supply module, CPU and communications module, communication interface modules and modules for input/output purposes.



- 7.2.2.5 I/O and serial cards shall be able to be arranged in the RTU rack in any order.
- 7.2.2.6 The remote terminal units shall at least respect the whole set of the following features:
- The average load of each CPU per slice of one minute shall be smaller than 60%.
 - Connection to redundant LAN shall be achieved through dual-attachment network interface cards.
 - Connection to external systems shall be carried out through physical interface such as I/O expandable cards, serial link modules, and Ethernet modules.
 - RTU shall support standard lower-level transport/network protocols (e.g., TCP/IP)
 - RTU shall support standard application protocols (e.g., OPC).
 - In case RTU needs a separate rack, it shall have a structure of 19 inches wide, mounted in an industrial cabinet.
 - For maintenance purposes, electronics status and troubleshooting LED codes shall be displayed on the RTU's front & rear panels.
 - RTU's power supply shall conform to electrical values such as: voltage range from 100V up to 240V and frequency range from 50Hz up to 60Hz.
- 7.2.2.7 Data from PLCs and Remote Terminal Units (RTUs) shall be relayed to the ICSS, and commands shall be entered into the HMI to adjust the processes they control.

7.2.3 ICSS Software

- 7.2.3.1 The ICSS software shall be designed to work on several platforms (cross-platform software).
- 7.2.3.2 Open and industry-standard protocols shall be implemented for all interfaces between systems.
- 7.2.3.3 All software and protocols shall be fully specified such that a 3rd party is able to implement the protocol for replacement/modified systems.
- 7.2.3.4 The supply of the ICSS shall include all necessary software perpetual licenses.
- 7.2.3.5 All licenses shall be fully transferred to the Authority on completion of the works.
- 7.2.3.6 All intellectual property rights for bespoke software designs and development, including all design documentation, source codes, development environment, and simulators, shall be transferred to the Authority on completion of the works.
- 7.2.3.7 The TSCC Contractor shall include provision for the evolution, upgrade path, and support of software and systems for the period specified in the contract.
- 7.2.3.8 All commercial "off the shelf" third-party software, except for operating systems, shall be the latest version available.
- 7.2.3.9 All software required to allow the ICSS to interface with other subsystems shall be defined and/or developed during the detailed design phase.
- 7.2.3.10 All interface software shall be written to allow full control of the respective sub-system.
- 7.2.3.11 The TSCC Contractor shall manage design coordination between all interfaced systems to ensure that all interfaces are fully developed, tested, and commissioned.
- 7.2.3.12 The TSCC Contractor shall, as part of the design phase, develop a Functional Architecture detailing how each sub-system functionality shall be implemented in the ICSS.
- 7.2.3.13 The design of the ICSS shall allow for fallback operation of the system database.
- 7.2.3.14 A Database Management Plan shall be prepared by the TSCC Contractor to address how the database is to be managed such that it does not become excessively large and complex.
- 7.2.3.15 The Database Management Plan shall also detail how the database can be updated and modified.



- 7.2.3.16 An alarm shall be raised in the ICSS upon its database and/or storage capacity exceeding a pre-set threshold.

7.2.4 Protocols

- 7.2.4.1 The ICSS shall be at least able to manage the following protocols:

- OPC UA
- BACnet
- IEC 60870-5
- IEC 61850
- SNMP V3
- MQTT
- Profisafe
- Modbus
- Profibus
- Profinet
- Or other open protocols can be proposed.

- 7.2.4.2 Open standard shall not be a proprietary or undocumented protocol.

- 7.2.4.3 Any protocol suggested shall be based on an Open public specification defined in an EN or ISO standard or an IETF RFC or similar, or another published and unencumbered specification that is available in full for industry review prior to any submission.

7.2.5 Human Factors requirements

- 7.2.5.1 The TSCC Contractor shall provide a Human Factors study prior to detailed design and submit it for approval to the Authority for the ICSS (present at the OCC and in Local within its scope).
- 7.2.5.2 The Human Factors design approach shall be based on best practices of industrial automation developed by the Abnormal Situation Management consortium and according to ISO 11064.
- 7.2.5.3 The ICSS HMI shall provide dynamic layout or diagrams of the monitored/controlled systems and shall allow the use of pan and zoom features to seamlessly navigate in the selected layout or diagrams.
- 7.2.5.4 The ICSS shall provide sufficient displays to allow operators at the OCC and in stations to supervise their area of responsibility.
- 7.2.5.5 The Human Factors (HF) methodology shall use a holistic approach bringing together all relevant stakeholders to ensure that the system will be defined correctly, and the design will meet all identified needs.

7.3 EMC Requirements

- 7.3.1 ICSS and associated electrical and electronic devices shall be designed to the requirements defined in the EN 50121-4 standard (Rail Applications - Electromagnetic Compatibility - Part 4: Emission and Immunity of Signaling and Telecommunications apparatus).
- 7.3.2 All equipment shall be provided with its own electromagnetic interference-free enclosure where necessary to ensure correct operation and avoid permanent degradation



8 TOLERANCES

Not applicable to the ICSS.

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 ICSS Scope of Work.
- 9.1.2 Virtualized, cloud (on-premises) solutions may be proposed by the TSCC Contractor.
- 9.1.3 All central servers may be on-premises or virtualized machines to ease systems' evolution, complying with the Cybersecurity requirements.

9.2 Specific Requirements for ICSS

- 9.2.1 The ICSS scope of supply and delivery shall include (but is not limited to):
 - Servers.
 - Workstations/Displays /HMI/printers.
 - RTUs.
 - Cabling and connectors.
 - Racks.
 - Software architecture, including a full definition of protocols used.
 - HW/SW licenses.
 - Maintenance tools.
 - Any necessary supporting structures for ICSS.
 - Any auxiliary elements needed for ICSS.
 - Spare parts.
 - Maintenance laptops.
 - Video wall and controller.
- 9.2.2 The cables used in the ICSS shall be low-smoke, flame-retardant, halogen-free type.
- 9.2.3 The TSCC Contractor shall provide the ICSS 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 ICSS

12.2.1 The TSCC Contractor shall develop a simulated environment to conduct all tests that can be performed using the simulated environment for the equipment and interfaces, before the on-site testing phase. The main goals are as follows:

- Prove the ICSS functionalities.
- Integrate ICSS with other systems.
- Test all interfaces.
- Test operational scenarios.
- Redundancy and robustness test.

12.2.2 The ICSS simulation environment(s) shall confirm that the CHSR operational principles are fully implemented on the prototypes, and this implementation complies with the expected behavior.

12.2.3 The TSCC Contractor shall propose and fulfil a set of functional and operational tests that comply with all the functionality of CHSR operational principles. These test scenarios shall be accepted by the Authority.



13 SUBMITTALS

13.1 General Requirements

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

13.2 Specific Requirements for ICSS

13.2.1 The design and supply of the ICSS shall include, as a minimum, the following plans/strategies:

- Alarm Management Strategy.
- Database Management Plan.
- Integration Plan.
- Access Authority Strategy.
- HMI specification.
- Functional Architecture.
- Future Expansion Strategy.

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 railway management aspects which may influence ICSS system reliability, availability, and maintainability characteristics.

16 LOGISTICS

16.1 General Requirements

16.1.1 General logistics requirements are defined in the Agreement.

