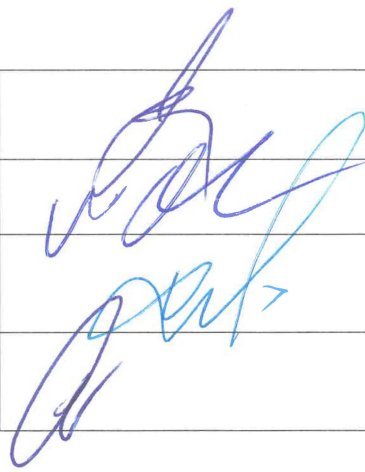
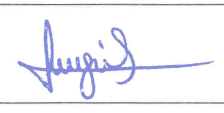


TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	1/41		

TS400072

TECHNICAL SPECIFICATION OF DRIVER'S CAB AIR DUCTS

R&D Center Coordinator	Serkan ÇÖKMEZ	
Electrical Machines Factory Manager	Necati Coşkun OTAŞ	
Locomotive Factory Manager	Oğuzhan HOŞGÖR	
Quality Control Coordinator	Tuba N. EROĞLU	

Prepared By	Aslı ARSLAN	Onur Hurşit ÇELİK	Tolgahan ŞİMŞEK
			

Date of Prep.	09/06/2026
---------------	------------

ÜRA F.005	This Technical Specification can not be REPRODUCED OR USED for any purposes without the written consent of TÜRASAS	07.04.2016 Rev:02
-----------	--	-------------------

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	2/41		

Revision Table			
Rev.	Date	Description of Revision	Revised By

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	3/41		

I. SUMMARY

1. SUBJECT AND SCOPE	6
2. DEFINITIONS & REFERENCE DOCUMENTS	6
2.1. INTRODUCTION	6
2.2. ACRONYMS AND DEFINITIONS	7
2.3. REFERENCE DOCUMENTS	8
2.4. SCOPE OF SUPPLY	8
2.4.1. HARDWARE	8
2.4.2. SOFTWARE	9
2.4.3. SPECIAL TOOLS	9
3. STANDARDS TO BE COMPLIED	10
4. TSI REQUIREMENTS AND RELATED DOCUMENTATION	12
4.1.1. TSI CERTIFICATION	12
4.1.2. EC CERTIFICATION OF CONFORMITY AS INTEROPERABILITY CONSTITUENCE	12
5. TECHNICAL SPECIFICATIONS	13
5.1. INTRODUCTION	13
5.2. PRODUCT DEFINITION	13
5.2.1. GENERAL PRODUCT DEFINITION	13
5.2.2. SUPPLY AND RETURN AIR DUCTING SYSTEM	13
5.2.3. HVAC INTERFACES	14
5.2.4. THERMAL INSULATION	16
5.2.5. FLEXIBLE DUCTS	18
5.2.6. AIR OUTLETS AND INLET	18
5.2.7. DRIVER'S CAB AIR SYSTEM DIMENSIONS AND QUANTITIES	21
5.3. APPLICATION SOFTWARE	21
5.4. DIAGNOSTIC	21
5.5. WEIGHT	22
5.6. MANUFACTURING	22
5.7. INTERFACE SPECIFICATION	22
5.7.1. MECHANICAL INTERFACE	22
5.7.2. ELECTRICAL INTERFACE	22
5.7.3. DIGITAL AND/OR ANALOGUE INPUTS/OUTPUTS	22
5.8. EARTHING	22
5.9. ENVIRONMENTAL CONDITIONS	22
5.9.1. CLIMATIC CONDITION	22
5.9.2. NOISE, VIBRATION AND SHOCK	23
5.9.3. PROTECTION (IP)	23
5.9.4. PAINTING	23
5.9.5. ELECTROMAGNETIC COMPATIBILITY (EMC)	23
5.10. SYSTEM AND COMPONENTS LIFE	24
5.11. MATERIAL REQUIREMENT	24
5.11.1. GENERAL REQUIREMENTS	24

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	4/41		

5.11.2.	FIRE RESISTANCE BEHAVIOUR	24
5.11.3.	SMOKE OPACITY AND TOXICITY	25
5.12.	LABELS/MARKING.....	25
6.	RELIABILITY, AVAILABILITY, MAINTAINABILITY AND SAFETY (RAMS) REQUIREMENTS	27
6.1.	RELIABILITY, AVAILABILITY, MAINTENABILITY & SAFETY (RAMS).....	27
7.	TRAINING AND MANUAL	27
7.1.	TRAINING.....	27
7.2.	MAINTENANCE MANUAL	27
7.2.1.	MAIN FEATURES OF THE MANUAL.....	27
7.2.2.	CONTENTS OF THE MANUAL.....	28
7.2.3.	FORMAT OF THE MANUAL.....	29
8.	TESTING, INSPECTION AND ACCEPTANCE	30
8.1.	INTRODUCTION TO TEST AND INSPECTION.....	30
8.2.	TYPE TESTS	30
8.3.	ROUTINE TESTS.....	31
8.4.	FIRST ARTICLE INSPECTION.....	31
8.5.	CONTRACTOR TECHNICAL ASSISTANCE	32
8.6.	COMMISSIONING	32
8.6.1.	TYPE COMMISSIONING TEST.....	32
8.6.2.	ROUTINE COMMISSIONING TEST	32
9.	AUTHORIZATION TO START PRODUCTION	32
9.1.	DESIGN FREEZING.....	32
9.2.	AUTHORIZATION TO START PRODUCTION	33
9.3.	AUTHORIZATION TO START MASS PRODUCTION	33
10.	ACCEPTANCE.....	33
10.1.	TEMPORARY ACCEPTANCE.....	33
10.2.	FINAL ACCEPTANCE.....	33
11.	PACKAGING AND STORAGE CONDITIONS	34
11.1.	PACKAGING	34
11.2.	STORAGE CONDITIONS	35
11.3.	MOUNTING AND HANDLING	35
12.	DOCUMENTS TO BE DELIVERED TO THE ADMINISTRATION ALONG WITH THE PRODUCT/EQUIPMENT	36
13.	INTELLECTUAL AND INDUSTRIAL PROPERTY ISSUES.....	39
14.	GUARANTEE	39
14.1.	WARRANTY CONDITION.....	39
14.2.	SYSTEMATIC FAULT / EPIDEMIC FAILURE	40
15.	OTHER ISSUES	41
16.	ANNEXES AND NOTES.....	41

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	5/41		

II. LIST OF TABLES

Table 1 – Acronyms and Definition	8
Table 2 – Reference Documents	8
Table 3 – Applicable Standards	11
Table 4 – Acoustic absorption performance	17
Table 5 – Driver's cab quantity and dimensions (preliminary)	21
Table 6 – Material Fire Behaviours	25
Table 7 – Stage 1 Offer Phase: list of requested documents and due date	36
Table 8 – Stage 2 list of requested documents and due date	37
Table 9 – Stage 3 list of requested documents and due date	38

III. LIST OF FIGURES

Figure 1 – Duct interface (preliminary)	14
Figure 2 – Interface gasket between flange and duct (preliminary)	15
Figure 3 – Cabin ducts system (preliminary)	15
Figure 4 – Driver's cab ceiling outlet (preliminary)	16
Figure 5 – Thermal insulation application example	17
Figure 6 – Flexible duct (example)	18
Figure 7 – Ceiling air outlets (preliminary)	19
Figure 8 – Windscreen air outlets (preliminary)	19
Figure 9 – Window air outlets (preliminary)	20
Figure 10 – Air inlet of recirculation duct	20

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	6/41		

1. SUBJECT AND SCOPE

This document describes the technical requirements for the procurement of the **Driver's cab air ducts** to be installed on the COCO LOCO (hereafter called LOCO) produced by Turkish Railway Vehicles Industry Inc. (hereafter called ADMINISTRATION) identical for DIESEL and ELECTRICAL configurations.

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.

IMPORTANT NOTE:

The present document shall be examined by the Bidder, together with the following documents:

TS400048 – Electric General Technical Specification

TS400049 – Diesel General Technical Specification

in order to know general applicable requirements established at LOCO level.

2. DEFINITIONS & REFERENCE DOCUMENTS

2.1. INTRODUCTION

Within this Technical System Specification, the following definitions are applied to the words reported below:

- “the End Client” means the railways company that will be the user of the locomotive.
- “the Administration” means the Turkish Railway Vehicles Industry Inc. (TÜRASAS)
- “the 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 digital or other format which is prepared by the Contractor in the course of the contract
- “the Bidder” means the company who want to join to the tender to supply the good object of this specification

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	7/41		

2.2. ACRONYMS AND DEFINITIONS

The acronyms and definitions used in this document are reported in the following Table

Acronymus	Description
TÜRASAS	Turkish Railway Vehicles Industry Inc.
TSI LOC&PAS	Document 1302/2014/EU and relative amandments of the European Commission (Technical specification for interoperability relating to the rolling stock — locomotives and passenger rolling stock subsystem of the rail system in the European Union)
UIC	International Railway Association
RAMS	Reliability - Availability- Maintainability- Safety
TCMS	Train Control Management System
ERTMS	European Rail Traffic Management System
ADMINISTRATION	TÜRASAS
Admin. Personnel Bidder	TÜRASAS and / or Co-Co project working groups assigned in the relevant subject
Contractor	The winner of the tender and the Contractor of the products covered by this spec.
EN	European Standard
TSE	Turkish Standards Institute
UNI	National Standards Unit
EC	European Community
ISO	International Standard Organization
CAD	Computer Aided Design
LOCO	Diesel/Electrical Mainline Locomotive
NoBo	Established by the relevant commission of the European Union under the directive 2016/ 797 / EC on the ""Interoperability of the rail system within the European Union"" directive. “Notified Body”
TSI SRT	Document 1303/2014 / EU of the European Commission (the technical specification for interoperability relating to ‘safety in railway tunnels’ of the rail system of the European Union)
TSI CCS	Document 2023/1695/EU of the European (the technical specification for interoperability relating to the control-command and signaling subsystems of the rail system in the European Union)
TSI NOI	Document 1304/2014 / EU of the European Commission ((technical specification for interoperability relating to the subsystem rolling stock — noise)
CSM	Document 402/2013/EU of the European Commission (Common Safety Method for Risk Evaluation and Assessment)
FRP	Fiberglass Reinforced Plastics

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	8/41		

ECM	Electronic Control Module
HCU	HVAC Control Unit
N/A	Not Applicable
TBD	To be defined
LRU	Line Replaceable Unit
LCC	Life Cycle Cost
CBM	Condition Base Maintenance
FAI	First Article Inspection
MDBF	Mean Distance Between Failure
MTBF	Mean Time Between Failure

Table 1 – Acronyms and Definition

2.3. REFERENCE DOCUMENTS

In the following table the documents used for reference documents.

Ref	Document	Title
1	TS400048	Electric General Technical Specification
2	TS400049	Diesel General Technical Specification
3	TB50160	Standard List
4	TB50165	RAMS Targets Allocation
5	TB50172	Thermoacoustic Behaviour

Table 2 – Reference Documents

2.4. SCOPE OF SUPPLY

2.4.1. HARDWARE

The Bidder/Contractor shall provide all relevant components related to the manufacturing and assembly of the driver's cab air ducts installed in the LOCO, but not to be limited to, as follows:

- Aluminium delivery plenum/duct
- Aluminium return duct
- Flexible ducts
- Air grids
- Air deflectors
- Thermal insulation
- Housing and frame
- Fasteners (nuts, bolts, resilient mounts, etc.)
- Air filters (where applicable)
- If any, special tools and test equipment

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	9/41		

- All other needed equipment and/or components (this issue will be discussed during design phase)

The scope of supply of the air ducts also includes, but is not limited to, the following:

- 2D, construction and assembly drawings (dwg, pdf) and 3D data
- BOM list
- Structural calculations
- Fixing calculations
- Tests report
- Assembly instructions
- First supply assembly assistance
- Maintenance, cleaning and repair instructions
- Standards, tests and certification of the materials used

2.4.2. SOFTWARE

N/A

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
- drawings (2D/3D)
- 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 Bidder/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.).

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	10/41		

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 published in accordance with TSE directives and related annexes

Unit System: SI (International System of Units)

The complete standards list is indicated in the TB50160.

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 Administration 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 Administration for approval. However, the approval process shall not exceed two (2) months (60 calendar days) from the date the amendment enters into force.
- The Administration 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 Employer 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,

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	11/41		

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

All the norms have to be with the version indicated in the current TSI LOC&PAS list; if the norm is not listed in the TSI list, has to be applied the version of the norm available at the signature of the contract.

The Bidder/Contractor should satisfy the specific standards indicated in Table 3

Standard	Title
TSI LOC&PAS 1302	Technical Specification of Interoperability: Rolling Stock - locomotives and passenger rolling stock subsystem of the rail system in the European Union
EN 45545	Railway applications - Fire protection on railway vehicles
EN 15663	Railway applications. Definition of vehicle reference masses.
UIC 566	Loadings of coach bodies and their components.
EN 15085-3	Railway applications - Welding of railway vehicles and components - part 3: Design requirements.
EN IEC 61133	Railway applications – Rolling stock – Testing of rolling stock on completion of construction and before entry into service.
IEC 61373	Railway applications – Rolling stock equipment – Shock and vibration tests.
EN 60077	Railway applications. Electro technical components.
ISO 3381	Railway applications. Acoustics. Measurement of noise inside railbound vehicles.
IEC 60529	Degrees of protection provided by enclosures (IP Code).
EN 50128	Railway applications - Communications, signaling and processing systems - Software for railway control and protection systems.
IEC 61287-1	Railway applications -Power converters installed on board rolling stock - Part 1: Characteristics and test methods.
EN 50343	Railway applications. Rolling stock. Rules for installation of cabling.
EN 13129	Railway applications - Air conditioning for main line rolling stock - Comfort parameters and type tests.
EN 12663	Railway applications - Structural requirements of railway vehicle.
IEC 60721-2-5	Classification of environmental conditions - Part 2: Environmental conditions appearing in nature - Section 5: Dust, sand, salt mist.
ISO 16890	Air filters for general ventilation – Part 1 to 4
ISO 717-1	Acoustics -- Rating of sound insulation in buildings and of building elements -- Part 1: Airborne sound insulation
ISO 14040-1	Acoustics -- Laboratory measurement of sound insulation of building elements -- Part 1: Application rules for specific products
EN1507	Ventilation for buildings - Sheet metal air ducts with rectangular section - Requirements for strength and leakage

Table 3 – Applicable Standards

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	12/41		

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

The Bidder/Contractor shall comply with the specific standards indicated; all norms shall be considered with the version indicated in the relevant TSI list. If a norm is not listed in the TSI list, the latest version available at the time of contract signature shall apply.

4. TSI REQUIREMENTS AND RELATED DOCUMENTATION

4.1.1. TSI CERTIFICATION

The LOCO shall be certified according to current version TSI LOC/PAS, TSI NOI, TSI PRM, TSI SRT and TSI CCS by Notified Body (NoBo) / Designated Body (DeBo). LOCO shall be certified by the Designated Body (DeBo) in accordance with national legislation and national rules. 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 7)
- Conformity report with all conformity evidence (The Contractor shall submit it at Stage 3, see § 12 Table 9)
- Type test reports (The Contractor shall submit them at Stage 3, see § 12 Table 9)

3.1 certificates for the products according to EN 10204 (Contractor shall submit them in Stage 3, see § 12 Table 9) shall be submitted by the Contractor to the Administration.

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 on.

4.1.2. EC CERTIFICATION OF CONFORMITY AS INTEROPERABILITY CONSTITUENCE

N/A

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	13/41		

5. TECHNICAL SPECIFICATIONS

5.1. INTRODUCTION

Each driver's cab shall be equipped with a dedicated HVAC (not in scope of supply). The air will be directly supplied inside the cab, by means of ducts, from the HVAC to the air grids positioned on the cab interior panels. A return air grid will suck the air from inside the cab and, through suitable interfaces, direct it to the cab HVAC.

5.2. PRODUCT DEFINITION

5.2.1. GENERAL PRODUCT DEFINITION

The air distribution in the driver's cab shall be realized by means of an air supply and return ducts system.

The main ducts and the outlets shall be made of aluminium with following characteristics (TBC):

- Material: Aluminium 5754 H22
- Density: 2660 Kg/m³
- Elastic Modulus: 68 GPa
- Tensile Strength: Yield 130 MPa
- Tensile Strength: Ultimate 220 MPa
- Elongation at Break, %: 7
- Electrical Conductivity: 49 m/Ω-mm²
- Thermal Conductivity: 147 W/m-K
- Thermal Expansion: 24 µm/m-K
- Design massflow: 700 m³/h

. The required performance of the system are:

- Duct System Air Leakage A class
- Maximum pressure system 1000 Pa

5.2.2. SUPPLY AND RETURN AIR DUCTING SYSTEM

The main components of the driver's cab air ducting system shall be (TBC):

- Air supply aluminium plenum/duct.
- Air return aluminium duct.
- Air supply flexible ducts.
- Air deflectors.
- Air grids.
- Air filters.
- Thermal insulation.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	14/41		

For the driver's cab, the air, coming from the HVAC, shall be distributed within the cab by means of ducts. The ducts will connect the HVAC unit to the outlets positioned on the interior panels (more details in the following paragraph).

HVAC outlet shall be connected to the grid positioned on the interior ceiling by means of a recirculation interface and a carbody flange (TBC).

5.2.3. HVAC INTERFACES

The cabin air ducts system shall be connected to the driver's cab HVAC by means of two interfaces, one for the air supply and one for the air recirculation. Carbody flanges (not in scope of supply) will allow the interface of the HVAC with the air supply plenum/duct and the recirculation duct.

The following figures show the detail of the duct interface area, in particular of the interface between the carbody flange and the duct. The installation shall be guaranteed by means of a U-shaped guide positioned on the duct. The tightness and noise shall be guaranteed by a gasket placed inside the U profile.

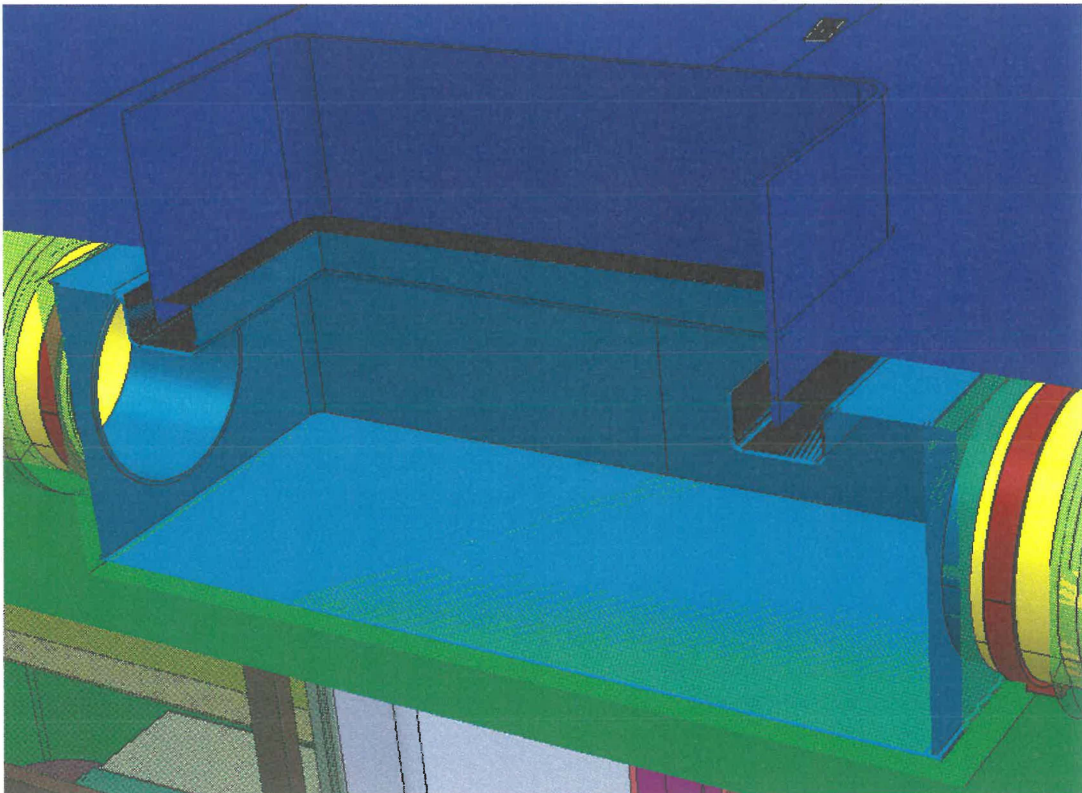


Figure 1 – Duct interface (preliminary)

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	15/41		

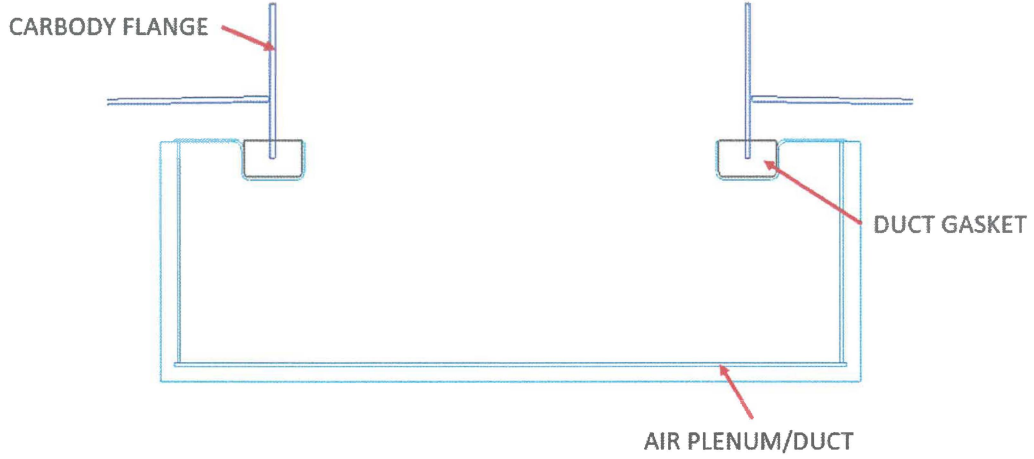


Figure 2 – Interface gasket between flange and duct (preliminary)

The air supply, coming from the HVAC by means of an aluminium plenum/duct, shall be brought, through flexible ducts to the outlets positioned on the interior panels.

- The flexible ducts, with inner diameter of 50 mm, shall connect the HVAC to the grids positioned over the driver's cab side windows.
- The flexible ducts, with inner diameter of 100 mm, shall connect the HVAC to the grids positioned on the driver's cab ceiling and beneath the windscreen.

The flexible ducts shall connect with the side interfaces of the air supply plenum/duct. The grids will let the air supply enter inside the cabin.

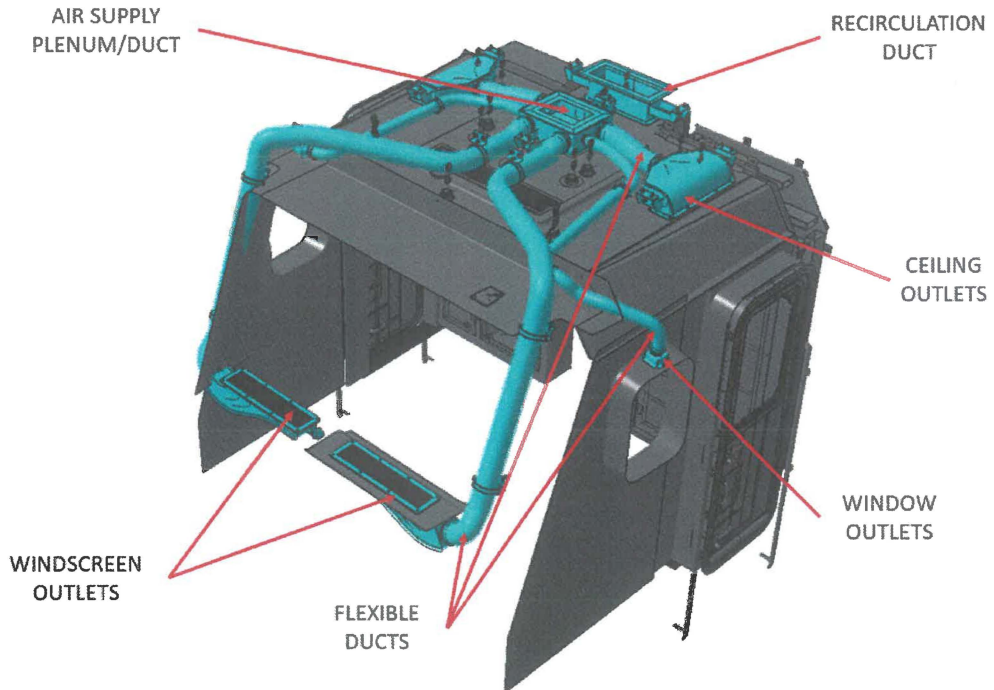


Figure 3 – Cabin ducts system (preliminary)

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	16/41		

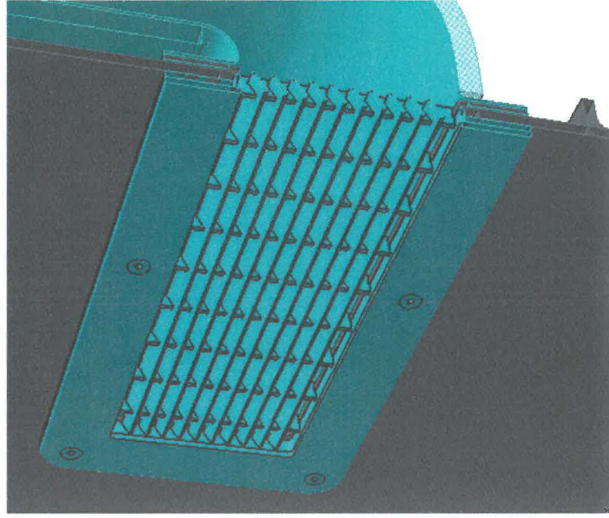


Figure 4 – Driver's cab ceiling outlet (preliminary)

The recirculation air, coming from the grid positioned on the cab ceiling, will reach the HVAC through a duct.

As the air supply plenum/duct, also the recirculation duct shall be connected with the HVAC outlet through a carbody flange.

5.2.4. THERMAL INSULATION

The aluminium ducts shall be insulated with closed cell elastomeric foam. The foam shall be adhesive to allow a quick installation on the duct. In order to merge the free corner, an adhesive tap shall be used.

Main technical data of thermal insulation are (as reference) listed below (TBC):

- Material: Elastomeric closed cells foam (for railway application)
- Temperature of use: +110°C/-50°C
- Thermal conductivity: $\leq 0.035 \text{ W/(mK)}$
- Fire Resistance: HL2 (EN 45545)
- Density: 20 Kg/m³
- Thickness: 10 mm
- Water absorption: <3% after 28 day (ISO 2896)

The insulation shall be applied as described in the next figure **Hata! Başvuru kaynağı bulunamadı..**
The adhesive insulation shall be applied on the wall duct and the open side shall be closed by tape.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	17/41		

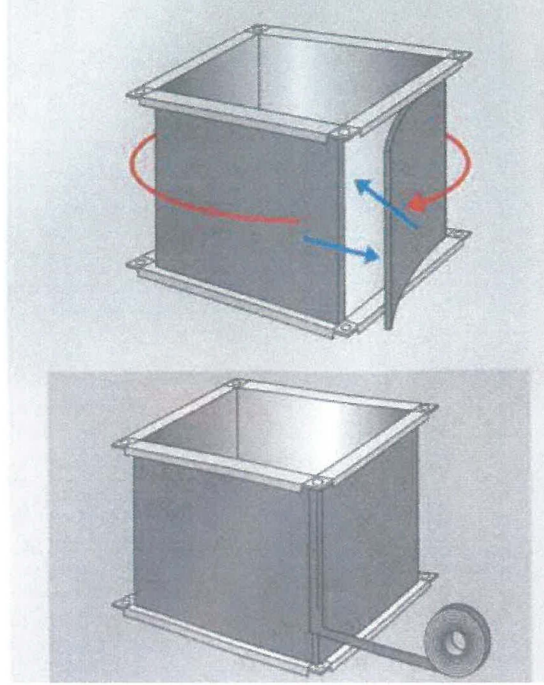


Figure 5 – Thermal insulation application example

The minimum acoustic absorption capacity is reported in the following table.

Freq (Hz)	α (abs)
100	0.05
125	0.05
160	0.06
200	0.11
250	0.30
315	0.36
400	0.60
500	0.83
630	0.92
800	0.90
1000	0.74
1250	0.85
1600	0.80
2000	0.72
2500	0.53
3150	0.45

Table 4 – Acoustic absorption performance

ÜRA F.005	This Technical Specification can not be REPRODUCED OR USED for any purposes without the written consent of TÜRASAS	07.04.2016 Rev:02
-----------	--	-------------------

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	18/41		

5.2.5. FLEXIBLE DUCTS

The flexible ducts are made by multilayer aluminium pipes with thermal insulation, of the spiral/lined or corrugated type. Main technical data (as reference) are listed below (TBC):

Temperature of use:	-30°C/+100°C
Diameter range:	50 mm – 100 mm (inner diameter)
Thermal insulation:	Polyester fibres 10 mm thickness - 16 kg/m ³
Max air speed:	20 m/sec
Bent radius:	0,8-1,5 x Ø
Pressure:	max. 2000 Pa approx.
Fire Resistance:	HL2 (EN 45545)



Figure 6 – Flexible duct (example)

Metal clamps shall be used for the flexible air ducts. All stainless-steel clamps and fasteners to be used shall be covered by the Contractor. The metal clamp dimensions shall be appropriate for the flexible air ducts. The contractor shall take the necessary precautions to ensure leak-tightness in all ducts.

5.2.6. AIR OUTLETS AND INLET

The air outlets which allow the air coming from the HVAC, through the air supply plenum/duct and the flexible ducts, to reach the interior of the cabin are the followings:

- Ceiling outlets. Two ceiling outlets shall be positioned over the interior ceiling panels. They shall be composed of a deflector and a grid as shown in the following figure.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	19/41		

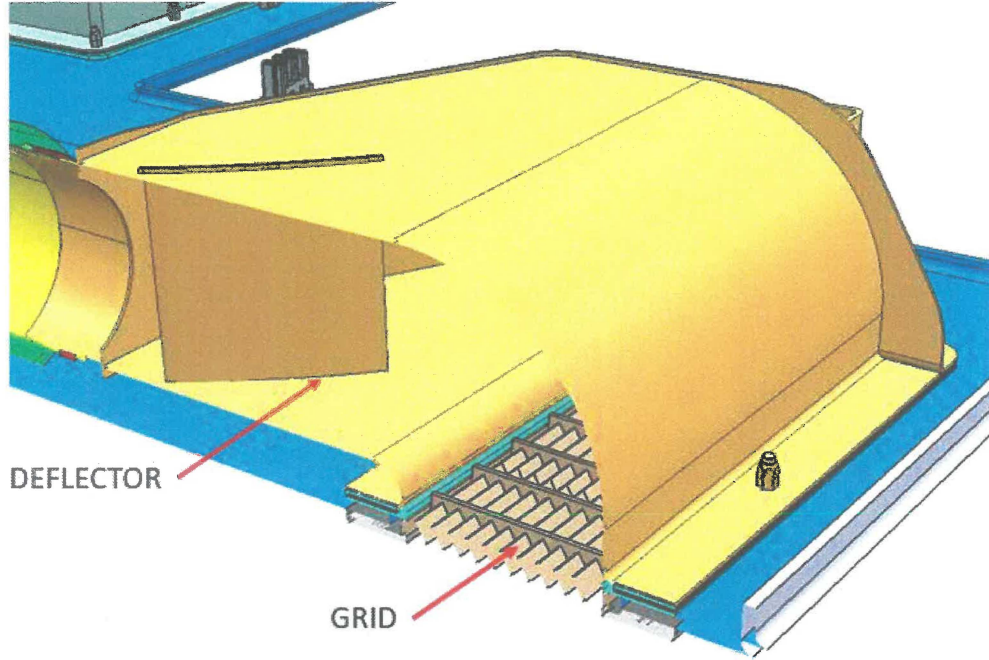


Figure 7 – Ceiling air outlets (preliminary)

- Windscreen outlets: Two windscreen outlets shall be installed on the interior panels positioned just beneath the windscreen. They shall be composed of a deflector and a grid as shown in the following figure.

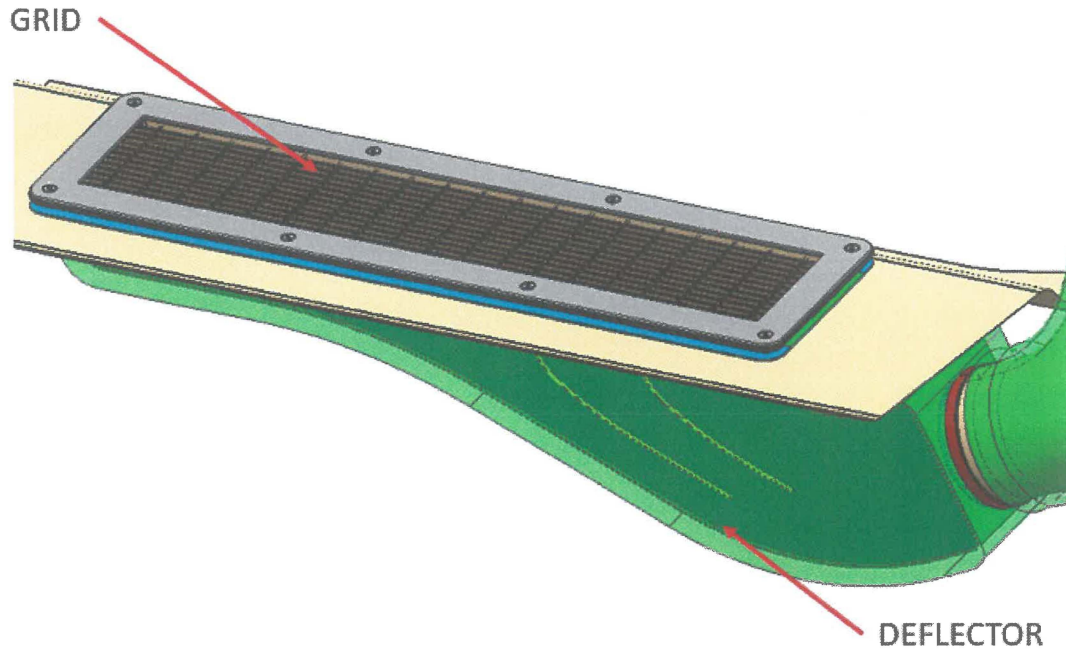


Figure 8 – Windscreen air outlets (preliminary)

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	20/41		

- Window air outlets. Two window outlets shall be positioned over the side windows (one for each window). They shall be composed of a simple grid as shown in the following figure.

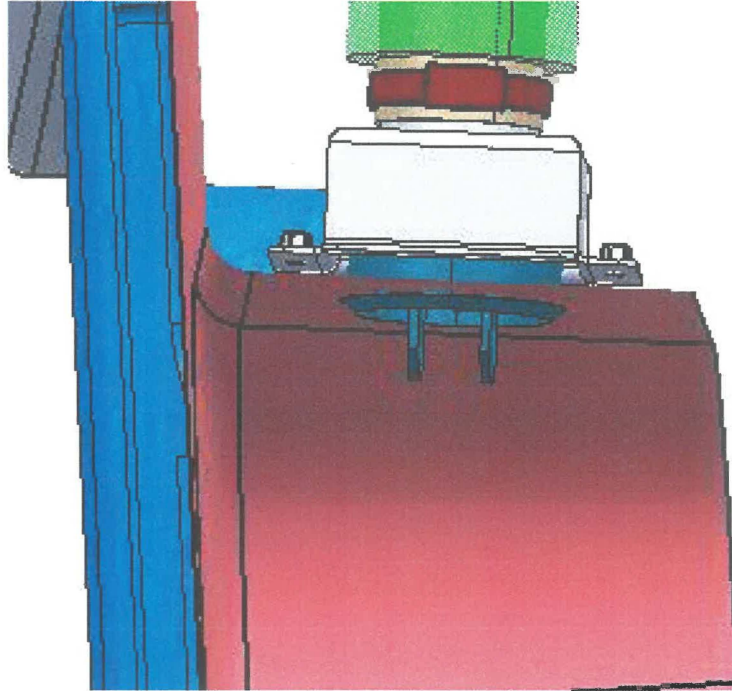


Figure 9 – Window air outlets (preliminary)

A grid shall also be provided on the ceiling as inlet for the recirculation duct.

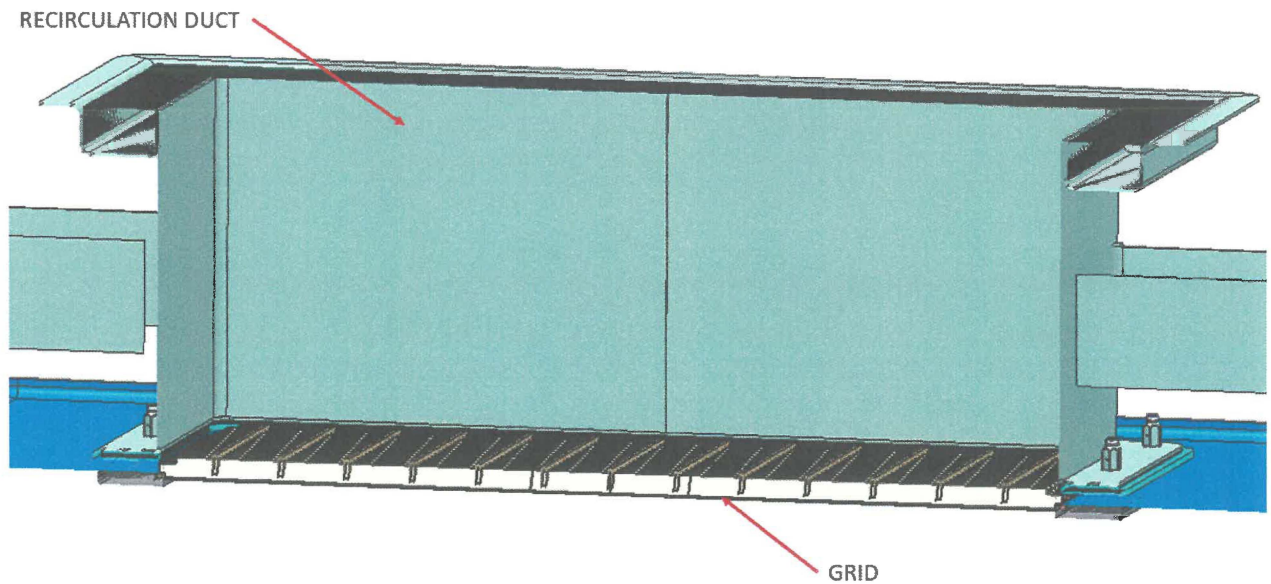


Figure 10 – Air inlet of recirculation duct

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	21/41		

Air deflectors shall direct the delivery air flow inside the driver's cab. They shall be made of aluminium and shall be fixed to the flexible air ducts.

Air grids installed on the interior panels shall be designed and shaped in order to optimize and increase the comfort parameters.

5.2.7. DRIVER'S CAB AIR SYSTEM DIMENSIONS AND QUANTITIES

The following table describes the driver's cab bill of quantity (approximate values). For accurate dimensions refer to the 3D model.

Air supply duct volume (mm)	380x320x125
Recirculation duct volume (mm)	415x150x140
Ø100 Flexible ducts length (m)	10
Ø50 Flexible ducts length (m)	5
Outlet gasket	The supplier shall provide sufficient amount considering to assure the correct assembly according to the technical specification and the customer proposals.
Brackets	The supplier shall provide sufficient amount considering to assure the correct assembly according to the technical specification and the customer proposals.
Al. Adhesive Tape	The supplier shall provide sufficient amount considering to assure the correct assembly according to the technical specification and the customer proposals.
NOTES:	The supplier shall consider a 10-15% more for each dimension and quantity reported above.

Table 5 – Driver's cab quantity and dimensions (preliminary)

5.3. APPLICATION SOFTWARE

N/A

5.4. DIAGNOSTIC

N/A

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	22/41		

5.5. WEIGHT

The Bidder/Contractor shall be committed to the process of weight management required in order to meet target weights as LOCO design develops.

The target weight for air ducts system complete with all the fixing elements shall be 40 Kg. (TBC)
Weight is one of the significant characteristics of the equipment, and it shall be taken into great account by Bidder/Contractor.

5.6. MANUFACTURING

All parts that can be opened easily for maintenance must be locked with secure systems.

The air filters, where applicated, shall be in class G3 minimum of ISO 16890.

All the components shall be supplied complete with all the mechanical interfaces necessary to be fixed to the carbody.

The dimensioning of the fixing elements (screws, bolts, washers ...) shall be under supplier responsibility; all the not normalized elements necessary for the fixation of the equipment and components shall be considered under supplier scope of supply.

The weight as defined into section WEIGHT shall include also the necessary mechanical interfaces and elements as required above.

5.7. INTERFACE SPECIFICATION

5.7.1. MECHANICAL INTERFACE

TBD in design phase. Refer to the 3D model.

5.7.2. ELECTRICAL INTERFACE

N/A

5.7.3. DIGITAL AND/OR ANALOGUE INPUTS/OUTPUTS

N/A

5.8. EARTHING

N/A

5.9. ENVIRONMENTAL CONDITIONS

5.9.1. CLIMATIC CONDITION

The system object of the present document 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.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	23/41		

General climatic conditions, following the EN 50125-1, are reported in the mentioned General Technical Specification.

5.9.2. NOISE, VIBRATION AND SHOCK

To be respected in accordance to the relevant norms.

Vibration capability modules

IEC 61373 Cat1

Contractor shall perform vibration test for subassembly of equipment according to IEC 61373. If no shock and vibration test is performed and similar components are already being used in other projects, the Contractor can submit FEM calculation and conformity explanation with similar products, which are in operation, instead of performing vibration test.

The supplier must take in account that the ducts shall be manufactured in order to not emit vibration noise when the HVAC is running. Furthermore, the ducts shall not contain any sharp edge or obstacle that can create turbulence in the flow, thus generating noise.

General noise, vibration and impact conditions are reported in General Technical Specification and Thermoacoustic Behaviour document.

The contractor shall conduct the relevant sound measurements at its own facilities and submit the measurement reports it approves to ADMINISTRATION upon product delivery.

5.9.3. PROTECTION (IP)

Equipment/components fitted to the train shall offer water and dust ingress protection in accordance with EN 60529 as follows:

IP 54 for internally mounted and assembled 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.

5.9.5. ELECTROMAGNETIC COMPATIBILITY (EMC)

N/A

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	24/41		

5.10. SYSTEM AND COMPONENTS LIFE

The required life shall be equal or greater than 30 years.

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". To correctly define the requirements, it is necessary to know the hazard level of the locomotive that, in this case, is HL2.

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 locomotive are listed.

In the table below the material requirements for the components of the cars are reported.

Applicable Product type (No)	Definition	Details	Requirement
EX5	External design features	External design features (e.g. steam lining parts, ventilation grills, flaps, skirts, coverings for HVAC systems, enclosures, etc.)	R7
EX4A	Exterior Air Ducts connected to the interior of the vehicle – Interior Surfaces	Interior surfaces of ducts which are installed on the exterior of the vehicle and from which air flows into the vehicle interior	R1
ÜRA F.005	This Technical Specification can not be REPRODUCED OR USED for any purposes without the written consent of TÜRASAS		07.04.2016 Rev:02

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	25/41		

EX4B	Exterior ducts	Exterior and interior surfaces of the ducts which are not in the scope of EX4A	R7
IN13	Air filters	Materials for air filters used for equipment ventilation, heating and air conditioning.	R5
IN12A	Air ducts – Interior surfaces	Interior surface of ducts which are installed on the interior of the vehicle and from which air flows into the vehicle interior	R1
IN12B	Air ducts – Exterior surfaces	Exterior surface of ducts which are installed on the interior of the vehicle and from which air flows into the vehicle interior	R1

Table 6 – 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 Bidder/Contractor shall give the list of the inflammable materials used with material type, quantity and fire resistance behaviour tests.

The Bidder/Contractor shall adopt materials with required characteristic and also identify other materials not mentioned above. The above R(x) list is not definitive; the Bidder/Contractor shall complete it according the materials used in the Scope of Supply.

The documentation presented by the Bidder or the Contractor relevant fire performance will be examined for approval by the Notified Body / Designated Body in charge of certification of Project nominated by the ADMINISTRATION. The Contractor/Bidder shall be responsible to perform all necessary activities which are required by Notified Body / Designated Body.

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

Labeling will be applied to main air duct assemblies only. Sub-components of the duct system will not be individually labeled, as the duct system does not consist of independent maintainable sub-

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	26/41		

components . Where necessary to comply with legislation, parts shall be fitted with suitable safety and warning signs.

The applied labels shall include the following:

- 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.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	27/41		

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

N/A

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.

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 End Client 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.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	28/41		

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.
 - 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

ÜRA F.005	<i>This Technical Specification can not be REPRODUCED OR USED for any purposes without the written consent of TÜRASAS</i>	07.04.2016 Rev:02
-----------	---	-------------------

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	29/41		

- 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 End Client requirements, therefore here following are reported some rules generally applicable.

Specific requests shall be communicated when available.

- 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
- The manual shall highlight the importance for a correct identification of LRUs/components by utilizing the same identification name reported by the technical drawings.
- The manual shall be transmitted by electronic means (CD copy) and in the final version a paper copy is also requested for each release.
- The documentation in electronic format shall be in a completely editable form (Office Word version TBD)
- The PDF format can be used as formal delivery of the documentation (in order to be used as official delivery towards End Client)
- Pictures and photos shall be inserted and not simply linked.
- Photos should be only JPEG format.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	30/41		

- Pictures should be only TIFF format.

Derogations from above listed issues can be discussed and agreed between ADMINISTRATION and the Contractors pending the respect of End Client requirements

8. TESTING, INSPECTION AND ACCEPTANCE

The CoCo LOCo shall be certified following the TSI 2023 regulation. If the component shall be satisfy the TSI, the Contractor shall be responsible for all relative certification of the equipment presented 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.

Type test can be waived if system or components are already proven and confirmed to waive by end Final User. In that case, the Contractor shall provide old test report or certificate to submit for approval.

All test and inspection specifications and reports including all repair activities and check-lists shall be submitted by Contractor and approved by ADMINISTRATION.

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

- The procedure shall be shared by the Contractor 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.

ÜRA F.005	<i>This Technical Specification can not be REPRODUCED OR USED for any purposes without the written consent of TÜRASAS</i>	07.04.2016 Rev:02
-----------	---	-------------------

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	31/41		

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 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.

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

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.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	32/41		

8.5. CONTRACTOR TECHNICAL ASSISTANCE

The Contractor shall provide all necessary technical support and engineering services for the product covered by the technical specifications and the equipment and sub-components (hardware and software) that constitute this product during the initial installation and commissioning to be carried out at the ADMINISTRATION's facilities. The installation and commissioning procedures, instructions, and step-by-step checklists shall be available for verification and approval during this process, and details shall be finalized during the project process.

The Contractor's support shall cover, at a minimum, installation, connections, configuration, system verification, and commissioning/homologation activities.

The Contractor shall actively participate in the installation of the products and sub-components (hardware and software) within the scope of supply on the first locomotive, in the initial system commissioning processes to be carried out at the ADMINISTRATION's facilities, as well as in track tests conducted on the national railway network, test tracks, and/or at the End Client's site. The Contractor shall monitor the performance of the supplied products and sub-components under field conditions and carry out verification/testing activities in coordination with the ADMINISTRATION.

8.6. COMMISSIONING

8.6.1. TYPE COMMISSIONING TEST

For the first prototype LOCO, the Contractor shall perform static (factory test on ADMINISTRATION workshop) and dynamic commissioning (on track) tests for the system to adequately demonstrate the requirements of TS, in accordance with a test procedure to be prepared by the Contractor and approved by ADMINISTRATION, under ADMINISTRATION participation.

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 Administration will authorize the Contractor to start production according to the following stages.

9.1. DESIGN FREEZING

After the contract is signed, procurement scope Design Freeze meetings will be held with the participation of End Client, the Contracting Authority and the Contractor. The date and place of the meetings will be mutually agreed.

ÜRA F.005	<i>This Technical Specification can not be REPRODUCED OR USED for any purposes without the written consent of TÜRASAS</i>	07.04.2016 Rev:02
-----------	---	-------------------

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	33/41		

At the design freeze stage, the design data, interface definitions, technical drawings, and engineering calculations of all systems, subsystems, and components developed under the scope of this contract shall be finalized in compliance with the relevant specification clauses and the referenced national and international standards.

The design freeze process shall be carried out in accordance with the project schedule. The Contractor shall be responsible for submitting to the Administration, in a complete and timely manner, all documents required for the Design Freeze, including but not limited to the final design data, technical drawings, and interface definitions.

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.

9.3. 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

10.1. TEMPORARY ACCEPTANCE

Temporary acceptance report shall be issued by ADMINISTRATION after followings have been covered by the Contractor:

- All required components have been delivered.
- All documents have been delivered.
- Routine tests in ADMINISTRATION have been performed successfully (if required)

10.2. FINAL ACCEPTANCE

Final 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);

ÜRA F.005	<i>This Technical Specification can not be REPRODUCED OR USED for any purposes without the written consent of TÜRASAS</i>	07.04.2016 Rev:02
-----------	---	-------------------

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	34/41		

- 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.

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–

ÜRA F.005	<i>This Technical Specification can not be REPRODUCED OR USED for any purposes without the written consent of TÜRASAS</i>	07.04.2016 Rev:02
-----------	---	-------------------

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	35/41		

500 kg. Deliveries shall be made, at the Contractor's expense, to TÜRASAS Eskişehir Regional Directorate.

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 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.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	36/41		

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

Table 8 and Table 9 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	IRIS Certification of the Bidder (If the Bidder is an agency of the manufacturer, the Bidder shall show the manufacturer's certificate) or ISO 9001 Quality Management System Certificate (This certificate will belong to the manufacturer).		English
1.10	List of special tools and test equipment		Turkish and English
1.11	Design schedule, in line with project milestones		Turkish and English
1.12	Sub Contractor List		English
1.13	Escalation formula for spare parts		English
1.14	Explanation on how to pack in pieces		Turkish and English
1.15	A certificate/letter confirming that the contractor will provide domestic service and spare parts support		Turkish and English
1.16	Documents showing compliance to EN 45545-2 (see chapter 5.11.2)		Turkish and English
1.17	Documents showing that they are the manufacturer/authorized distributor of the relevant equipment and that they provide service/spare parts supply support within the country		Turkish and English
1.18	10-year spare parts supply guarantee commitment (valid from the end of the warranty period)		Turkish and English

Table 7 – Stage 1 Offer Phase: list of requested documents and due date

ÜRA F.005	<i>This Technical Specification can not be REPRODUCED OR USED for any purposes without the written consent of TÜRASAŞ</i>	07.04.2016 Rev:02
-----------	---	-------------------

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	37/41		

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
2.9	Delivery time from order		English

Table 8 – 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)		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

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	38/41		

Id.	Stage 3 - DETAIL Review	Time Schedule	Language
3.14	RAMS and LCC documentation: see dedicated paragraphs		Turkish and English
3.15	User Manuals		Turkish and English
3.16	Maintenance Manuals (including periodic maintenance Schedule) (including failure repair documentation)		Turkish and English
3.17	Calculations, tests and analysis reports requested by TSI		Turkish and English
3.18	3.1 certificates of the product/equipment according to EN 10204		English
3.19	Documents showing compliance to EN 45545-2 (Certificate of Conformity, Test Report etc.) (see chapter 5.11.2)		Turkish and English
3.20	Warranty documentation		Turkish and English
3.21	Reports showing the strength of all bolted connections		Turkish and English

Table 9 – 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.
- 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.

ÜRA F.005	<i>This Technical Specification can not be REPRODUCED OR USED for any purposes without the written consent of TÜRASAS</i>	07.04.2016 Rev:02
-----------	---	-------------------

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	39/41		

- 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. GUARANTEE

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 COCO LOCO, or 36 months from the delivery date of the products to the ADMINISTRATION, whichever expires first.

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 two (2) 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

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	40/41		

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

Upon commissioning of the Electric CoCo locomotive, any failures that occur repeatedly and in a non-random manner under specific conditions or inputs during the warranty period shall be considered systematic failures.

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.

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.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400072		
		Revision			
		Page	41/41		

Components characterized as "epidemic faulty" will be replaced with new ones in all locomotives free of charge without the requirement of failure. The supply of the part, integration, assembly etc. related to this situation shall be carried out by the Contractor without any charge. For problems characterized as epidemic, the root cause of the failure shall be found and the Administration shall be notified in writing.

If necessary, the Contractor shall send the relevant expert(s) to ADMINISTRATION, at its own expense, to ensure that such failures are eliminated and not repeated.

For systems / parts / components within the scope of epidemic failure; The warranty period from the taking of the necessary measures is limited to 30 months from the delivery of the products to ADMINISTRATION, and 24 months from the re-operation of the locomotives.

Epidemic Failure; If it does not prevent the locomotive from being put into service safely, the Contractor will repair the failure in the locomotive and / or replace the defective parts with new parts at its own cost within 30 calendar days at the latest from the date of receipt of this notice. In the event that the Contractor fails to fulfill its obligations within this period, the terms of the Administrative Specification and the contract shall apply.

15. OTHER ISSUES

- 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 facilities.
- 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.

16. ANNEXES AND NOTES

T.B. 2348

ÜRA F.005	This Technical Specification can not be REPRODUCED OR USED for any purposes without the written consent of TÜRASAS	07.04.2016 Rev:02
-----------	--	-------------------