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TS400057
TECHNICAL SPECIFICATION OF
FIRE FIGHTING SYSTEM
ELECTRIC TYPE COCO LOCOMOTIVE

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1. SUBJECT AND SCOPE

This technical specification describes the technical requirements for the procurement of the Fire Fighting system to used in the Electric COCO LOCO (hereafter called LOCO) produced by Turkish Railway Vehicles Industry Inc. (hereafter called Administration).

The Bidder shall offer a solution totally compliant with the requirements of this specification.

After signing the contract, possible deviations from this specification or from other specifications and norms mentioned in this document, shall be validated by written agreements between Administration and the Contractor.

The Bidder shall make clause by clause comment into present technical specification together with their offer.

This Technical Specification and its annexes have been prepared in Turkish and English. In the event of any inconsistency between the two, the Turkish language shall prevail.

IMPORTANT NOTE:

The present document shall be examined by the Bidder, together with the following document:
TŞ400048 –General Technical Specification of Electric COCO LOCO
in order to know general applicable requirements established at LOCO level.

2. DEFINITIONS & REFERENCE DOCUMENTS

2.1. INTRODUCTION

In this Technical Specification, the following definitions apply:

- “End Client” means the legal entities or private persons operating on the national railway lines of the Republic of Türkiye with using the LOCO.
- “Final User” means The End Client or its staff who is in charge of use, maintenance, repair etc. the LOCO.
- “Administration” means the Turkish Railway Vehicles Industry Inc. (TÜRASAS)
- “Contractor” means the company who wins the tender to supply the good object of this specification
- “Documentation” means all or any specifications, drawings, reports, networks, operating and maintenance manuals and all other information whether on paper or on electronic media or other format which is prepared by the Contractor in the course of the contract
- “Bidder” means the company who want to join to the tender to supply the good object of this specification

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2.2. ACRONYMS AND DEFINITIONS

Acronyms and technical terms in the technical specifications and their annexes will be interpreted as follows.

Acronyms	Description
UIC	International Railway Association
RAMS	Reliability - Availability- Maintainability- Safety
TCMS	Train Control Management System
ERTMS	European Train Control System
TCDD	General Directorate Of Turkish State Railways
TCDDT	Turkish State Railways Transportation Inc.
EN	European Standard
TSE	Turkish Standards Institute
UNI	National Standards Unit
EC	European Community
ISO	International Standard Organization
CAD	Computer Aided Drawing
Co-Co	Electrical Mainline Locomotive
NoBo	An organization within the scope of Directive 2016/797/EU, issued by the relevant European Union Commission, on the interoperability of railway systems within the EU. "Notified Body"
TSI LOC&PAS	Document 1302/2014/EU and related orders of the European Commission (Technical specification for interoperability of the rolling stock – locomotives and passenger railway vehicles subsystem of the railway system in the European Union)
TSI SRT	Document 1303/2014 / EU of the European Commission (technical specifications for the mutual operability of the Trans-European Conventional and High-Speed railway system concerning 'security in railway tunnels')
TSI CCS	Document 2016/919/EU of the European (Interoperability technical specifications for 'control-command and signalling subsystems of the Trans-European railway system)
TSI NOI	Document 1304/2014 / EU of the European Commission (Railway vehicles - technical specification for mutual operability related to 'noise')
CSM	Document 402/2013/EU of the European Commission (General security method for Risk Assessment)
I/F	Interfaces
LOCO	Electric Locomotive
SOS	Scope Of Supply
LCC	Life Cycle Cost
LRU	Line Replaceable Unit
MTBF	Mean Time Between Failures
MKBF	Mean Kilometres Between Failure
MKBSF	Mean Kilometer Between Service Failure

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N/A	Not Applicable
TBC	To be Confirmed
TBD	To be Defined
IEC	International Electrotechnical Commission
IP	Ingress Protection
IRIS	International Railway Industry Standard
PRM	Person with Reduced Mobility
FAI	First Article Inspection
EMC	Electromagnetic Compatibility
FCU	Fire System Control Unit

Table 1 – Acronyms and Definitions

2.3. REFERENCE DOCUMENTS

In the following table the documents used for

Ref	Document	Title
1	TS400048	General Technical Specification of Electric Coco Loco
2	TB50160	Standard List
3	TB50165	RAMS Target Allocation
4	TB50161	Fire Classification
5	012GX0000201	General Layout Electric
6	TB2348	Contractor's Responsibilities and Rules to be Followed

Table 2 –Reference Documents

2.4. SCOPE OF SUPPLY

2.4.1. HARDWARE

The Bidder/Contractor shall provide all relevant components related to the fire protection system, to be used in the LOCO.

The Fire protection system system shall consist of:

- Fire detection system components
- Fire extinction system components
- Fire system control Unit (FCU)
- All the connectors (mating and fixed parts), accessories belong to connectors, other accessories (with crimp contact)
- Special cables, assembly parts (bolt, screw etc), supports and brackets for equipment belong to system

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The quantity of Fire protection system equipment shall be given in the following table;

Description	Per LOCO
FCU	2
Smoke/Temperature Sensors	2
Technical areas detection sensors	5 zones
Technical areas extinguishing devices	2 Kit
If any, all other equipment which are necessary for functionality of Fighting System	1 Kit

Table 3 – Quantities

2.4.2. SOFTWARE

The Contractor shall give system software with equipment to guarantee system performance in the first product delivery.

The Contractor will provide all the software for the system maintenance and operation of the ERD so that the minimum will be as follows:

1. Operational Software
2. Diagnostic & Test Software
3. All the documentation including software operation, user and maintenance manual as well as user manual for the all development & test software and diagnostic software.

The SW development shall be at least as per the Basic Integrity level requirements defined in the EN 50716.

If any, Contractor shall provide diagnostic software tools as 6 pieces (programs, special connection cables, licences, CBM data cloud access and analysis, etc.).

If a special software tool for uploading application software, downloading diagnostic files or other functions is necessary, Contractor shall provide related software tool to Administration.

Contractor shall submit definitive software documentation which shows definition of necessity of SIL 2 for the system and software has been prepared according to SIL requirements according to EN50128 at Stage 3 (see §12, Table 8)

In case of demanding alteration about the correction of the software by Administration during the starting up tests or guarantee period, Contractor shall carry out these changes freely.

In case of any confliction in specified requirement, Contractor will take necessary improvement precautions with the condition of covering the expenses himself/herself within the agreed time schedule with Administration.

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Contractor shall provide system starting up test reports which have been carried out on the Contractor's plant or test reports belong to the trial tests of the updated software before the publishing of the updated software formally.

2.4.3. SPECIAL TOOLS

Generally, the usage of special tools shall be avoided to perform preventive and corrective maintenance.

If this is not possible, the Bidder/Contractor shall provide a list of tools and 2 complete sets of special tools free of charge.

Nevertheless if they are essential for maintenance (upon Contractor and Administration agreement), following information shall be supplied in a dedicated section of the Maintenance Manual:

- descriptions and technical data (including SW if present)
- drawings
- use instructions
- list of tasks where the tools usage is mandatory (and of course Maintenance Cards shall refer to the relevant special tools when is needed)
- all the information for purchasing it correctly (technical data, builder, price, and so on) if the special tool is available on the market

The Contractor shall provide the software tools necessary to manage the life cycle of the system (monitoring and troubleshooting SW, special connection cables and adaptors, diagnostics and CBM data cloud access and analysis, etc.).

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3. STANDARDS TO BE COMPLIED

The LOCO shall be designed, assembled and tested according to the following international reference standards:

European Standards:	TSI, EN
International standards:	UIC, ISO, IEC
Other International Standards:	DIN, NF F, UNI, CEI etc.
National Standards:	Technical documents and associated annexes issued under TSE directives.

System of units shall be SI (International System of Units).

In conformity assessments to be carried out by the Bidder/Contractor, and in respect of other requirements to be fulfilled by the product subject to this Technical Specification and its constituent equipment and sub-components, where such requirements are not explicitly defined herein, the directives, standards and requirements listed above shall be applied in the order of priority specified.

Where compliance with these directives, standards and requirements is not possible, other relevant international standards, European national standards, national standards, TCDD guidelines, and requirements stipulated by national legislation may be applied.

If a gap exists in the standards with the defined order of priority, such a gap shall be filled by the subsequent standard.

In case of any amendments to the standards/norms referred to under this clause during the execution of the Contract:

- The Contractor shall notify the Contractor in writing within twenty (20) working days following the date of entry into force of such amendment.
- Within one (1) calendar month after providing such notification, the Contractor shall prepare the necessary processes to comply with the new requirements and submit them to the Contractor for approval. However, the approval process shall not exceed two (2) months (60 calendar days) from the date the amendment enters into force.
- The Contractor shall review the process and notify the Contractor of its decision within fifteen (15) working days.

Amendments to directives, standards, or norms shall not prevent completion of certification.

By reviewing this Technical Specification and its annexes, the Bidder/Contractor shall confirm that the product, its constituent equipment and sub-components comply with the latest applicable versions of the relevant standards. The Bidder/Contractor shall be obliged to notify the Contractor in writing, together with proposals, in case of:

- Any inconsistency, contradiction, or violation with international standards,
- Problems that may arise in implementation,
- Matters that are deemed technically beneficial to amend,

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- Issues not specified in this Technical Specification or its annexes but necessary/mandatory for the manufacture of the system/equipment.

The complete standards list is indicated in the TB50160.

The Bidder/Contractor should satisfy the specific standards indicated in Table 4.

Standard	Title
EN 17050	Conformity assessment - Contractor's declaration of conformity
TSI LOC&PAS 1302/2014 Amended 2023/1694	Technical Specification of Interoperability: Rolling Stock - locomotives and passenger rolling stock subsystem of the rail system in the European Union
TSI CCS 2016/796 Amended 2023/1695	Technical Specification of Interoperability: Control Command and Signalling TSI
TSI Noise 1304-2014 Amended 2023/1694	Technical Specification of Interoperability: Noise
TSI SRT 1303/2014 Amended 2019/776	Technical Specification of Interoperability: Safety in Railway Tunnels
EN ISO 14040	Environmental management - Life cycle assessment - Principles and framework
EN 50121	Railway applications. Electromagnetic compatibility
EN 50124	Railway applications. Insulation coordination.
EN 50125-1	Railway applications - Environmental conditions for equipment - Part 1: Rolling stock and on-board equipment
EN 50126	Railway applications. The specification and demonstration of reliability, availability, maintainability and safety (RAMS).
EN 50129	Railway applications - Communication, signalling and processing systems - Safety related electronic systems for signalling
EN 50153	Railway applications. Rolling stock. Protective provisions relating to electrical hazards
EN 50155	Railway applications - Electronic equipment used on rolling stock
EN ISO 14040	Environmental management - Life cycle assessment - Principles and framework
IEC 60529	Degrees of protection provided by enclosures (IP Code)
IEC 61373	Railway applications – Rolling stock equipment – Shock and vibration tests
EN 54 (series)	Fire detection and fire alarm systems
EN 50716	Railway Applications - Requirements for software development

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EN 45545-2	Railway applications -Fire protection on railway vehicles -Part 2: Requirements for fire behaviour of materials and components
EN 45545-6	Railway applications -Fire protection on railway vehicles -Part 6: Fire control and management systems
EN 50128	Railway applications -Communications, signalling and processing systems- Software for railway control and protection systems
IEC 61508	Functional safety of electrical/electronic/programmable electronic safety-related systems

Table 4 – Applicable Standards

The Bidder shall review and confirm compliancy to the above list of applicable norms, any deviation shall be submitted to Administration for approval.

4. TSI REQUIREMENTS AND RELATED DOCUMENTATION

4.1. TSI CERTIFICATION

The LOCO shall be certified according to current version TSI PAS/LOC, TSI NOI, TSI PRM, TSI SRT and TSI CCS by Notified Body (NoBo) / Designated Body (DeBo). The Contractor shall provide whole calculations, drawings, analysis, test reports and other kind of documentation which is requested by TSIs for the present Scope of Supply. Within the scope of Supply, Contractor Provide the documentation required for the compliance matrix to be created by NoBo.

The Contractor/Bidder shall provide the declaration of conformity of its Scope of Supply to the relevant technical specifications and applicable norms.

The declaration of conformity shall be in accordance to the EN17050 Norm and shall include also the following documents:

- Conformity declaration (The Bidder shall submit it at Stage 1, see § 12 Table 6)
- Conformity report with all conformity evidence (The Contractor shall submit it at Stage 3, see § 12 Table 8)
- Type test reports (The Contractor shall submit them at Stage 3, see § 12 Table 8)

3.1 certificates for the products according to EN 10204 (the Contractor will submit them in Stage 3, see § 12 Table 8) will be delivered to the Administration by the Contractor.

The documentation presented by the Contractor/Bidder relevant to the Conformity report with all conformity evidences and test reports will be examined for approval by the NoBo/DeBo in charge of certification of the LOCO.

If there is a need for corrections to the documents or new documents are required depending on the examinations made by the NoBo/DeBo, the relevant documents will be provided by the Contractor. The Contractor is obliged to meet the documents that are not foreseen at the tender stage but are requested by NoBo later.

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4.2. EC CERTIFICATION OF CONFORMITY AS INTEROPERABILITY CONSTITUTE
N/A

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5. TECHNICAL SPECIFICATIONS

The Fire Fighting system shall be compliant with the applicable standards as reported in dedicated. The fire protection system shall comply with the regulatory reliability requirements to reduce the risks of being impaired in its functions by damages produced by fire or by other interference due to other interfacing control system failure or equivalent.

All components part of the fire detection, shall withstand to effects due to locally generated accelerations, forces, and resonances acting within and on installed equipment.

5.1. INTRODUCTION

5.1.1. Regulatory Framework

The system will comply with the following safety standard:

- TSI Loc&Pass & SRT “Safety in Railway tunnels”

5.1.2. Fire vehicle classification

The vehicles classification and the fire protection requirements on vehicle level is described in document TB50161 – Fire classification.

The vehicle classification refers to the categories defined by the TSI (paragraph 4.1.4).

The locomotive must be classified as **freight locomotive** and according to TSI in paragraph 4.2.10.2.1, it can be considered as

- Standard vehicle: N
- Operation category: 2

So, the vehicle results to be classified as 2N, and this implies a hazard level equal to **HL2**.

5.2. PRODUCT DEFINITION

The fire protection system will performo following basic functions:

- Fire detection
- Fire extinction
- Warning, controls and diagnostic

The fire protection system shall be managed by FCU. Two FCUs for each locomotive shall be provided, in order to guarantee the appropriate redundancy for the system.

The system shall work in Master-Slave mode in each locomotive.

More in detail the main functions will be:

- To detect smoke/fire presence in driver cab and technical area, to activate acoustical and visual alarm signals (alarm signals are not in scope of supply) in the driver cabs. The alarm shall be audible and/or visible from the driver in all modes of service. In addition, the protection system will indicate the zone/cubicle affected by the sensor activation place on TCMS HMI in the driver desk.

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- To detect smoke/fire in the electrical cabinets/ converters cubicles/technical zones
- To extinct the fire that occurs in the technical zones protected by the fire protection system
- To shut down the energy supply in the technical area affected by the fire
- To shut down the ventilation, if required, in the zones affected by the fire
- Smoke and fire detection shall be performed using appropriate devices, suitable for the zones where they are installed.
- Appropriate redundancies shall be provided in order to have a safe and reliable system according to applicable standards and equipment SIL level.
- To manage relevant alarm and failure signals to the diagnostic communication with TMCS

When any process described above is initiated because of the occurrence of a fire, the following requirements shall apply to the fire fighting system:

- the process shall continue to completion; or
- the process shall be maintained in its end condition as long as this is required in the context of the fire incident.

The system shall not be disabled by fire before completion or before continuation. if appropriate, for as long as the system performs a required function in the context of the fire incident.

5.2.1. Driver cab fire detection

The fire detection in the driver cab shall be managed by dual STD smoke, temperature and temperature gradient sensors.

Sensors should be EN 54 approved detectors.

5.2.2. Technical areas fire detection and extinction

The technical areas to be protected by a fire detection and extinction systems are indicated below.

Detection shall be provided in:

- 2 Traction Converter + Auxiliary
- Electrical Cabinets EC1 and EC2 and ECMV

For detection in technical cabinets, it shall be obtained through a linear heat detection cable or a suitable other method that guarantees an equal or better performance.

The Contractor shall be responsible of the correct installation inside the technical cabinet to guarantee the better detection performance for each area considered.

Extinction shall be provided in:

- 2 Traction Converter + Auxiliary

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For fire extinction inside technical areas, Contractor shall indicate the best option for each area and shall be in charge of the quantity and dimensioning of the extinction system.
The fire extinguishing method shall not damage electronic cabinets and equipments. The equipments shall not become unusable as a result of the fire extinguishing process.

5.2.3. Fire Protection System Operational Features

The detection system shall be designed to ensure timely detection of the fire in all danger zones, so as to minimize exposure times to the hazardous situation.
The detection system shall also be able to detect the fire selectively so as to implement the most suitable actions according to the area where the fire originated.
The Contractor shall define all the actions taken by the system in the possible scenarios of fire in the areas of interested described in paragraph 5.2.1 and 5.2.2.

5.3. APPLICATION SOFTWARE

It is under responsibility of the Contractor to develop the software control of the fire protection system to guarantee full required performances and required functionality for the system at SIL level.

Contractor shall provide application software.

SIL level for the system is 2, a SIL certification of system including software and hardware, issued by independent authority according to relevant railway standards, shall be delivered by Contractor.

Temporary acceptance can be done without delivery of SIL certification, but final acceptance is subject to delivery of SIL certification

If a special software tool for uploading application software, downloading diagnostic files or other functions is necessary, Contractor shall provide related software tool to Administration.

Contractor shall submit definitive software documentation which shows definition of necessity of SIL 2 for the system and software has been prepared according to SIL requirements according to EN50716 at Stage 3 (see §12 Table 8 show).

5.4. DIAGNOSTIC

The system shall avoid undue or false alarm in case of smoke and fire detection.
Reset procedures in case of alarm shall be clearly described in the operational manual.
The system shall manage the condition fault or out of service separately and independently from the alarm signal management; the information about fire fight system failures and out of service shall be available in the active driver desk, via opportune signals.
The functional restore (manual or automatic) shall be possible only after the fault or out of order condition is eliminated or the involved failed components substituted.
After any restore or reset operation, the system shall be in initial efficiency working condition.
In case of fault or out of service condition that is not restorable the Contractor shall describe the criteria to consider the system functioning still acceptable.

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The system shall record any alarm signal in the FCU and TMCS, the same for any manual interventions or reset.

The alarm signal shall be clearly noticed to the crew and driver.

The FCU shall be equipped with a diagnostic system, continuously running, and able to verify the status of the main components and share, on the data bus, all the main failure data to guarantee immediate information to the staff. Diagnostic information shall be recorded in an opportune memory inside the FCU; these data can be downloaded from maintenance personnel using a standard PC with a dedicated diagnostic software (included into the scope of supply) and via the TMCS interface.

Shall be recorded all kind of failures at LRU level.

Minimum information to be managed for diagnostic:

- Failure of sensor(s)
- Failure of an equipment detection system
- Failure of an equipment extinction system

Complete LRU list, maintenance troubleshooting and instructions shall be defined by the Contractor. Contractor shall provide diagnostic codes with its corrective actions according to related communication protocol.

TCMS supplier is the leader of implementing communication protocols. Contractor shall provide requested documents according to defined parameters which are defined by TCMS supplier and Administration.

5.5. WEIGHT

The fire protection system Contractor shall be committed to the process of weight management required in order to meet target weights as the train design develops.

Contractor shall declare the weight of all the components included into scope of supply.

5.6. MANUFACTURING

N/A

5.7. INTERFACE SPECIFICATION

5.7.1. MECHANICAL INTERFACE

The fire fighting system Contractor shall define and detail all the mechanical interfaces to the carbody of each component included into its system.

It shall be included in the scope of supply all the elements necessary for the fixation of the components to the vehicle (e.g. screws, brackets, ...)

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5.7.2. ELECTRICAL INTERFACE

Electrical connections shall be realized using dedicated connectors, to be included (fixed and mobile) in the scope of supply.

The FCU and the relevant sensors/controls units shall have at least following connections:

- Power supply connection
- Input modules to connect remote sensors; according to the Contractor architecture, for each sensor shall be available a dedicated input, sensor status shall be checked constantly
- Output modules to manage output signals, such as alarm, fire detection, ventilation inhibition lines, and these signals will be used by wired lines to manage fire functions, such as stop of ventilation, energy cut-off, information to driver and so on
- Ethernet connection to interface Fire Detection control Unit with TCMS.

5.7.3. DIGITAL AND/OR ANALOGUE INPUTS/OUTPUTS

TBD during design phase

5.8. EARTHING

For protective provisions relating to electrical hazards on railway vehicles EN 50153 - standard is valid and shall be obeyed.

All equipment causing an electric shock shall be protected against direct contact.

All conductive surfaces of electrical equipment on the vehicle shall be connected to an earthing point for equalization of the electrical potential.

This includes conductive surfaces of cubicles, doors and covers.

Exceptions are small items of interior trim in an environment otherwise protected by bonding to car body and/or insulation (e.g. grips, coat hooks, etc.).

All equipment operating at AC-voltage >25V or at DC-voltage >60V shall be earthed for safety.

Each earthing point of the equipment shall be designed as follows: the earthing points shall be of good electrical conduction to ensure low touch voltage, the earthing points shall have large contact surface and shall be able to carry a possible short circuit current.

A design according to EN 60529, min IP20 (>12,5mm) is required for cubicles containing Band III voltages.

The min IP20 shall be achieved when there are situations when the cubicle is open and Band III voltage is live.

Each earthing point shall be easily accessible for assembly.

The Contractor shall provide an earthing diagram of its equipment including earthing bonds and shields.

The Contractor shall indicate which cables of his system will be shielded.

Cable shielding may only be used for shielding purposes and NOT as signal, ground or reference wires.

If Contractor does not request different connection, cable shields shall be grounded on both ends in order to obtain high shielding efficiency against electric and magnetic fields.

This requires potential equalisation between both grounding points, e.g. through chassis or appropriate structural components.

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Grounding of cable shields shall be made with low impedance (large contact surface, preferably over 360 deg. circumference).

Grounding by means of sheath wires (pig tails) or connector pins is NOT permitted.

The Low Voltage 0V level in the cars is floating, so shall be avoided an internal connection in the equipment between metallic chassis and the 0V connection; grounding connections in the equipment shall not be connected to car Low Voltage DC power supply.

5.9. ENVIRONMENTAL CONDITIONS

5.9.1. CLIMATIC CONDITION

The systems and equipment within the scope of this technical specification shall work properly in the specified climatic conditions (temperature, rain, snow, ice, dust, wind and so on) in particular, ice, sand and snow shall not be cause of malfunction.

General climatic conditions in accordance with the EN 50125-1 standard are defined in the following document:

- TŞ400048 Electric CoCo Locomotive General Technical Specification

5.9.2. NOISE, VIBRATION AND SHOCK

General noise, vibration and impact conditions are reported in the already mentioned in General Technical Specification and Noise Requirement document.

For shock and vibration the Contractor shall be able to demonstrate that the bogie equipment is tested and validated according to IEC61373

5.9.3. PROTECTION (IP)

The control unit shall be min IP 20 for internally mounted equipment/components as minimum (IP level shall be suitable to the effective location of the components, to be verified during the project evolution).

5.9.4. PAINTING

The Bidder/Contractor can propose its own painting specification to Administration. The usage of this painting specification is dependent on Administration approval.

Concerning resistance to corrosion, design and processes shall take in account the effect of potential galvanic corrosion.

The colours of products have to be defined by Administration during design meetings.

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5.9.5. ELECTROMAGNETIC COMPATIBILITY (EMC)

The equipment shall comply with the EMC requirements defined in EN 50121-1, EN 50121-3-1 and EN 50121-3-2.

5.10. SYSTEM AND COMPONENTS LIFE

The service life for systems/equipment/components within the scope of this specification shall be 30 years or more.

5.11. MATERIAL REQUIREMENT

5.11.1. GENERAL REQUIREMENTS

Materials shall be suitable to allow the normal maintenance activities without need to adopt special protections including welding, cuts and so one. They shall be suitable for the waste disposal without need of particular care.

All information about safety and health shall be provided, even for consumables like glue and cleaning agents.

The choice of materials shall be done to prevent corrosion in every usage condition.

The Bidder/Contractor shall give the list of every material used together with their offer.

5.11.2. FIRE RESISTANCE BEHAVIOUR

According to TSI LOC&PAS materials requirements for fire resistance behaviour are expressed through the index R(n) described in the standard EN 45545-2, "Table 5". According to EN 45545-1 and EN 45545-2 standards the locomotive hazard level will be HL2 and operation category will be 2N (freight locomotive). The Contractor shall submit to the Administration a certificate of conformity to this standard. This hazard level identifies the relevant tests pass-no-pass condition. These requirements for materials depend not only on the component intrinsic nature, but also on the position, shape and layout, surface exposure, relative mass and thickness of the material considered. To identify the relevant R (n) requirements, in "Table 2" of the standard EN 45545-2 several products and their position on the train are listed. In the following table the material requirements are reported:

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Name	Applicable Product type (N°)	Definition	Details	Requirement
Fire Protection	EL1A	Cables for interior	Cables not compliant with one of the standards referenced in 4.2c	R15
	EL10	Small Electrotechnical products	Examples include low power circuit breakers, overload relays, contactors, contactor relay, switches, control or signalling switches, terminals, fuses	R26
	EL9	Printed circuit boards	Printed circuit boards without any attached technical equipment	R24 or R25 or R26

Table 5 – Material Fire Behaviours

Any material used, even if not included in Table above, must meet the requirements specified in chapter 4 of the EN 45545-2 standard.

The Contractor shall give the list of the inflammable materials used with material type, quantity and fire resistance behaviour tests.

5.11.3. SMOKE OPACITY AND TOXICITY

All the materials used do not emit toxic gases in such quantities as to be harmful.

The parameters taken as reference for the selection of materials, and the requirements they must meet, are described in "Table 5" of the EN 45545-2 standard with reference to the classification of the hazard level of the LOCO and the set of requirements R(n) to which the material is associated.

5.12. LABELS/MARKING

The system/equipment/components supplied shall be provided with technical markings, in order to fulfil requirements of electrical safety, and provide information to maintenance personnel.

Wherever required for health and safety purposes, including where necessary to comply with legislation, parts shall be fitted with suitable safety and warning signs.

In particular the parts supplied, including all replaceable parts, shall be identified by a label showing:

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- Serial number;
- Data of manufacturer
- Date of manufacture
- Contractor's part number (if any)
- Revision level;
- Company's part number (if any)

Format and positioning of all labels/markings shall be subject to approval by Administration. Wherever possible, the position shall be such that any company information (Logo and brand etc) cannot be viewed when the relevant part is installed within the vehicle.

All labels shall be permanent and indelible.

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6. RELIABILITY, AVAILABILITY, MAINTAINABILITY AND SAFETY (RAMS) REQUIREMENTS

6.1. RELIABILITY, AVAILABILITY, MAINTENABILITY & SAFETY (RAMS)

The Contractor shall make RAMS analysis according to TB50165.

7. TRAINING AND MANUAL

7.1. TRAINING

Comprehensive training courses, covering the system/equipment supplied, shall be provided by the Contractor to Administration or Final User personnel free of charge.

The level of training shall be congruent with the complexity and criticality of the system/equipment in object, therefore training performed by the Contractor shall be properly prepared in order to be efficient and effective.

This training shall give to the trainees a general overview of the system/equipment, of its performance, as well as sufficient knowledge for carrying out periodic maintenance of the system/equipment and its components, fault finding and repair and carrying out works both of preventive and of corrective maintenance. Additionally the Contractor shall give detailed training about assembly/disassembly of system/equipment.

Generally the training activities are divided in two steps; the first concerning a general description of the system/equipment and depth training for carrying out scheduled maintenance needed during the first 2 years of operation.

The second step completes the knowledge about all maintenance aspects with particular care to overhaul activities.

The Contractor shall give 2 day training for Administration personnel for the equipment in Administration facilities.

The training documentation shall be prepared in English and Turkish languages in number of participants by the Contractor. The language of the training shall be Turkish.

The bidder shall propose and detail in the tender phase the training activity to be carried out.

Then Administration and the Contractors will discuss and agreed details pending on End Client requirements.

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7.2. MAINTENANCE MANUAL

7.2.1. MAIN FEATURES OF THE MANUAL

The Contractor shall prepare integrated manual for the operation and maintenance of its scope of supply equipment according to EN15380 and its annexes.

The manuals shall contain:

- supplied system/equipment description;
- preventive maintenance tasks description;
- corrective maintenance tasks description (repair instructions included)
- information in order to carry out the overhaul of the system/equipment and the heavy repair
- (if it is repairable and off Loco).

The manual will be used as the basis for LOCO operation and maintenance by Final User staff.
The manual shall be prepared in electronic editable format and the language UK English and Turkish.

The Contractor shall be responsible for ensuring that the maintenance manuals remain up-to-date, accurate, and applicable until the end of the general warranty period of the final delivered product. During this process, the opinions, requirements, and requests communicated by the Administration and/or the End User shall be taken into consideration. The Administration reserves the right to request modifications, corrections, or additions in case the submitted maintenance manuals are found insufficient during its review. The Contractor shall be responsible for carrying out the necessary revisions in a timely and complete manner in line with such requests.

7.2.2. CONTENTS OF THE MANUAL

The manual shall contain as minimum the following information/instructions:

- Description and Operation
 - General description and operation of system/equipment
 - Functional description and operation of all LRU's and components
 - Mechanical and electrical data sheets for all LRU's and components.
- Maintenance Activities
 - Preventive Maintenance Plan including the maintenance periodicity (frequency) table for system/equipment.
 - Reported information shall be the same of those described by the Preventive Maintenance analysis and be linked with detailed Maintenance Instructions.
 - Preventive Maintenance Plan shall report reference to specific/special tools needed for the maintenance works (if used).
 - Maintenance Instructions shall report step by step detailed description of each task of the maintenance plan in order to include all information necessary for carrying out the relevant work.

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- The Preventive Maintenance Plan shall include all activities foreseen for the system/equipment from daily inspection up to major repair/overhaul.
- Preventive Maintenance card/instruction
Each maintenance instruction shall include:
 - task periodicity
 - safety warnings
 - cleaning materials
 - recommended lubricants
 - torque values
 - special tools (if any): as special tool is intended either a tool (hardware and/or software) that is exclusively produced by the Contractor and is essential for system/equipment maintenance, either a tool available on market but expensive, sophisticated, with long lead time and so on
 - step by step activity description with necessary schemes, drawings and illustrations, including:
 - scheduled activities (greasing, topping up, visual check, etc)
 - removal and refitting
 - off- LOCO overhaul
 - final functional check

The Contractor is responsible to update the maintenance instructions until the end of the general warranty period of the last supplied equipment.

- Corrective Maintenance card/instruction
Each maintenance instruction shall include:
 - trouble shooting
 - safety warnings
 - torque values
 - special tools (if any)
 - step by step activity description with necessary schemes, drawings and illustrations, including:
 - removal and refitting
 - off- LOCO repair
 - failure diagnosis
 - final functional check

The Contractor is responsible to update the maintenance instructions until the end of the general warranty period of the last supplied equipment.

7.2.3. FORMAT OF THE MANUAL

The format of the Maintenance Manual can vary according to the Administration and the Final User requirements, therefore here following are reported some rules generally applicable.

Specific requests shall be communicated when available.

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- The Manual shall report/contain the same references, drawings, schemes, component codes, Part Numbers, definitions, descriptions, terminology and so on used in the system/equipment configuration and design documentation to guarantee a perfect correspondence and to avoid mismatching during tasks performance.
- In the manual, the parts should be shown by numbering on the exploded picture. Within the scope of this picture, there should be a list consisting of Part No, Stock or Part Code No, Part Name and Quantities
- It is important to properly identify the LRUs/components by utilizing the same identification name reported by the technical drawings.
- All maintenance manuals shall be prepared in electronic format and delivered to the Administration through cloud-based storage with encrypted sharing platforms. The Contractor shall be responsible for delivering each new version/revision in electronic format and for keeping revision records of previous versions. No hard copies shall be delivered. The contractor shall deliver two copies of the manuals with two USB flash drives.
- The documentation in electronic format shall be in a completely editable form (Office Word)
- The PDF format can be used as formal delivery of the documentation (in order to be used as official delivery towards Final User)
- Pictures and photos shall be inserted and not simply linked.
- Photos should be only JPEG format.
- Pictures should be only TIFF format.

Derogations from above listed issues can be discussed and agreed between Administration and the Contractor pending the respect of Final User requirements

8. TESTING, INSPECTION AND ACCEPTANCE

LOCO will be certified in accordance with the latest version of the TSI regulations. If all products and services (including hardware, software, system main and subcomponents) to be procured under the tender are evaluated within the scope of TSI requirements, the contractor will be responsible for all relevant certifications for the equipment to be provided to NoBo.

8.1. INTRODUCTION TO TEST AND INSPECTION

The Contractor shall perform the tests and the inspection in accordance with the Approved Test Procedure and the Approved Inspection Specification.

Administration and/or End Client have the right to witness any of these tests and inspections at any stage of test and inspection procedure.

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In the event that any system or component has been previously tested and its adequacy has been demonstrated, and the Administration waives the type test upon finding it acceptable, the Contractor shall submit the following documents to the Administration for approval:

- A technical analysis explaining the differences between the previously tested product and the product used under the current contract,
- A technical report demonstrating that such differences have no adverse impact on the operation and performance of the product as defined in this specification,
- Approved test procedures, reports, and certificates pertaining to the previously tested product (including repair activities and checklists).

All test and inspection documents, as well as final reports—including the verification of design activities and the assessment of any improvements to the checklists, if applicable—shall be submitted to the Administration and shall only become valid upon approval by the Administration.

The following prescription shall be observed if the test is defined as a type test in TSI:

- The procedure shall be shared and approved by NoBo,
- The test, and relative documentation, shall be done in either an accredited lab, or with the NoBo attendance
- The test, that will be done on the vehicle, shall be planned in coordination with NoBo (attendance required), Contractor and Administration

8.2. TYPE TESTS

Type tests are required to verify that the components of the system object of the scope of supply, operate in accordance with the Approved Design Data.

The Contractor shall perform Type Tests, in accordance with a test procedure approved by Administration with Administration and/or End Client participation.

During testing, the criteria shall be observed and recorded. All alterations, adjustments and maintenance works required by Administration shall be carried out by the Contractor.

The Contractor has the responsibility for the success of mentioned Type Tests.

8.3. ROUTINE TESTS

Routine tests are required to verify that the components of the system object of the scope of supply have been built in such a way that it satisfies the requirements of the Approved Design Data as verified by the Type Test.

The Contractor shall perform routine tests in accordance with a test procedure approved by Administration under his responsibility, and, if necessary, with Administration participation.

During tests, the criteria shall be observed and recorded and necessary alterations, adjustments and maintenance works shall be carried out by the Contractor.

Records from Routine tests shall be kept by the Contractor and made available timely for Administration and/or end Client's inspection.

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All copies of the approved routine test results shall be submitted. Additional copies of records of all tests/inspections results shall also be kept at the Contractor's work to be made available to Administration or their representative on demand.

This test shall include functional test, visual inspection and dimensional inspection, as a minimum. The test details shall be approved.

8.4. FIRST ARTICLE INSPECTION

The Contractor shall perform a First Article Inspection (FAI) of the components of the system object of the scope of supply at the Contractor's factory with Administration and/or End Client participation in accordance with an inspection specification issued by Administration and/or End Client, prior to serial production in order to confirm that the hardware & software fully complies with the Contractor's scope of supply design and manufacturing process.

Contractor shall submit FAI test procedure to Administration at least 4 weeks before FAI. If any changes are requested by Administration, Contractor shall comply with these requests.

During the First Article Inspection (FAI), the Contractor shall have available all pertinent documents related to the design and production process, test records, material certifications, etc. Any nonconformities identified during the FAI shall be considered a critical quality defect. If all requirements are not met, a Hardware Review shall be requested. The Contractor shall initiate a System Review process covering the hardware and associated software components, and shall implement the necessary corrective actions. Upon completion of the System Review, the FAI shall be repeated to verify that the nonconformities have been resolved. The System Review and the repeated FAI shall be carried out in such a manner as not to affect the project delivery schedule.

Upon acceptance of the FAI by Administration and/or End client, the Contractor is then free to proceed to manufacture all pertinent hardware. The hardware shall meet or exceed the quality standards set at the FAI and must incorporate any comments made by Administration and/or End Client at the FAI.

All domestic and international accommodation and travel expenses (including round-trip international airfare, accommodation, and transportation between workplaces) for all Administration personnel traveling to the Contractor's facilities for First Article Inspections (FAI) will be covered by the Contractor. Administration personnel will participate in First Article Inspections for a maximum of 6 personnel / day.

8.5. CONTRACTOR TECHNICAL ASSISTANCE

The Contractor shall ensure the installation and commissioning of the product subject to the technical specification and the equipment and subcomponents (hardware and software) that make up this product, in all LOCOs at the Administration facilities. During these processes, all necessary technical support and engineering services will be fully provided; installation and commissioning procedures, instructions and step-by-step checklists will be available for verification and approval during this process, and the details will be shaped during the project process.

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Contractor support will at least cover installation, connection, configuration, system control and commissioning/homologation activities.

8.6. COMMISSIONING

8.6.1. TYPE COMMISSIONING TEST

In order to demonstrate the compliance of the supplied products and sub-components (hardware and software) with the requirements of this technical specification and its annexes, static tests (at the Administration's facilities) and dynamic commissioning tests (on railway track) shall be carried out for the first prototype locomotive under the Contractor's responsibility, with the participation of the Administration and the End User, in accordance with the test procedures prepared by the Contractor and approved by the Administration and/or the Notified Body (NoBo).

If the tests to be performed are defined as a 'type test' within the scope of the TSI, the test procedure shall be submitted to and approved by the NoBo (Notified Body). The on-board static and dynamic tests shall be planned in coordination between the Contractor and the Administration and executed with the approval and participation of the NoBo.

8.6.2. ROUTINE COMMISSIONING TEST

On the serial LOCOs, routine commissioning test for the system will be performed by Administration in workshop and service track under the Contractor's responsibility.

9. AUTHORIZATION TO START PRODUCTION

The Contractor shall prepare a Project Plan covering all information specified in this specification, including the delivery schedule of parts and documents, key milestones, and major activities. The Project Plan shall be subject to the Administration's approval upon each issue. The Contractor shall commence production in line with the Project Plan and shall regularly participate in Project Progress Meetings within the defined schedule. If deemed necessary as a result of such meetings, the Contractor shall update the Project Plan.

Throughout the production process, the Contractor and its Subcontractors shall be responsible for the delivered components and systems. The Administration reserves the right to request modifications or alternative solutions for systems or components if deemed necessary due to installation, operation, interface, or similar reasons; such requests shall be mutually agreed upon during meetings with the Contractor.

Technical modifications prior to the FAI shall be managed under the Contractor's Quality Management System, whereas modifications after the FAI shall be subject to the Administration's approval. The Contractor shall monitor modifications in accordance with the plan and shall notify the Administration of each completed modification, including date, serial number, level, and location information.

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9.1. DESIGN FREEZING

During the Design Freeze phase, all design data, interfaces, technical drawings, and engineering calculations related to the systems, sub-systems, and components developed under the scope of the contract shall be finalized. This phase shall be carried out within the timeframes defined in the project schedule and is mandatory; no design changes shall be made without the written approval of the Administration.

The Contractor shall submit to the Administration all documents forming the basis for the Design Freeze (design reports, technical drawings, interface definitions, and, if applicable, prototype test results) complete and on time.

The Design Freeze shall be completed within the prescribed durations and in accordance with the project schedule.

9.2. AUTHORIZATION TO START PRODUCTION

According to the final design criteria mutually agreed upon as a result of the design freeze meetings, the Contracting Authority will authorize the Contractor to manufacture the first product(s) within the scope of supply.

8.3 AUTHORIZATION TO START MASS PRODUCTION

The Contractor will be authorized by the Administration to start mass production after the FAI (First Product Inspection) is performed on the first product(s) produced by the Contractor after receiving the Authorization to Start Production.

10. ACCEPTANCE

Acceptance report shall be issued by Administration after followings have been covered:

- Complete delivery of the products and sub-components (hardware/software) within the scope of supply
- Demonstration of compliance with all standards and technical requirements defined in this technical specification and its annexes, supported by conformity declarations, inspection, and test reports
- Complete submission of documentation to the Administration by the Contractor;
- Successful execution of the locomotive system's on-track tests (commissioning type tests);
- Successful completion of the approval process by the NoBo/DeBo.

Acceptance of the first product shall not be construed as acceptance of the entire quantity requested. Each item of the contract shall be evaluated individually, and acceptance shall be carried out separately for each item.

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11. PACKAGING AND STORAGE CONDITIONS

11.1. PACKAGING

The products and all their sub-components (hardware/software) shall be delivered in suitable packaging with sufficient strength to withstand impacts and transport damage, including effects from climatic conditions such as dust, rain, snow, sun, wind, etc.

Packaging boxes shall be stackable and suitable for lifting by forklift (where reasonably applicable) or overhead crane.

Even if the products cannot be mounted on the locomotive promptly and are stored for long periods (e.g., up to three years) without use, they shall be delivered in packaging that fully protects them from any damage.

All packaging and crates shall carry the following information in a clear, legible, and weather-resistant manner:

- Manufacturer's name, address, and registered logo
- Product name, part number, and technical specification number
- Serial number and manufacturing date (if applicable)
- Contract number and date
- Quantity of products in the package and serial numbers of components
- Batch number (if applicable)
- "Project No: XXXXXX" statement

If a box contains multiple components:

- Each component shall be labeled separately
- A component list shall be included inside and outside the box/crate
- Lists shall be finalized with the Administration's approval

Systems/equipment/components:

- Shall be packaged in sets required for the production of one locomotive
- Packages shall be arranged separately for mechanical and electrical production lines
- Package lists shall be finalized upon the Administration's approval and a copy shall be provided to the Administration prior to shipment

Products and all their sub-components (hardware/software) shall be wrapped in appropriately thick bubble wrap, secured to wooden crates, and delivered on pallets. Crate weights shall not exceed 400–500 kg. Deliveries shall be made to TÜRASAS Eskişehir Regional Directorate, with the costs borne by the Contractor.

If packaging or delivery documents are missing or non-compliant, the situation shall be recorded in a report, and the products shall be returned to the Contractor without acceptance. If the returned

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materials are reshipped after the contractual delivery date, delay penalties shall apply. The Contractor shall not be entitled to any claims due to delays caused by packaging.

11.2. STORAGE CONDITIONS

The Contractor shall provide any useful information it is deemed necessary for the correct storage of the goods delivered.

In addition, the necessary conditions and procedures to be applied in order to prevent damage to the products stored in warehouses without being used for a long time will be delivered by the Contractor in detail.

11.3. MOUNTING AND HANDLING

All the components shall be supplied ready for installation and possibly already mounted and pre-regulated. Special care is requested to the Contractor to list all the necessary tools for mounting and maintenance.

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12. DOCUMENTS TO BE DELIVERED TO THE ADMINISTRATION ALONG WITH THE PRODUCT/EQUIPMENT

The following tables report the list of requested documents (with schedule) to be supplied to Administration.

Table 6 shows the documentation which shall be given by the Bidders in the offer phase.

Table 7 and Table 8 show the documentation which shall be provided by the Contractor for the Preliminary Technical Review and the Detail Technical Review respectively.

Id.	Stage 1 -OFFER Phase	Time Schedule	Language
1.1	Clause by Clause commentary of present Tech. Specification	With offer	Turkish and English
1.2	Scope of supply list		Turkish and English
1.3	General description of the proposed system, including all the characteristics and functionalities and technical documentation and information requested in this specification as preliminary		Turkish and English
1.4	Preliminary 3D models or installation drawings showing the main external space envelope		English
1.5	Preliminary applicable schemes		Turkish and English
1.6	Preliminary definition of main I/F characteristics with the other LOCO systems		Turkish and English
1.7	List of tests (FAI, routine, type, commissioning and homologation) that shall be performed on components and systems		English
1.8	Declaration of Conformity to applicable standards According to EN17050		English
1.9	EC Declaration of Conformity according to the TSI LOC&PAS 1302 if the scope of Supply is considered "Interoperability Constituent"		English
1.10	IRIS or ISO 9001 Certification of the Bidder (If the Bidder is an agency of the manufacturer, the Bidder shall show the manufacturer's certificate)		English
1.11	List of special tools and test equipment		Turkish and English
1.12	Project schedule, in line with project milestones		Turkish and English
1.13	Sub Contractor List		English
1.14	Detailed part list with price information of each part		Turkish and English
1.15	Delivery time from order		English
1.16	Escalation formula for spare parts		English
1.17	Explanation on how to pack in pieces		Turkish and English
1.18	10-year spare parts supply guarantee commitment (valid from the end of the warranty period)		Turkish and English
1.19	A commitment declaring that the products will be provided in accordance with the standards requested in the technical specification and TSI		Turkish and English

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Table 6 – Stage 1 Offer Phase: list of requested documents and due date

Id.	Stage 2 - PRELIMINARY Review	Time Schedule	Language
2.1	First level drawings with weight and centre of gravity indications in 3D and 2D formats	Within one month after signing the contract	English
2.2	Technical description of the system, with system characteristics and performance		English
2.3	Functional description (normal and degraded mode) of the system, included diagnostic description		English
2.4	Design justification analysis reports		English
2.5	Definition and specification of applicable I/F's characteristic (mechanical, pneumatics, electrical, signals, I/O data, etc.)		English
2.6	Certificates of the fire smoke behaviour of non-metal materials and electric cables		English
2.7	Certificates of behaviour versus applicable emissions requirements		English
2.8	Preliminary applicable analysis reports (performance, consumptions, structural strength, etc.)		English

Table 7 – Stage 2 list of requested documents and due date

Id.	Stage 3 - DETAIL Review	Time Schedule	Language
3.1	Definitive drawings with weight and centre of gravity indications in 3D and 2D format.	Within one month before FAI with product/equipment delivery	English
3.2	Definitive schemes		English
3.3	Installation drawings		English
3.4	Installation instruction		Turkish and English
3.5	Detailed description of the supplied components or systems		Turkish and English
3.6	All the technical documentation and information requested during the project (including final version of documents of previous stages), included software documentation		Turkish and English
3.7	Procedures of tests (FAI, routine, type, commissioning and homologation) performed on components and systems		Turkish and English
3.8	Available reports of tests (routine, type, commissioning and homologation) performed on components and systems		English
3.9	List of special tools and test equipment		Turkish and English
3.10	LRU list		Turkish and English
3.11	Spare Parts and Equipment List (including order codes)		Turkish and English
3.12	Servicing and lubricating table		Turkish and English
3.13	Final documentation for Certification		Turkish and English

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Id.	Stage 3 - DETAIL Review	Time Schedule	Language
3.14	EC Certification according to the TSI LOC&PAS 1302 if the scope of Supply is considered “Interoperability Constituent”		English
3.15	RAMS and LCC documentation: see dedicated paragraphs		Turkish and English
3.16	User Manuals		Turkish and English
3.17	Maintenance Manuals (including periodic maintenance Schedule) (including failure repair documentation)		Turkish and English
3.18	Calculations, tests and analysis report requested by TSI		Turkish and English
3.19	3.1 certificates of the product/equipment according to EN 10204		English
3.20	Documents showing compliance to EN 45545-2 (Certificate of Conformity, Test Report etc.)		Turkish and English
3.21	Warranty documentation		Turkish and English

Table 8 – Stage 3 list of requested documents and due date

The Bidder/Contractor shall review and confirm the above lists of documents for all the phases of the project. Any deviation shall be submitted to Administration for approval.

In Stage 1, the IRIS document submitted by the Bidder will be examined by the Administration in terms of its compliance with the scope of the product/work subject to the tender.

The documents specified in Stage 3 shall be delivered to the Administration both before the FAI and together with the product/equipment.

The documents to be delivered by the Contractor in Stage 1 and Stage 3 will be provided to the Administration in 2 (two) USBs.

Notes:

- All components, including their sub-elements (cables, connectors, etc.), shall be provided as complete 3D models in “.step” format. Connectors shall be prepared separately from the 3D model to allow their use in harness design.
- 2D drawings shall be provided in “.dwg or .dxf” format (plus PDF).
- Electrical schematics shall preferably be provided in EPLAN Electric P8 format; alternatively, in .dwg/.dxf format (plus PDF).
- All documents shall be provided in editable format as well as in PDF.
- In case both Turkish and English are used in the documents, the Turkish version shall be considered authoritative.

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- Documents shall be delivered in a format compatible with the Administration's PLM system.
- All documents shall be prepared electronically and delivered to the Administration via cloud-based storage with secure access. After each update, relevant parties shall be notified by email in accordance with the communication matrix. Alternatively, the digital documents may be delivered on two copies of portable storage media.
- 3D design of electrical equipment and cables shall be provided in Catia Electric format (plus PDF) and/or in EPLAN Pro Panel or EPLAN Harness format.

13. INTELLECTUAL AND INDUSTRIAL PROPERTY ISSUES

- 1- Any projects and documents shared with the Contractor within the scope of the work subject to the tender shall not be used for any other purpose. The Contractor shall share all technical information only with the Administration
- 2- Administration shall be authorized to use the products to be supplied by the Contractor (right of usage) – without prejudice to any mandatory legal provisions applicable and without any detriment to the Contractor's dignity and reputation.
- 3- In case of proven violation of an intellectual and / or industrial property rights by the Contractor, the Contractor shall be liable for any direct, reasonable and properly documented damages resulting directly from such violation. If the Administration faces legal sanctions, it is allowed to recourse such sanctions to the Contractor within the scope of liability of the Contractor mentioned above. Upon the request of the Administration, the Contractor is obliged to fully inform and certify to the Administration whether the service to be undertaken is a matter of intellectual and industrial property.
- 4- This technical specification is a part of the contract between the Contractor and the Administration. The Contractor does not have the authority to distribute this document or any part of it to third parties without the approval of the Administration.
- 5- If an official document is requested and mutual communication causes any mistake; all possible information requests and their responses shall be made in written format and via e-mail.

14. WARRANTY

14.1. WARRANTY CONDITION

The Contractor shall warrant the quality of the products supplied under this Specification against failures, malfunctions, assembly and workmanship defects, except for cases arising from natural wear and tear and maintenance neglect; for a period of 400,000 km of operation or 24 months from the commissioning date of LOCO, or 36 months from the delivery date of the products to the Administration, whichever expires first.

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The responsibility of performing preventive maintenance on the normally used parts and the protective maintenance in cases where it is evidently clear that the root cause is not the own malfunctions of the unit, shall belong to Administration.

Throughout the warranty period, following the notification by Administration of any malfunction, the Contractor shall respond to that malfunction within three (3) working days and replace the malfunctioning parts and equipment or repair and fix the malfunction. The Contractor shall make available in Turkey throughout the warranty period the required service facilities in order to respond to the possible malfunctions and a sufficient number of spare parts or fully complete equipment within this time period.

Responsibility for making sure that none of the information, document, certificate, component, system, machine, software, technology and design the Contractor supplies to the Administration violates any brand, patent or third-party ownership rights belongs to the Contractor.

The contractor company shall provide a 10 (ten) year service and spare parts guarantee, valid from the end of the warranty period.

14.2. SYSTEMATIC FAULT / EPIDEMIC FAILURE

Starting from the commissioning of the LOCO locomotive and during the warranty period, if a failure within the scope of the warranty occurs in more than 15% of the same part/component in the first 24 locomotives, or in more than 10% of the same part/component in the 25th and subsequent locomotives, due to the same reason, it shall be considered an “epidemic failure.”

Records of systematic failures shall be kept for a period of 24 months following the commissioning of the locomotive.

In addition, if mean time between failures (general average failure time) for the failures occurring in main components/parts used in all sets within annual periods during the guarantee term is shorter than guaranteed MDBF or MTBF value, such failure shall be deemed as an epidemic failure.

In case of confirmed systematic faults, proper investigations shall be done in order to define a proper technical solution or modification including Spare Parts modification or replacement.

In case systematic failures are confirmed, the necessary investigations shall be carried out in order to define an appropriate technical solution, including spare part replacement or modification, and a new warranty period for the solution defined within this scope shall be agreed with the Administration.

The Contractor shall perform, within the determined period, all necessary reinforcement, modification, material replacement, assembly and disassembly works at its own expense.

The expiration of the warranty period shall not relieve the Contractor of its obligations related to the subject matter of the contract. The Contractor shall remain responsible for remedying the systematic failures recorded by mutual agreement at the end of the warranty period.

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15. OTHER ISSUES

Following points have to be considered:

1. For matters not specified in the technical specification, the administrative specification shall apply.
2. The Contractor is responsible for all transportation costs.
3. The Contractor is responsible for work accidents that may occur during the work of the Contractor personnel at Administration.
4. The food and accommodation costs of the Contractor personnel belong to the Contractor.
5. The Contractor must comply with T.B. 2348 in its work within the boundaries of Administration facilities.
6. The Contractor must comply with the safety, protective safety, occupational health and safety instructions and provide the protective materials required by the work and follow their use.
7. The contractor must comply with all kinds of warnings, signs and writings within the boundaries of Administration facilities.
8. All software used by the contractor (Computer Aided Design Programs (CATIA, AutoCAD etc.), MS Office. FEM Analysis Programs etc.) will be licensed. All responsibility in this regard belongs to the Contractor.
9. The Contractor is responsible for all kinds of damages and losses to Administration or third parties in relation to the obligations fulfilled within the scope of the work subject to the tender. For matters not specified in the technical specification, the administrative specification shall apply.

16. ANNEXES AND NOTES

N/A