Ref. Ares(2024)3991934 - 04/06/2024

ANNEX II + III: TECHNICAL SPECIFICATIONS + TECHNICAL OFFER

Contract title: Supply of equipment for Sustainable Urban Mobility Strategy Plan for Gaziantep
Publication reference: EC-NEAR/ANK/2024/EA-OP/0046

Columns 1-2 should be completed by the contracting authority
Columns 3-4 should be completed by the tenderer
Column 5 is reserved for the evaluation committee
Annex III - the contractor's technical offer
The tenderers are requested to complete the template on the next pages:

- Column 2 is completed by the contracting authority shows the required specifications (not to be modified by the tenderer),
- Column 3 is to be filled in by the tenderer and must detail what is offered (for example the words ‘compliant’ or ‘yes’ are not sufficient)
- Column 4 allows the tenderer to make comments on its proposed supply and to make eventual references to the documentation

The eventual documentation supplied should clearly indicate (highlight, mark) the models offered and the options included, if any, so that the evaluators can see the exact configuration. Offers that do not permit to identify precisely the models and the specifications may be rejected by the evaluation committee.
The offer must be clear enough to allow the evaluators to make an easy comparison between the requested specifications and the offered specifications.
The Tenderer should avoid copying the specifications required from Column 2 to specifications offered in Column 3. Column 3 shall be filled by the Tenderer with the exact/real specification for the offered supplies.
Each offered supplies must be stated with brand / product name, product version and product/part number. The tenderer shall identify model and manufacturer of each individual item in their technical offer. Offers that do not permit to identify clearly and precisely the existence of the items with all the proof documents and/or certifications requested through this annex may be rejected by the evaluation committee.

Abbreviations

ABS	Anti-Lock Braking System
ASR	Acceleration Slip Regulation
EBS	Electronic braking system
EC	European Commission
ECE	Economic Commission of Europe
ERA	End Recipient of Assistance- Gaziantep Metropolitan Municipality (GMM)
EU	European Union
DIMS	Dynamic Intersection Management System
HVAC	Heating Ventilation Air Conditioning
IEC	International Electro technical Commission
IP	Internet Protocol
ISO	International Standards Organization
IT	Information Technology
KM	Kilo Meter
KPI	Key Performance Indicator
KW	Kilo Watt
KWH	Kilo Watt Hour
Lux	Illuminance
M	Meter
MB	Megabyte
Mm	Millimeter
Nm	Newton Meter
PVC	Polyvinyl Chloride
SORT	Standardized On Road Test
TS	Turkish Standards
UNECE	United Nations Economic Commission of Europe
V	Volts

1. General Requirements

1.1. Offered supplies must be provided complete with necessary accessories and/or parts to ensure that the supplied items can operate to required technical and quality specifications.

1.2. The contractor is fully responsible for proper connections of supplied items to existing infrastructure for smooth installation and operation.

1.3. The type of voltage in Türkiye is 220 V (mono phase) and 380 V (tri phase + neutral). All hardware must be suitable or adapted for direct connection to the standard power outlets in Türkiye. The type of electrical outlets generally installed in Türkiye is the type with 2 side mounted earthing poles (EUROPLUG). All plugs of all goods will have to fit exactly. The contractor shall evaluate the supplied current, the quality of the current and the fluctuations of the current and take the necessary precautions to avoid damage to the equipment.

1.4. The supplies must be compliant with CE standards. Wherever reference is made in the technical specifications to specific standards and codes to be met, provisions of the latest edition or revision of the relevant standards in effect, shall apply, unless otherwise stated in this technical specification.

1.5. The supplies should comply with the regulations concerning safe operation, energy saving and environmental safety, in line with the policies or the practical measures in use within the EU and Türkiye.

1.6. During the installation of supplied items, the contractor will be responsible for providing measures for any Health & Safety risks associated with supplies provided.

1.7. For:

- Lot 1- Traffic management system equipment;
- Lot 2 - Sensors;
- Lot 3 - Parking management system;
- Lot 4 – IT equipment; and
- Lot 5 - Electric bus and charging stations.

system components and whole system must be compatible with each other “as a whole”. Any compatibility problems between software and hardware must be resolved by the contractor at no additional cost to Gaziantep Metropolitan Municipality (GMM) and the Contracting Authority.

1.8. All offered supplies must be suitable for operation in climatic conditions in place of delivery (please refer to “Draft Contract and Special Conditions, including annexes”).

2. Technical Documents to be provided during the implementation period

2.1. Please refer to Article 14 of Special Conditions of the Contract.

2.2. Please refer to Article 31 of Special Conditions of the Contract for obligatory documents needed for the Provisional Acceptance.

3. Installation and Commissioning Requirements

3.1. Please refer to the Article 25 of Special Conditions of the Contract.

3.2. The contractor shall make available to himself all tools, materials and equipment required for transport, assembling, installation and commissioning.

3.3. The contractor shall provide all tools and equipment needed for testing of supplies.

3.4. The contractor shall perform starting-up, installation and commissioning of the supplies by trained and authorized personnel in accordance with Article 29 of Special Conditions.

3.5. Consumptions on site during the installation and commissioning shall be borne by the contractor.

3.6. Subscription for all utility connections such as internet, electricity, water, etc. to relevant authorities shall be under a responsibility of GMM.

3.7. Full assembly and complementary engineering related to the installation and put into operation will be borne by the contractor including integration of other software / hardware (already existing or to be procured under this operation).

Connection to main electrical, mechanical, water, air and/or gas supplies from the equipment to the existing infrastructure shall be done according to the rules and regulations of Türkiye. Recovering any damage to building structure that may occur during the installation of goods is under the responsibility of the contractor.

3.8. Any other components which are not explicitly mentioned under Lot 1, Lot 2, Lot 3, Lot 4 and Lot 5 but required for fully functioning of the system shall be provided by the contractor during installation and commissioning.

3.9. All software must be delivered and installed in electronic version. All software must be licensed to GMM.

3.10. All data shall be stored in Türkiye in accordance with Presidential Decree No:2019/12 published on 30823 numbered, 06.07.2019 dated Official Gazette. All the user data entered, collected, or produced shall be a sole property and under ownership of GMM.

4. Health and Safety

4.1. The contractor shall be fully responsible for applying the Health and Safety procedures in accordance with the legislation published by Republic of Türkiye, Ministry of Labor and Social Security during the manufacturing, delivering, assembling, installation, commissioning and testing. Moreover, the contractor shall be responsible for advising GMM and the Contracting Authority of any Health and Safety risks associated with supplies provided and suitable protective measures.

4.2. Supplies shall be designed to operate safely taking into account the characteristics of the terrain and its surroundings, atmospheric and meteorological conditions, any possible structures, and obstacles located in the vicinity either on the ground or in the air in such a way as to cause no nuisance or pose no danger under operation or servicing conditions or in the event of an operation to rescue persons.

5. Training Requirements

5.1. Following installation and commissioning of supplies, the contractor shall provide trainings for GMM staff.

5.2. The tenderers shall include in their offer a training plan according to requirements in this Technical Specifications (duration, topics provided in tables hereunder are requested as minimum). The contractor (if required) may extend training durations and topics covered.

5.3. Trainings shall be realized in Turkish or English with simultaneous translation when necessary.

5.4. Trainings shall be provided by qualified instructors.

5.5. All necessary accessories, materials and documentation for the trainings shall be provided by the contractor.

5.6. Unless otherwise required, trainings shall be realized in GMM facilities.

5.7. The trainings shall be recorded by the contractor and provided as a separate media to GMM for future use.

Lot No.		Min. no. of training days	Max. no. of participants	Content of the trainings
Lot 1	Traffic system equipment	5	10	For all Lots 1 to 4: Trainings shall include theoretical training and applied training. The trainings shall cover topics including but not limited to: • Overview and terminology; • Basic usage training; • Maintenance and troubleshooting; • User interface and software; • Health and safety requirements.
Lot 2	Sensors	3	10	
Lot 3	Parking management system	2	10	
Lot 4	IT equipment	1	10	
Lot 5	Electrical bus and charging station	25	25	The contractor shall organize theoretical and practical training sessions, in the designated locations and times determined by GMM, with the presence of authorized technical personnel. The contractor shall provide the following trainings to 25 participants: • Driver Training: 3 (three) days • Vehicle Tracking Interface Training: 2 (two) days • Technical Training: 5 (five) days (training content is provided below) + post-training competence assessment and certification shall be conducted. • Training on technical specifications of all equipment related to the vehicle (transmission components, bodywork, air conditioning, battery, charging, route indicator, etc.) • Introduction of all systems related to the vehicle (electrical, electronic, hydraulic, pneumatic, etc.) • The training on charging units and their usage shall be provided immediately before the Provisional Acceptance. • Practical application of necessary tests and adjustments. • Teaching methods for monitoring, identifying, and resolving malfunctions.

				• Theoretical and practical training on repair, maintenance, and troubleshooting of charging equipment. "Driver Training" and "Vehicle Tracking Interface Training" shall be provided prior to the Provisional Acceptance. The maintenance and repair training shall be conducted within a program determined by GMM and communicated to the contractor. The contractor shall ensure the presence of an interpreter with sufficient technical knowledge and experience if the training is conducted by foreign instructors. During the training sessions, the responsibility for any kind of malfunction or damage that may occur on the vehicle shall lie with the contractor. The contractor shall bear all expenses related to these training sessions, including travel, accommodation, meals, and fees.

6. Warranty requirements

6.1. Please refer to Article 32 and Article 33 of Special and General Conditions of the Contract and Warranty Regulation of Turkish Law as published on Official Gazette no.29029 dated 13.06.2014.

6.2. Only original or approved by the manufacturer(s) spare parts should be used in any repair service.

6.3. For all Lots the tenderer shall provide a list of spare parts for informative purposes only.

LOT 1 – Traffic system equipment

Dynamic Intersection Management System is a component of ITS that uses real-time data to optimize traffic flow and improve efficiency in the city. The system will use data from different sources (detectors, big data, hardware etc) to monitor traffic conditions and dynamically adjust strategies according to traffic volumes and patterns. Objectives of the system are following:

- Collect data to monitor, analyse and manage traffic,
- Improve waiting times in intersections,
- Minimize traffic congestion and delays,

- Contribute to decrease in carbon emissions,
- Dynamically response to traffic conditions using model based advanced optimisation techniques in conjunction with AI and ML
- Emergency vehicle prioritisation: Multimodal traffic management to ensure smooth movement of public transport and emergency response vehicles like ambulances, police etc.
- Working in tandem with other ITS system such as loop detectors and big data sources (Floating Car Data and smart cameras etc.) .

The contractor will be responsible to design, supply, install and to configure Dynamic Intersection Management System for 20 intersections. In this scope, the contractor shall provide the following assessment along with the system:

- Preliminary surveys including analyzing existing operating conditions, traffic volumes across various time periods of a day, which will cover all peak and non-peak hours, weekends, etc., saturation flow rates, travel times along major corridors during different times of the day
- Design and planning including solution architecture, drawings, execution plan and safety and traffic management plans
- Traffic engineering reports including base plans of intersections, intersection layout drawings, calibration and signal optimization report.

The contractor shall install and commission the dynamic intersection management system with the existing ITS system. All components of the DIMS shall be configured to integrate the traffic signal plans at each of the junctions, for varied operating conditions like peak and off-peak traffic, weekend traffic, traffic flows during special events. The software that is used shall use an industry standard protocol such as UTMC/UG405 or NTCIP. The DIMS shall use Artificial Intelligence for better performance over the time.

The contractor is required to utilize the existing signalization equipment, including the junction controller unit. As part of the project, the aim is to enhance the current functionalities of the junction controller box. This unit will establish communication with the **GMM's Traffic Management Platform** and take on the task of managing and controlling the existing Junction Controller Unit. It will integrate AI-based features to facilitate dynamic intersection management. The main components of the dynamic intersection management system shall include the following:

- Item 1.1 - Vehicle detection camera;
- Item 1.2 - Image processor unit;
- Item 1.3 - Dynamic intersection control unit;
- Item 1.4 - Field cabinet;
- Item 1.5 - Field switch;
- Item 1.6 - Signaling Uninterruptible Power Supply (UPS);
- Item 1.7 - Signalization manhole;
- Item 1.8 - Cat 6 FTP/UTP cable;
- Item 1.9 - Corrugated pipe;

- Item 1.10 - Accessible pedestrian button;
- Item 1.11 - Bicycle traffic signal module;
- Item 1.12 - Panel PC;
- Item 1.13 - VMS LED display;
- Item 1.14 - Display for smart stop passenger information system;
- Item 1.15 - Industrial control computer;
- Item 1.16 - Field switch.

Notes for installation;

- The System shall perform camera-based operation fed with Floating Car Data (FCD);
- Vehicle detection cameras (Item 1.1) shall be installed per each direction to perform vehicle detection in designed virtual loop at that direction.
- Vehicle detection cameras (Item 1.1) shall send detection information to Image Processor Unit (Item 1.2) through Cat 6 FTP/UTP cables (Item 1.8).
- Image Processor Unit (Item 1.2) shall determine vehicle counts and density information for each direction according to applied algorithm.
- Image Processor Unit (Item 1.2) shall send vehicle information to Dynamic Intersection Control Unit (Item 1.3) through Cat6 FTP/UTP cables (1.8).

The System should perform remote control functions as below;

- Display the status of instant signaling at the intersection;
- Display the number of vehicles passing through the intersection at each phase;
- Report instant error situations;
- Perform the manual operation to take intersection to the flash position, disabling and restarting.

The System shall transmit green/red light information about the directions together with vehicle density data of the intersection to the system server live, over GPRS line and/or fiber lines, to prevent data loss.

The System shall be remotely disabled or activated. It shall be possible to interfere in signalizing to deactivate automatized timing calculated by the system. In that case, the system shall manage the intersection according to remote intervention, not according to its own calculated schedule.

The camera and processor data shall be processed by algorithms in Dynamic Intersection Control Unit (Item 1.3) and operated instantly at the intersection.

At signalized intersections where traffic counting has been carried out, signal duration optimization and optimal phase layout work shall be carried out to increase the intersection capacity utilization rate.

Signal duration optimization and optimal phase layout, which are made to increase the capacity utilization rate of intersections, shall be tested in micro simulation environment. The optimum signal pattern generated shall be transferred to the simulation environment.

The System shall be integrated with existing Central Traffic Road Network and Control Software and Dynamic Intersection Control Units (Item 1.3) for signaling control. Dynamic Intersection Control units (Item 1.3) and Central Traffic Network and Control Software shall be compatible and integrated.

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.1	**Vehicle detection camera**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 80			
1.1.1	Vehicle detection camera (the camera) shall have a field of view of at least 50 meters in each approaching direction. The camera shall offer a field of vision extending from the stopping line to a minimum of 50 meters behind the approaching road at the intersection, ensuring a clear view of traffic.			
1.1.2	The camera shall transmit the images in real time over the cable to the Image Processor Unit (Item 1.2) on the board located at the intersection. The camera shall provide real time RTSP stream to the Image Processing Unit (Item 1.2).			
1.1.3	The camera must be at least a 2-Megapixel Progressive Scan CMOS.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.1.4	The camera must have 1 RJ-45(10/100Base-T) Ethernet on the camera.			
1.1.5	The camera must support ONVIF profile.			
1.1.6	The camera shall have 1 SD Card slot which support at least 64 GB of capacity on it.			
1.1.7	The camera must be powered by POE.			
1.1.8	The camera shall work in as a minimum in environmental conditions of -10°C ~ +60°C and humidity <90%.			
1.1.9	The camera must support H264 broadcast.			
1.1.10	The camera shall send detected information to Image Processor Unit (Item 1.2) through Cat6 FTP/UTP cables (Item 1.8).			
1.1.11	65 Camera Poles shall be supplied with the vehicle detection cameras.			
1.1.12	65 Camera poles shall be properly located on the required locations and 65 cameras shall be installed on them.			
1.1.13	The Camera pole shall have a height of at least 7.5 meters and a structure that will give a peak displacement of no more than 5cm in the wind blowing at speed of 130 km/h.			
1.1.14	The camera pole foundation shall be at least 70x70x80 cm in size at least C25 concrete.			
1.1.15	The fuse and/or interference covers of the pole shall be hot-dip galvanized steel.			
1.1.16	Camera pole shall be made of ST37 metal sheet.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.1.17	Camera pole shall be hot-dipped galvanized.			
1.1.18	The camera pole shall have a hole for cabling purposes with a size of minimum 20 cm X 10 cm.			
1.1.19	The hole shall be covered with a hot-dip galvanized steel cover.			
1.1.20	The camera pole shall have a top cover for a protection against environmental conditions.			
1.1.21	Camera pole screws shall be of galvanized steel.			
1.2	**Image processor unit**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 20			
1.2.1	The base frequency of the image processor unit shall be at least 2.0 Ghz.			
1.2.2	The unit shall have 6 CPU cores as minimum.			
1.2.3	The unit shall have 8 GB of RAM as minimum.			
1.2.4	The unit shall have 128GB SSD as minimum.			
1.2.5	The unit shall have 4 USB 3.0 as minimum.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.2.6	The unit shall have one HDMI as minimum.			
1.2.7	The unit shall have 2 RJ45 network connector as minimum.			
1.2.8	The unit shall have 8th generation i7 processor as minimum.			
1.2.9	The unit shall have 12M smart cache as minimum.			
1.2.10	The unit shall have 1 M.2 expansion slot as minimum.			
1.2.11	The unit shall have 1 PCIe expansion slot as minimum.			
1.2.12	The unit shall have 175mm x 175mm physical dimension as maximum.			
1.2.13	The unit shall have edge AI module or embedded GPU card that have OpenVINO support.			
1.2.14	Edge AI module or embedded GPU shall have Movidius SoC or ARC based GPU.			
1.2.15	The unit shall support modules that can be run by deep learning-based models supported by the INTEL Open VINO library or equivalent, which can perform artificial intelligence-based analysis on the PCI slot.			
1.2.16	The unit shall have sub-hardware support, compatible with deep learning models.			
1.2.17	The unit shall have free software development tools (API/SDK communication protocol) that supports the integration of third-party systems.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.2.18	The unit shall measure vehicle counts and density information for each direction. The unit shall access real-time video streams through RTSP from Vehicle Detection Cameras (Item 1.1) positioned at each approach to the intersection. The unit shall be capable of handling a minimum of 6 cameras. Employing AI-based algorithms, the unit shall extract density and vehicle count information as vehicles pass the stopping line.			
1.2.19	The unit shall send vehicle information to Dynamic Intersection Control Unit (Item 1.3) through Cat6 FTP/UTP cables. (Item 1.8). The unit shall transmit extracted traffic data (density and vehicle count) to the Dynamic Intersection Control Unit (Item 1.3) for each approaching intersection arm via network protocols.			
1.3	**Dynamic intersection control unit**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 20			
1.3.1	Dynamic Intersection Control Unit (The unit) shall be integrated with already existing GMM Intersection Control Units (ICU) placed at the intersections.			
1.3.2	Dynamic Intersection Control Unit shall support 2-way communication for data collection and sharing.			
1.3.3	Dynamic Intersection Control Unit shall support remote connection.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.3.4	The unit shall collect vehicle count data from the Image Processor Unit (Item 1.2).			
1.3.5	The unit shall have a processor with the following specifications; 32-bit processor core; Communication with RS232, USB, and Digital I/O units; Memory of at least 256MB RAM, 2GB Memory; One Network 10/100Mbit Ethernet and 1 GSM as minimum.			
1.3.6	The maximum power consumption of the unit shall be 10W.			
1.3.7	The units shall work in coordination with each other.			
1.3.8	The unit shall support NTCIP, Customized Communication Protocols.			
1.3.9	The unit shall have at least 1 ethernet port and 1 serial port for communication.			
1.3.10	The unit shall have an LCD screen to display; The current time/date; The current phase status; The current working status; The current connection status.			
1.3.11	The unit shall communicate with the existing GMM Traffic Control Center either via fiber or the GSM network.			
1.3.12	The unit shall communicate with the Image Processor Unit (Item 1.2) by wire.			
1.3.13	The unit shall transfer the following data as minimum; ICU time/date; ICU instant fault recording; ICU working status; Instant status of ICU output cards.			
1.3.14	The unit shall instantly decide green light duration.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.3.15	The unit shall use the instantaneous number of vehicles data in all directions to dynamically adjust the green light times.			
1.4	**Field cabinet**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 20			
1.4.1	The capacity of the cabinet for internal use shall be at least 15 U as minimum. External dimensions; the width shall be at least 600mm and the depth shall be at least 600mm.			
1.4.2	The cabinet shall comply at least IP54 standard.			
1.4.3	The cabinet shall have 2 upright columns.			
1.4.4	Main body and covers shall be made of galvanized sheet of at least 1.5mm as minimum			
1.4.5	The cabinet shall be floor type.			
1.4.6	The cabinet shall have ventilation filters each side and fan.			
1.4.7	The cabinet shall have at least a 1U x 6 fused (16A) UPS power plug group in and shall be fixed in the cabinet accordingly.			
1.4.8	The cabinet shall have at least the following certificates; TSE, EN60529, IEC60917, IEC 61587-1:2017, RoHS, CE			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.4.9	The cabinet shall have at least 2 AC fans with thermostats in it. Fans shall be 220-240 VAC, 50/60 Hz.			
1.4.10	The cabinet shall be painted with electrostatic powder or outdoor polyester coating. The color of the cabinet shall be gray (RAL7035).			
1.4.11	The cabinet shall be grounded by installing grounding cables.			
1.5	**Field switch**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 20			
1.5.1	Field switch shall have at least 16 10/100 TX RJ-45 Ports on it, these ports shall have support for 802.3 at Power over Ethernet.			
1.5.2	Field switch shall have at least 2 100/1000 SFP slots on the switch.			
1.5.3	Field switch shall support the key ring topology.			
1.5.4	Field switch shall have at least 8 Gbps switching capacity.			
1.5.5	Field switch shall support at least 8,000 MAC addresses.			
1.5.6	Field switch shall support SNMP v1/v2c/v3.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.5.7	Field switch shall support IEEE802.3ad and shall run LACP, support at least 8 group members.			
1.5.8	Field switch shall support IEEE802.1d Spanning Tree, IEEE802.1w Rapid Spanning Tree, IEEE802.1s Multiple Spanning Tree protocols			
1.5.9	Field switch shall provide port-based and MAC-based access control with 802.1X Authentication support.			
1.6	**Signaling Uninterruptible Power Supply (UPS)**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 20			
1.6.1	UPS shall be activated in a period of less than 50ms when the power is cut off at a signalized intersection, and the power of UPS shall be at least 3 KVA.			
1.6.2	UPS Input Voltage shall be 220VAC (single phase), input voltage range shall be 110-300 VAC, input frequency shall be +/-10%.			
1.6.3	UPS output power shall be at least 1800W.			
1.6.4	UPS output voltage shall be at least 220/230/240VAC.			
1.6.5	UPS voltage distortion shall be at most +/-1%.			
1.6.6	UPS frequency at the output shall be 50/60Hz.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.6.7	UPS total harmonic distortion shall also be less than 2% THD at linear load.			
1.6.8	The efficiency of UPS shall be at least 90%.			
1.6.9	Harmonic distortion of UPS input current shall be no more than 6%, and the input - power factor shall be 0.98.			
1.6.10	There shall be an LCD screen on the front panel of UPS. Front panel shall show the information of the status of UPS. As a minimum the following messages shall be displayed: Battery level, battery fault, UPS fault.			
1.6.11	The operating humidity range shall be between 5%-95% under non-condensing conditions.			
1.6.12	UPS shall provide enough battery at %90 capacity at least for 4 hours in a case of electricity shortage.			
1.7	**Signalization manhole**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 120			
1.7.1	Shall be made of composite material			
1.7.2	The cover and body shall be manufactured in class B125 using FRP Pulp according to TS 1478 EN 124 standard, UC CM 485-B125 or equivalent as minimum.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.7.3	There shall be lightning (high voltage symbol) text relief on the signaling manhole.			
1.7.4	Minimum dimensions for manhole in mm (between): Cover Width: 420 – 500; Cover Length: 420 – 500; Cover Thickness: 18-40; Body Width: 415 – 530; Body Height: 375 – 530; Body Internal Depth: 370 – 410; Number of Locks (Pcs): 1; Mass (Minimum Kg): 20,00.			
1.8	**Cat-6 FTP/UTP cable**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 10000 meters			
1.8.1	The cable shall support communication in accordance with Cat-6 FTP/UTP standards at 100 meters			
1.8.2	The cable shall support a data transmission speed of 250 MHz or Mbit/sec			
1.8.3	The cable conductor shall be bare and made of solid copper.			
1.8.4	The cable conductor shall be of 23 AWG quality as minimum.			
1.8.5	Operating temperature of the cable shall be between -20C and +60 C as minimum.			
1.8.6	The cable shall support 10/100/1000 Mbps speed for the LAN.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.8.7	In accordance with ANSI/TIA 568 and ISO/IEC 11801 standards.			
1.8.8	The cable shall have separators so that the cores within will not be damaged.			
1.9	**Corrugated pipe**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 2500 meters			
1.9.1	The pipe shall be used for cabling (between field cabinet (Item 1.4) and camera poles and between manholes (Item 1.7). Max. 6 meters pipe between manholes.			
1.9.2	Pipe diameter shall be at least 70 mm.			
1.9.3	The pipe and gaskets shall comply with TSE EN61386-24 standard or equivalent			
1.9.4	The length of pipe shall be at least 6 meters and sealed.			
1.9.5	Pipe shall be at least 450N pressure resistant and outdoor types			
1.10	**Accessible Pedestrian Button**			
	Manufacturer's name; product model/type:			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	Country of origin:			
	Quantity: 100			
1.10.1	The accessible pedestrian button (the button) body shall be constructed from powder coated aluminum or a polycarbonate-based material.			
1.10.2	The button's frontal surface of the device shall contain a plate or a backlit sign displaying informational messages to pedestrians.			
1.10.3	The button operating temperature of the device shall be between -40°C and +60°C.			
1.10.4	The button shall include a capacitive touch button.			
1.10.5	Acoustic orientation signal and acoustic signal shall be perceivable from a minimum of 1 m and a maximum of 5 m.			
1.10.6	The button shall automatically adjust sound level according to the ambient noise.			
1.10.7	The button shall have an IP protection level of IP65 as minimum.			
1.11	**Bicycle traffic signal module**			
	Manufacturer's name; product model/type:			
	Country of origin:			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	Quantity: 20			
1.11.1	The module diameter shall be 100 mm.			
1.11.2	The module constructed of polycarbonate-based material.			
1.11.3	The module shall have a black or grey body color.			
1.11.4	The module light distribution shall be ensured with Fresnel lens or grey front lens.			
1.11.5	The module LED colors shall be red, yellow, and green.			
1.11.6	The module LEDs shall be displaying a bicycle icon.			
1.11.7	The module maximum power consumption shall be 5W.			
1.11.8	The minimum Power Correction Factor (PFC) shall be 0.9.			
1.12	**Panel PC**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 20			
1.12.1	Panel PC shall have Atom or Celeron processor.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.12.2	Panel PC shall have 10'' screen size as minimum.			
1.12.3	Panel PC shall have 2GB RAM as minimum.			
1.12.4	Panel PC shall have 32GB SSD as minimum.			
1.12.5	Panel PC shall have one USB2.0 as minimum.			
1.12.6	Panel PC shall have a touch screen.			
1.12.7	Panel PC shall have one LAN RJ45 connector as minimum.			
1.13	**VMS LED display**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 4			
1.13.1	LED used within the VMS LED display shall be Surface Mount Device (SMD) type.			
1.13.2	VMS LED display dimensions shall be at least 576cm (W) x 192cm (H).			
1.13.3	VMS LED display shall be composed either of LED subpanels or a single LED panel.			
1.13.4	The pixel pitch of the VMS LED Display shall be 10 mm at most.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.13.5	The color spectrum of the VMS LED display shall be in 16 bits red color, 16 bits green color and 16 bits blue color for each pixel.			
1.13.6	VMS LED display shall have no mechanical parts, i.e., the fan shall not be used.			
1.13.7	VMS LED display brightness shall be at least 6000 cd / m^2 (Nits).			
1.13.8	VMS LED display viewing angle shall be at least 120 degrees horizontally and 120 degrees vertically.			
1.13.9	VMS contrast ratio shall be at least 2000:1.			
1.13.10	VMS display refresh rate shall be at least 1000 Hz.			
1.13.11	Electric consumption of VMS LED display shall be less than 350W/m2 on average and shall be less than 750W/m2 at maximum.			
1.13.12	Panel material of VMS LED display shall be made of aluminum, iron, or steel but not plastic.			
1.13.13	VMS LED display shall allow brightness control either manually or automatically.			
1.13.14	The front side of VMS LED display shall meet at least IP65 standards and the backside shall meet at least IP54 standards.			
1.13.15	The operating temperature range of VMS LED display shall be -15°C to +45°C as minimum.			
1.13.16	VMS LED display shall operate at 10% to 90% humidity rates as minimum.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.13.17	VMS display shall have at least one external brightness sensor which sets the brightness automatically.			
1.13.18	The lifetime of LEDs used in VMS LED display shall be at least 100000 hours at %50 brightness.			
1.13.19	The power supply of VMS LED display shall be 220 V AC operable.			
1.13.20	VMS LED display shall have over-low voltage protection to prevent damage from power outages.			
1.13.21	VMS LED Displays shall be supplied with 4 steel construction units.			
1.13.22	Steel construction shall be custom-made product to be constructed at the location of their installation in Appendix 1.			
1.13.23	Steel construction shall have following dimensions: • 15.0 ± 1 meter length; • 5.1 ± 0.1 meter height from the road surface; • - 0.80 ± 0.05 meter width.			
1.13.24	The minimum steel profile to be used shall be designed and constructed according to regulation under Official Gazette 29614. (https://www.resmigazete.gov.tr/eskiler/2016/02/20160204-2.htm) All the metal structure used in the construction shall be galvanized.			
1.13.25	The columns of the steel construction shall be of polygon cross-section and the beam structure shall be of either box cross-section or cylindrical cross-section.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.13.26	Steel construction shall be made of at least ST 37 quality metal sheets according to EN 10025-2 or higher standard.			
1.13.27	Galvanization of the material shall be in accordance with EN ISO 1461 or higher standard.			
1.13.28	Steel construction shall have concrete foundations designed and constructed according to regulation under Official Gazette 29614.			
1.13.29	Foundations shall be made of minimum C25 grade concrete, designed, and constructed according to regulation under Official Gazette 30364. https://www.resmigazete.gov.tr/eskiler/2018/03/20180318M1.htm			
1.13.30	Concrete quality shall be minimum C25, reinforcing iron shall be ribbed S420 or higher standard.			
1.13.31	Steel construction shall be designed and constructed to resist weather conditions according to regulation under Official Gazette 30364.			
1.13.32	The design of the steel construction shall take into consideration a minimum 160 km/h wind factor.			
1.13.33	EIA-222-E standard shall be considered in wind pressure calculations.			
1.13.34	All metal materials to be used in open-air space shall be designed and produced for corrosion resistance according to regulation under Official Gazette 29614. All metal materials shall be galvanized and painted according to regulation under Official Gazette 29614.			
1.13.35	Welding shall be cleaned of oil and other substances on the surface by degreasing process.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	Rust on the surfaces shall be cleaned in a low-density acid bath at 25 -30ºC with 18% concentration of HCl. Iron chloride remaining on the surface shall be completely cleaned with the washing bath. The material removed from the washing bath shall be precoated in zinc chloride-ammonium chloride solution.			
1.13.36	The walking path shall be in the form of a corridor from end to end, with no physical obstacles that prevent personal walking. The walking path width shall be at least 60 cm.			
1.13.37	The walking path shall be made of a diamond embossed sheet to prevent icing. The structure of the walking path shall prevent falling of any object larger than 1 cm in diameter.			
1.13.38	The walking path of the steel construction shall be in the form of a cage structure with a handrail of at least 100 cm from the foot level. The personnel shall be isolated from the external environment while working. The walking path shall provide safe working environment regarding European Union Working Safety Directives and IRATA International Association rules.			
1.13.39	Steel climbing ladder shall be mounted after 3 meters to prevent unauthorized climbing.			
1.13.40	Steel construction shall be manufactured compatible with VMS LED display, visible areas and road openings			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.13.41	The design of the steel construction shall take into consideration proper fitting and compatibility of cabinet openings of the VMS LED displays.			
1.14	**Display for Smart Stop Passenger Information System**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 8			
1.14.1	The display shall have the following dimensions of 865 mm x 50 mm x 378 mm (WxHxD).			
1.14.2	The display shall have a maximum weight of 45 kg.			
1.14.3	The display shall have a bright grey or RAL9006 color, or have another color chosen according to RAL standards.			
1.14.4	The display shall include a LED panel of the minimum dimensions of 40x128 pixels.			
1.14.5	Smart Stop Passenger Information System screen display area shall be 223 mm x 712 mm C15A1 at least.			
1.14.6	Display for Smart Stop Passenger Information System shall be supplied with 8 steel construction units.			
1.14.7	Steel construction shall be custom-made product to be constructed at the location of their installation (Appendix 1).			
1.14.8	Steel construction shall be "L" shaped, composed of two columns and the beam.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.14.9	Steel construction shall have following dimensions: • 2,1 ± 0,3 meter height; • - 0.80 ± 0.05 meter width.			
1.14.10	The minimum steel profile to be used shall be designed and constructed according to regulation under Official Gazette 29614. (https://www.resmigazete.gov.tr/eskiler/2016/02/20160204-2.htm) All the metal structure used in the construction shall be galvanized.			
1.14.11	Steel construction shall be made of at least ST 37 quality metal sheets according to EN 10025-2 or higher standard.			
1.14.12	Galvanization of the material shall be in accordance with EN ISO 1461 or higher standard.			
1.14.13	Steel construction shall have concrete foundations designed and constructed according to regulation under Official Gazette 29614.			
1.14.14	Foundations shall be made of minimum C25 grade concrete, designed, and constructed according to regulation under Official Gazette 30364. https://www.resmigazete.gov.tr/eskiler/2018/03/20180318M1.htm			
1.14.15	Concrete quality shall be minimum C25, reinforcing iron shall be ribbed S420 or higher standard.			
1.14.16	Steel construction shall be designed and constructed to resist weather conditions according to regulation under Official Gazette 30364.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.14.17	The design of the steel construction shall take into consideration a minimum 160 km/h wind factor.			
1.14.18	EIA-222-E standard shall be considered in wind pressure calculations.			
1.14.19	All metal materials to be used in open-air space shall be designed and produced for corrosion resistance according to regulation under Official Gazette 29614. All metal materials shall be galvanized and painted according to regulation under Official Gazette 29614.			
1.14.20	Welding shall be cleaned of oil and other substances on the surface by degreasing process. Rust on the surfaces shall be cleaned in a low-density acid bath at 25 -30ºC with 18% concentration of HCl. Iron chloride remaining on the surface shall be completely cleaned with the washing bath. The material removed from the washing bath shall be precoated in zinc chloride-ammonium chloride solution.			
1.15	**Industrial Control Computer**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 12			
1.15.1	The computer shall be supplied together with an information system integration software.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.15.2	The computer shall have at least 2 GHz processor.			
1.15.3	Processor with min 2 cores.			
1.15.4	Cache shall be min 1,5 MB.			
1.15.5	The computer shall have at least 4 GB RAM.			
1.15.6	The computer shall have at least 64 GB SSD.			
1.15.7	Minimum 1 x HDMI output.			
1.15.8	The computer shall have a minimum 2 USB, 1 ethernet (Lan) input.			
1.15.9	The computer shall work between -10 and +50 degrees with industrial SSD.			
1.15.10	The computer shall have FAN module.			
1.15.11	The computer shall have minimum 2 relays and the relays shall have 16A and 250V AC characteristics.			
1.15.12	The computer shall have minimum 4 optocouplers for output isolation.			
1.15.13	The computer shall have RS232 connection.			
1.15.14	The computer shall have maximum 4 U sizes.			
1.15.15	The computer shall support Windows and Linux based operating systems (OS) or equivalent.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.15.16	Information system integration software shall be used in bus stations to inform passengers about public bus arrival times.			
1.15.17	The software shall be operable and functional on the Industrial Control Computer.			
1.15.18	The software shall enable remote operation of the following functions as minimum; • shut down Display for Smart Stop Passenger Information System (Item 1.14); • start and restart Display for Smart Stop Passenger Information System (Item 1.14); • change messages on the Display for Smart Stop Passenger Information System (Item 1.14); • send images and videos to the Display for Smart Stop Passenger Information System (Item 1.14); • receive images and videos displayed at the Display for Smart Stop Passenger Information System (Item 1.14); • receive error messages from Display for Smart Stop Passenger Information System (Item 1.14).			
1.15.19	The software shall be able to communicate using secure network protocols such as HTTP or MQTT. The software shall provide an open protocol via HTTP or MQTT to be manageable from GMM's Traffic Management Platform. The software shall allow interfacing with the traffic management platform application. The software shall enable GMM's Traffic Management Platform to do the following functions as minimum;			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
	- shut down and activate the VMS Display (Item 1.13). - Change messages on the VMS Display (Item 1.13) - Send images and videos to VMS Display (Item 1.13) - Send instant messages VMS Display (Item 1.13) and related to traffic information.			
1.15.20	The software shall have a web interface.			
1.15.21	The software NTP settings shall be set on the web interface.			
1.15.22	The software IP configuration shall be set on the web interface.			
1.15.23	The software brightness plan shall be set on the web interface.			
1.15.24	The software shall provide different display designs for different public transport platforms, public buses, and trams as a minimum.			
1.15.25	The software shall show following information, for users, in a form of scrolling text: • Destination location; • Estimated arrival times; • List of incoming busses.			
1.15.26	The software shall incorporate connection to GPRS and Ethernet services.			
1.15.27	The Industrial Control Computer and Information system integration software shall work in an integrated way both with VMS LED Display (Item 1.13), Display for Smart Stop Passenger Information System (Item 1.14).			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
1.16	**Field switch**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 12			
1.16.1	Field switch shall have at least 16 10/100 TX RJ-45 ports on it. Ports shall have support for 802.3 at Power over Ethernet.			
1.16.2	Field switch shall have at least 2 100/1000 SFP slots on the switch.			
1.16.3	Field switch shall support key ring topology.			
1.16.4	Field switch shall have at least 8 Gbps switching capacity.			
1.16.5	Field switch shall support at least 8,000 MAC addresses.			
1.16.6	Field switch shall support SNMP v1/v2c/v3.			
1.16.7	Field switch shall support IEEE802.3ad and run LACP, support at least 8 group members.			
1.16.8	Field switch shall support IEEE802.1d Spanning Tree, IEEE802.1w Rapid Spanning Tree, IEEE802.1s Multiple Spanning Tree protocols.			
1.16.9	Field switch shall provide port-based and MAC-based access control with 802.1X authentication support.			

LOT 2 – Sensors

Intelligent Transportation Systems (ITS) Sensors are vital components in contemporary transportation, contributing essential real-time data to monitor, oversee, and enhance different facets of transportation networks.

Sensors will be used to optimize the effectiveness, safety, and eco-friendliness of transportation systems. The objectives of the sensors are as follows:

- Real-time data collection
- Traffic Monitoring and Management
- Environmental Monitoring
- Traffic Safety Improvement
- Real Time Travel Information Generation

The scope of works includes design, supply, installation and calibration and integration of the sensors to the overall system:

- Item 2.1 - Bicycle counting sensor (20 quantity);
- Item 2.2 - Pedestrian counting sensor (20 quantity);
- Item 2.3 - Bluetooth detector sensor (90 quantity);
- Item 2.4 - Air quality measurement sensor (6 quantity);
- Item 2.5 - Meteorological measurement station (5 quantity);
- Item 2.6 - Field switch Type 1 (27 quantity);
- Item 2.7 - Field switch Type 2 (25 quantity)

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
2.1	**Bicycle counting sensor**			
	Manufacturer's name; product model/type:			

	Country of origin:			
	Quantity: 20			
2.1.1	The bicycle counting sensor shall count all bicycles crossing at least from 5-meter distance from the installation location.			
2.1.2	Sensor shall be constructed to be mounted without the need of invasive roadworks.			
2.1.3	The counting shall be carried out with sensor placed on the road.			
2.1.4	Sensor shall detect bicycles by relying on radar, lidar or camera input.			
2.1.5	Sensor shall be; - If camera based, resolution of the camera shall be 4MP as minimum; - If radar based, sensor shall have between 20 to 60 Ghz frequency; - If lidar based, the wavelength shall be between 800-1000mm.			
2.1.6	Sensor shall have a minimum water and dust resistance rating of IP 65.			
2.1.7	Sensor shall operate under -20/+50 C temperature conditions.			
2.1.8	Sensor shall offer consistent counting through daytime and nighttime conditions.			

2.1.9	Sensor's performance shall not be affected by weather conditions.			
2.1.10	Sensor shall detect bicycles traveling at a maximum speed of 40 km/h.			
2.1.11	Sensor shall transmit collected data via RS232 or wireless based networks.			
2.1.12	Sensor shall have a maximum weight of 5 kg.			
2.1.13	The dimensions of sensor shall be: - 30 cm as maximum width; - 30 cm as maximum height; - 30 cm as maximum depth.			
2.2	**Pedestrian counting sensor**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 20			
2.2.1	The pedestrian counting sensor shall be capable of counting all pedestrians crossing at least from 5-meter distance from sensor installation location.			
2.2.2	Sensor shall transmit collected data via RS232 or wireless based networks.			
2.2.3	Sensor shall be constructed to be mounted without need of invasive roadworks.			

2.2.4	The counting shall be carried out with sensor placed on the road.			
2.2.5	Sensor shall detect pedestrians by relying on radar, lidar or camera input.			
2.2.6	Sensor shall be; • If camera based, resolution of the camera shall be 4MP as minimum; • If radar based, sensor shall have between 20 to 60 GHz frequency; • If lidar based, the wavelength shall be between 800-1000mm.			
2.2.7	Sensor shall have a minimum water and dust resistance rating of IP 65.			
2.2.8	Sensor shall operate under -20/+50 C temperature conditions.			
2.2.9	Sensor shall offer consistent counting through daytime and nighttime conditions.			
2.2.10	Sensor's performance shall not be affected by weather conditions.			
2.2.11	Dimensions of sensor shall be: - 50 cm as maximum width; - 50 cm as maximum height; - 50 cm as maximum depth.			
2.2.12	Sensor shall have a maximum weight of 5 kg.			
2.3	**Bluetooth detector sensor**			

	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 90			
2.3.1	The Bluetooth detector sensor shall detect Bluetooth signals emitted by mobile phones, headphones, navigation devices, and car kits in a range of up to 100 meters, provided that the Bluetooth feature is enabled and visible.			
2.3.2	Sensor shall collect data from vehicles up to speed of 150 km/h as minimum.			
2.3.3	Sensor shall collect as minimum; ● Date and time information of when the Bluetooth signal was detected; ● Type of device where the Bluetooth signal was detected; ● Average signal strength of the detected Bluetooth signal.			
2.3.4	In the event of multiple detections of Bluetooth signals from the same device, only information related to the strongest Bluetooth signal shall be transmitted.			
2.3.5	The sensor shall transmit Bluetooth signals it detects to the central server at 1-minute intervals. Interval can be changed if needed.			
2.3.6	The permanent storage space of the Bluetooth sensor shall store Bluetooth signal information detected for a minimum of 6 (six) months.			

2.3.7	Sensor shall utilize hashing to decode detected mac-addresses.			
2.3.8	Sensor shall have a web interface. Following configuration shall be done as minimum; - NTP configuration; - TCP/IP and GPRS settings configuration; - Firmware update; - Central management software communication settings; - Device ID.			
2.3.9	Sensor shall operate in the 2.4 GHz bandwidth.			
2.3.10	Sensor shall support Bluetooth v4.2 BR/EDR and Bluetooth LE specification.			
2.3.11	The internal antenna used in the system shall have a sensitivity to detect Bluetooth signals of -102 dBm or stronger.			
2.3.12	Sensor shall support NZIF receiver with –97 dBm sensitivity, Class-1, class-2 and class-3 transmitter, AFH.			
2.3.13	Sensor shall have a capacity to transmit detected Bluetooth mac ID information via HTTP or MQTT protocols.			
2.3.14	Sensor shall have a capacity to transmit detected information via embedded GPRS 3G/4G link and 10/100 ethernet background.			
2.3.15	Sensor shall have an ARM based processor.			
2.3.16	Sensor shall have 512MB RAM as minimum.			

2.3.17	The sensor shall have an integrated GSM module.			
2.3.18	Sensor shall have at least one RJ45 ethernet connector.			
2.3.19	Sensor shall work with 12-36 VDC with an embedded switched-mode power supply module.			
2.3.20	Sensor shall support embedded solar panel integration.			
2.3.21	Sensor shall have a Linux based operating system.			
2.3.22	Sensor shall have IP65 protection level as minimum.			
2.3.23	Sensor shall operate in ambient temperatures ranging from -25°C to +60°C and with an ambient humidity level between 0% and 90%.			
2.3.24	Sensor shall be capable of operation under adverse weather conditions (such as wind, snow, rain, fog).			
2.3.25	Sensor shall have a size of maximum 300 mm X 300mm X 100mm (Height, width, length)			
2.3.26	Sensor shall have a weight of maximum 3 kg.			
2.4	**Air quality measurement sensor**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 6			

2.4.1	The air quality measurement sensor shall provide relevant air pollution data and transmit them to designated platforms.			
2.4.2	The sensor shall measure as minimum particle matter level of PM2.5 and PM10.			
2.4.3	Sensor shall measure the selected gases of SO2, NO2 and O3 as minimum.			
2.4.4	Sensor shall send data in real time with second resolution via network.			
2.4.5	Sensor shall be fed with 5VDC, 12VDC or 220V AC.			
2.4.6	Sensor shall have the capability of sending data via GPRS/3G/4G with or without a router.			
2.4.7	The maximum weight of sensor shall be 7.5 kg.			
2.4.8	The maximum size of sensor shall be 600-300-300 mm (Height-Width-Depth)			
2.4.9	Sensor shall have minimum IP34 protection.			
2.4.10	Sensor shall have optimum operating range between -20°C and +45°C.			
2.5	**Meteorological measurement station**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 5			

2.5.1	As minimum, the station shall measure: • Air temperature; • Relative humidity; • Precipitation intensity; • Precipitation type; • Precipitation quality; • Air pressure; • Wind speed; • Wind direction.			
2.5.2	Station shall measure temperature; - using Negative Temperature Coefficient method; - with an accuracy of +- 0.2 as maximum; - between -40 to +70 as minimum.			
2.5.3	- Station shall measure relative humidity; - using capacitive principle; - between 0% RH to 100%RH as minimum; - Accuracy +- 2% RH as minimum.			
2.5.4	Station shall measure precipitation intensity of rain, snow, and hail as minimum: - between 0-6 mm (rain), 0-10 mm (snow, particle sizes) as minimum.			
2.5.5	Station shall measure wind direction; - using Ultrasonic principle; - between 0 to 359.999 as minimum; - Accuracy +- 3 as minimum.			
2.5.6	Station shall measure wind speed; - using ultrasonic principle; - between 0 m/s to 75 m/s as minimum; - accuracy ±0.3 m/s or 3 % of measurement / highest value applies as minimum.			

2.5.7	Station shall measure air pressure; - using MEMS Capacitive principle; - between 300 hPa and 1200 hPa as a minimum; - accuracy +- 5 hPa as a minimum.			
2.5.8	Station shall have an interface of RS485 for data transmission.			
2.5.9	Station shall have IP66 protective level as a minimum.			
2.5.10	Station shall have an operation temperature between -40 and +70 as a minimum.			
2.6	**Field Switch Type 1**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 27			
2.6.1	Switch type 1 shall have at least 16 10/100 TX RJ-45 Ports. Ports shall have support for 802.3 at Power over Ethernet.			
2.6.2	Switch shall have at least 2 100/1000 SFP slots on the switch.			
2.6.3	Switch shall support the key ring topology.			
2.6.4	Switch shall have at least 8 Gbps switching capacity.			
2.6.5	Switch shall support at least 8,000 MAC addresses.			
2.6.6	Switch shall support SNMP v1/v2c/v3.			

2.6.7	Switch shall support IEEE802.3ad and shall run LACP, support at least 8 group members.			
2.6.8	Switch shall support IEEE802.1d Spanning Tree, IEEE802.1w Rapid Spanning Tree, IEEE802.1s Multiple Spanning Tree protocols.			
2.6.9	Switch shall provide port-based and MAC-based access control with 802.1X Authentication support.			
2.7	**Field Switch Type 2**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 25			
2.7.1	Switch type 2 shall have at least 1 10/100 TX RJ-45 ethernet ports on it.			
2.7.2	Switch shall have RS232 or RS485 serial interfaces as minimum.			
2.7.3	Switch shall have LTE antenna input.			
2.7.4	Switch shall support IP filtering, HTTP, SSH capabilities as minimum.			
2.7.5	Switch shall have a SIM switch for WAN connections as minimum.			
2.7.6	Switch shall support auto APN.			
2.7.7	Switch shall support DHCP servers.			

2.7.8	Switch shall support WEB UI for configuration.			
2.7.9	Switch shall connect with Cat6 F/UTP cable to vehicle counting cameras, UPS, surveillance camera, Dynamic Intersection control unit.			

LOT 3 – Parking Management system

Parking Management Systems are aligned with creating a more efficient, user-friendly, and sustainable parking environment within urban areas. These systems leverage technology and data to address the challenges associated with parking and contribute to the broader goals of intelligent transportation and smart city initiatives.

The objectives of the system are:

- Optimize parking procedures.
- Recording digital data
- Improve user satisfaction for visitors and staff alike.
- Augment security through advanced monitoring and access management.
- Produce comprehensive reports for analysis and informed decision-making

The Contractor shall be responsible for the supply, installation and commissioning of 3 Parking Management System, consisting of:

- Item 3.1. Automatic barrier;
- Item 3.2. Validator;
- Item 3.3. Payment station software;
- Item 3.4. Plate recognition camera;
- Item 3.5. Plate recognition software;
- Item 3.6. Traffic monitoring camera;
- Item 3.7. Image processor unit;
- Item 3.8. Traffic monitoring software;
- Item 3.9. Field switch.

All items shall be compatible and integrable with the existing smart card system infrastructure.

The Parking Management System shall provide:

- Automatic detection of incoming vehicles with photo, plate information and time information;
- Automatic detection of leaving vehicles with photo, plate information and time information;
- Automatic calculation of time of parking per each vehicle;
- Consistency of ticket-pricing via accurate calculation of parking times;
- No need for ticket / ticketless;

- Payment option with existing Smart Card;
- Security of entry and exit processes to and from parking spots;
- Processing and storage of data critical for car parking management;
- Statistical analysis of usage of parking areas.

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
3.1	**Automatic barrier**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 6			
3.1.1.	The System shall have one automatic barrier in the entrance point and one automatic barrier in the leave point.			
3.1.2.	The automatic barrier opening or closing speed shall be up to 8 seconds.			
3.1.3	The automatic barrier arm shall contain reflective material and lights that will provide high visibility in all weather conditions and shall have LED tape on it.			
3.1.4.	The automatic barrier control unit shall have inputs for photocell, flasher lamp and traffic light that can be integrated when necessary.			

3.1.5	The automatic barrier body shall be 2mm thick galvanized coated, resistant to corrosion, corrosion and external weather conditions, sea water.			
3.1.6	The barrier shall be manually operable in case of emergencies and power losses.			
3.1.7	The barrier shall require a power input of 100/120, 220/240 220VAC and 50/60Hz ± 10%.			
3.1.8	The barrier body shall be IP54 protected.			
3.1.9	The barrier shall automatically open in the case of an obstacle encounter while closing.			
3.1.10	The barrier shall work integrated with the magnetic vehicle detector.			
3.2	**Validator**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 3			
3.2.1	The machine shall scan for existing smart cards.			
3.2.2	The machine shall be activated to receive and scan tickets only in the case of detection of incoming traffic, and shall not activate otherwise.			
3.2.3	The machine shall support RS232 or RS485 connectors.			

3.2.4	The machine shall display guiding messages on the graphic LCD display on its front side.			
3.2.5	The machine shall have a maximum operating temperature of 70°C and a minimum operating temperature of -20°C.			
3.2.6	The machine shall operate with 12-35VDC.			
3.3	**Payment station software**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 3			
3.3.1	In each parking lot area, one payment station software shall be utilized.			
3.3.2	The payment station software shall enable data sharing and communication with commonly used protocols.			
3.3.3	The software shall be integrated with the Plate Recognition Camera (Item 3.4) and Plate Recognition Software (Item 3.5).			
3.3.4	The software shall get vehicle photo with plate information from the Plate Recognition Camera (Item 3.4) and Plate recognition Software (Item 3.5).			

3.3.5	The software shall show the detected vehicle image photo with plate, time and detected camera information.			
3.3.6	The software shall enable modification of the plate information.			
3.3.7	The software shall activate the Automatic Barrier when a vehicle's plate is detected.			
3.3.8	The software shall activate the Automatic Barrier when payment is complete in the leave point.			
3.3.9	The software shall show the time of entrance and time of leave.			
3.3.10	The software shall calculate the pricing based on total parking time and tariff.			
3.3.11	The software shall show price and parking duration information.			
3.3.12	The software shall be capable of sharing vehicle entrance and leave times.			
3.3.13	The software shall calculate the number of empty parking lots.			
3.3.14	The software shall show the total number of vehicles entered and left.			
3.3.15	The software shall be capable of sharing empty parking lot information.			
3.3.16	The software shall have a web interface.			

3.3.17	The software shall provide different levels of authorization for different users.			
3.3.18	The software shall incorporate flexible tariff identification option for consistent car pricing			
3.3.19	The software shall enable the modification of pricing tariff.			
3.3.20	The software shall provide the option for periodical database backup.			
3.3.21.	The software shall automatically activate the payment function when a vehicle arrives at the payment area.			
3.3.22.	The software shall run on the servers (Item 4.1, 4.2)			
3.4	**Plate recognition camera**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 6			
3.4.1	The System shall have one Plate Recognition Camera in the entrance point and one Plate Recognition Camera in the leave point.			
3.4.2	The camera shall incorporate a CMOS camera sensor with a minimum sensor size of 1/3MP.			
3.4.3	The camera shall have a resolution of 1.3MP as minimum.			

3.4.4	The camera shall have 2.7mm-12mm Motorized Lens as minimum.			
3.4.5	The camera shall transmit the images in real time over the cable to the Image Processor Unit (Item 3.7).			
3.4.6	The camera shall have 1 RJ-45 (10/100Base-T) Ethernet as minimum.			
3.4.7	The camera shall have 4 IRLEDS as minimum.			
3.4.8	The camera shall support ONVIF profile.			
3.4.9	The camera shall have 1 SD Card slot which supports at least 64 GB of capacity as minimum.			
3.4.10	The camera shall be powered by POE as minimum.			
3.4.11	The camera shall have IP66 protective level as minimum.			
3.5	**Plate recognition software**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 3			
3.5.1	Plate Recognition software shall have a minimum accuracy of 95%.			
3.5.2	The software shall run on the Image Processing Unit (Item 3.7).			
3.5.3	The software shall run on Linux.			

3.5.4	The software shall be capable of providing number plate photos during day and night lighting conditions.			
3.5.5	The software shall create a maximum of one record for each incoming vehicle.			
3.5.6	The software shall not recognize the two different vehicles as one.			
3.5.7	The software shall provide accurate readings for vehicles going at a maximum speed of 40 km/h.			
3.5.8	The software shall provide photos taken for the front license plate of incoming and outgoing traffic.			
3.5.9	The software shall be capable of reading different types, and shapes of number plates.			
3.5.10	The software shall provide a consistent detection rate throughout day, and night lighting conditions and differing weather conditions.			
3.5.11	The software shall take a photograph for each vehicle showing its license plate.			

3.5.12	The software shall not provide accurate detection under the following conditions: • Covered plates or altered character appearance due to screws, labels, paint, stickers, rust, mud, snow, embossing; • Private plates; • Military plates; • Non-reflective license plates (in infrared mode); • Damaged, bent, or broken plates; • Plates illegible to eye; • Plates of vehicles at speeds higher than ~40 km/h; • Plates that do not comply with official standards.			
3.5.13	The Plate Recognition System shall be able to export the following data as minimum. - Car photograph - Car plate - Camera information - Car direction - Car pass time			
3.5.14	The software shall send data via FTP.			
3.5.15	The software shall have a web interface.			
3.5.16	The software NTP settings shall be set on the web interface.			
3.5.17	The software IP configuration shall be set on the web interface.			

3.5.18	The software video stream URL shall be set on the web interface.			
3.5.19	The software shall process 2 video streams of the traffic monitoring camera (Item 3.6) as minimum.			
3.5.20	The software shall use OpenVINO toolkit.			
3.5.21	The software shall run deep learning based models on Edge AI module or embedded GPU.			
3.6	**Traffic monitoring camera**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 60			
	• 60 camera Poles shall be supplied with the vehicle detection cameras. • 60 camera poles shall be properly located on the required locations and 60 cameras shall be installed on them.			
3.6.1	The traffic monitoring camera shall provide video streams to the Traffic Monitoring Software (Item 3.8). The camera shall transmit images in real time over the cable to the Image Processor Unit (item 3.7).			
3.6.2	The camera shall have least a 2-Megapixel Progressive Scan CMOS.			

3.6.3	The camera shall have pan and tilt ability to monitor different zones (presets).			
3.6.4	The camera shall have 32x optical zoom as minimum.			
3.6.5	The camera shall have focal length as minimum 5 mm to 150 mm.			
3.6.6	The camera shall support 16 presets as minimum.			
3.6.7	The camera shall support movement range of 360° as minimum.			
3.6.8	The camera shall have 1 RJ-45(10/100Base-T) Ethernet as minimum.			
3.6.9	The camera shall have 6 IRLEDS as minimum.			
3.6.10	The camera shall support ONVIF profile.			
3.6.11	The camera shall have 1 SD Card slot which support at least 64 GB of capacity as minimum.			
3.6.12	The camera shall be powered by POE as minimum.			
3.6.13	The camera shall have as minimum IP66 protective level.			
3.6.14	The camera shall work in as a minimum in environmental conditions of -10°C ~ +60°C and humidity < 90%.			
3.6.15	The camera must support H264 broadcast.			
3.6.16	Camera pole shall have a height of at least 7.5 meters and it shall have a structure that shall give a peak displacement no more than 5cm in the wind blowing at speed of 130 km/h.			

3.6.17	Camera pole shall be hot-dipped galvanized.			
3.6.18	The fuse and/or interference covers of pole shall be hot-dip galvanized steel.			
3.6.19	Camera pole has a galvanized, suitable camera mounting equipment on top of it.			
3.6.20	Camera pole shall have an equipment on the top part so that water does not enter directly into it.			
3.6.21	Camera pole screws shall be of galvanized steel.			
3.6.22	The pole foundation shall be at least 70x70x80 cm in size.			
3.7	**Image processor unit**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 18			
3.7.1	The base frequency of the image processor unit (unit) to be used shall be at least 2.0 Ghz.			
3.7.2	The unit shall have 6 CPU cores as minimum.			
3.7.3	The unit shall have 8 GB of RAM as minimum.			
3.7.4	The unit shall have 128GB SSD as minimum.			
3.7.5	The unit shall have 4 USB 3.0 as minimum.			
3.7.6	The unit shall have one HDMI as minimum.			
3.7.7	The unit shall have 2 RJ45 network connector as minimum.			

3.7.8	The unit shall have 8th generation i7 processor as minimum.			
3.7.9	The unit shall have 12M smart cache as minimum.			
3.7.10	The unit shall have 1 M.2 expansion slot as minimum.			
3.7.11	The unit shall have 1 PCIe expansion slot as minimum.			
3.7.12	The unit shall have 175mm x 175mm physical dimension as maximum.			
3.7.13	The unit shall have edge AI module or embedded GPU card that have OpenVINO support.			
3.7.14	Edge AI module or embedded GPU shall have Movidius SoC or ARC based GPU.			
3.7.15	The image processor shall support modules that can be run by deep learning-based models supported by the INTEL Open VINO library or equivalent, which can perform artificial intelligence-based analysis on the PCI slot.			
3.7.16	The image processor shall have sub-hardware support, compatible with deep learning models.			
3.7.17	The image processor shall have free software development tools (API/SDK communication protocol) that supports the integration of third-party systems.			
3.8	**Traffic Monitoring Software**			
	Manufacturer's name; product model/type:			
	Country of origin:			

	Quantity: 15			
3.8.1	Traffic monitoring software shall have a web interface.			
3.8.2	The software NTP settings shall be set on the web interface.			
3.8.3	The software web settings shall be set on the web interface.			
3.8.4	The software video stream URL shall be set on the web interface.			
3.8.5	The software shall process 5 video streams of the traffic monitoring camera (Item 3.6) as minimum.			
3.8.6	The software shall change the preset of the traffic monitoring camera (Item 3.6).			
3.8.7	The software shall allow to set preset durations of traffic monitoring camera (Item 3.6).			
3.8.8	The software shall allow the drawing of analysis area for vehicle detection using the web interface per each preset.			
3.8.9	The software shall allow to set maximum number of vehicles that can park per each preset using the web interface.			
3.8.10	The software shall allow to set the order of presets via web interface.			
3.8.11	The software shall allow to give a name for each preset.			
3.8.12	The software shall detect the stopped vehicles in the drawn area per each preset.			

3.8.13	The software shall detect stopped vehicles in a 40-meter area as minimum.			
3.8.14	The software shall detect stopped vehicles that park parallelly or vertically.			
3.8.15	The software shall mark the detected vehicles on the video stream and show on the web interface.			
3.8.16	The software shall detect stopped vehicles both during day and night.			
3.8.17	The software shall have the capacity to send detected stopped vehicle number data to relevant devices using HTTP or MQTT protocols.			
3.8.18	The software shall use OpenVINO toolkit.			
3.8.19	The software shall run deep learning based models on Edge AI module or embedded GPU.			
3.9	**Field switch**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 63			
3.9.1	Field switch shall have at least 16 10/100 TX RJ-45 Ports on it, these ports shall have support for 802.3 at Power over Ethernet.			
3.9.2	Field switch shall have at least 2 100/1000 SFP slots on the switch.			
3.9.3	Field switch shall support the key ring topology.			

3.9.4	Field switch shall have at least 8 Gbps switching capacity			
3.9.5	Field switch shall support at least 8,000 MAC addresses.			
3.9.6	Field switch shall support SNMP v1/v2c/v3.			
3.9.7	Field switch shall support IEEE802.3ad and shall run LACP, support at least 8 group members.			
3.9.8	Field switch shall support IEEE802.1d Spanning Tree, IEEE802.1w Rapid Spanning Tree, IEEE802.1s Multiple Spanning Tree protocols			
3.9.9	Field switch shall provide port-based and MAC-based access control with 802.1X Authentication support.			

LOT 4 – IT equipment

IT equipment will be employed in the Traffic Control Management Room. Servers will be allocated for the Traffic Management Software, Public Transportation Systems Software, and all associated software applications. These applications will furnish an interface and management platform for all systems outlined in Lot 1, 2, and 3 with following objectives:

- Reliability and High Availability
- Performance Optimization
- Security and Data Protection
- Scalability and Flexibility
- Operational Management
- Automation and Orchestration
- Backup Management
- Data Storage

The Contractor shall be responsible for the supply, installation and commissioning of IT Equipment, consisting of:

- Item 4.1 - Server Type 1;
- Item 4.2 - Server Type 2;
- Item 4.3 - Server Type 3;
- Item 4.4 - Backbone Switch;
- Item 4.5 - Notebook;
- Item 4.6 - Printer;
- Item 4.7 - Tablet.

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
4.1	**Server Type 1**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 3			

4.1.1	Server type 1 shall use Linux or a compatible operating system.			
4.1.2	The server shall require an input voltage with a range of 220 V ± 20 V and a frequency rate of 50Hz ± 3 Hz.			
4.1.3	The server shall have at a minimum of one physical processor. Each server shall have a minimum of 8 cores, be 64-bit and run with a base frequency speed of 2.5 GHz as minimum, as minimum of 12 MB cache memory and a maximum of 140-Watt TDP power consumption.			
4.1.4	The server shall have a minimum of 16 GB and 2666 MHz DDR4 memory available.			
4.1.5	The server shall have a minimum operating system dedicated storage of 960 GB SSD.			
4.1.6	The server shall have 3,5” SAS HDD technology for use in storage.			
4.1.7	The server shall have a minimum of 2 (two) 1GbE (GBASE) RJ45 port.			
4.1.8	The server shall have at least 12Gbps hardware raid controller and servers support at least RAID 0,1,5,50,6,60.			
4.1.9	The server shall be mountable on a rack cabinet.			
4.1.10	The server shall have at least one redundant 1000W power supplies.			
4.2	**Server Type 2**			
	Manufacturer’s name; product model/type:			
	Country of origin:			

	Quantity: 3			
4.2.1	Server type 2 shall use Linux or a compatible operating system.			
4.2.2	The server shall run with a voltage range of 220 V ± 20 V and a frequency rate of 50Hz ± 3 Hz.			
4.2.3	The server shall have at least two physical processors. The server shall have a minimum of 64 cores, be 64-bit and run with a frequency speed of 5.2 GHz. Each server shall have a minimum of 128MB smart cache memory and a maximum of 400-Watt TDP power consumption.			
4.2.4	The server shall have at least 128 GB and 3200 MHz DDR4 memories mounted on them.			
4.2.5	The server shall have disks configured as a minimum of 240 GB RAID 1 which consists of SSD disks on which operating system shall run.			
4.2.6	The server shall have disks configured as a minimum of 1,92 TB RAID 1 which consists of SSD disks on which operating system shall run.			
4.2.7	The server shall have 3,5” SAS HDD technology for use in storage. Server have at least 120 TB HDD.			
4.2.8	The server shall have at least 12Gbps hardware raid controller and servers support at least RAID 0,1,5,50,6,60			
4.2.9	The server shall have a minimum of 4 (four) iSCSI-supported 1G Ethernet and a minimum of 2 (two) 25 Gigabit Ethernet/SFP port.			
4.2.10	The server shall have a minimum of 6 (six) PCIe sockets.			
4.2.11	The server shall be mountable on a rack cabinet.			

4.2.12	The server shall have at least two redundant 800W power supply.			
4.3	**Server Type 3**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 1			
4.3.1	Server type 3 shall use Linux or a compatible operating system.			
4.3.2	The server shall require an input voltage with a range of 220 V ± 20 V and a frequency rate of 50Hz ± 3 Hz.			
4.3.3	The server shall have at a minimum of one physical processor. Each server shall have a minimum of 20 cores, be 64-bit and run with a frequency speed of 2 GHz. a minimum of 27,5 MB L3 cache memory and a maximum of 125-Watt TDP power consumption.			
4.3.4	The server shall have a minimum of 32 GB and 2666 MHz DDR4 memory available.			
4.3.5	The server shall have a minimum operating system dedicated storage of 2 x 960 GB SSD.			
4.3.6	The server shall have 3,5" SAS HDD technology for use in storage.			
4.3.7	The server shall have a minimum of 2 (two) 10G Ethernet and a minimum of 2 (two) GbE RJ45 port.			
4.3.8	The server shall have at least 12Gbps hardware raid controller and servers support at least RAID 0,1,5,50,6,60.			

4.3.9	The server shall be mountable on a rack cabinet.			
4.3.10	The server shall have at least two redundant 800W power supply.			
4.4	**Backbone switch**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 1			
4.4.1	Backbone switch shall have at least 8 10/100 TX RJ-45 ethernet ports on it.			
4.4.2	Backbone switch shall have at least 2 SFP slots fiber ports on it.			
4.4.3	Backbone switch shall support traffic shaping, VLAN (802.1Q) tagging, QoS, GMRP and IGMP.			
4.4.4	Backbone switch shall support HTTP, Telnet, SSH, SNMP v1 or v2 or v3 management methods as minimum.			
4.4.5	Backbone switch shall support as minimum: - IEEE802.1d Spanning Tree protocols or; - IEEE802.1w Rapid Spanning Tree protocols or; - IEEE802.1s Multiple Spanning Tree protocols.			
4.4.6	Backbone switch shall provide BGP capability.			
4.4.7	Backbone switch shall support MAC-based ACL.			
4.4.8	Backbone switch shall include as minimum 2 x 1000-Base SX/LX SFPs with a power supply.			

4.4.9	Backbone switch shall support IGMP Snooping.			
4.4.10	Backbone switch shall support port isolation and port security.			
4.4.11	Backbone switch shall support broadcast storm control.			
4.4.12	Backbone switch shall operate as minimum between 0 - +50 C.			
4.4.13	Backbone switch shall tolerate relative humidity between 10-95% as minimum.			
4.4.14	Backbone switch shall have protection class IP20 as minimum.			
4.5	**Notebook**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 13			
4.5.1	CPU benchmark shall be min 9000.			
4.5.2	Processor base frequency shall be min 2.4 Ghz.			
4.5.3	Processor with min 8 cores.			
4.5.4	Cache shall be min 24 MB.			
4.5.5	Main memory installed shall be min 16 GB.			
4.5.6	Processor type shall be min İ7.			

4.5.7	Memory type shall be DDR5.			
4.5.8	SSD type hard drive with min 1TB capacity.			
4.5.9	Minimum 1 x HDMI output.			
4.5.10	Min 15.6" size monitor supporting 1920 x 1080 resolution.			
4.5.11	Display Card shall be min RTX4060.			
4.5.12	Windows 11 shall be installed.			
4.5.13	As a minimum, laptop shall have; • Speakers; • wi-fi; • Bluetooth; • web-camera; • 2 x USB 3.0 or latest port; • Ethernet port.			
4.5.14	The integrated keyboard of the laptop shall be Turkish-Q and shall have backlit feature. A wireless optical mouse with scroll feature shall also be provided.			
4.5.15	Shall comply with CE and Energy Star compliance.			
4.6	**Printer**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 2			

4.6.1	The printer shall be color and A3 as minimum.			
4.6.2	The printer shall have a 20-print speed page for A4 paper size as minimum.			
4.6.3	The printer shall have ethernet and USB connectivity.			
4.6.4	The printer shall print with a minimum resolution of 600x 600 DPI.			
4.6.5	Power requirements: 220-240V, AC, 50/60Hz, EU power cords			
4.6.6	The printer shall support for Windows or compatible operating system.			
4.6.7	The printer shall have a color and monochrome (black white) scanner.			
4.6.8	Scan speed of 200 dip (dots per inch) in color scanning as minimum or scan per minute up to 50.			
4.6.9	Scan resolution of 600 DPI x 600 DPI as minimum.			
4.6.10	The printer shall have fax.			
4.7	**Tablet**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 10			
4.7.1	Screen diagonal: minimum 11".			
4.7.2	Screen resolution: minimum 2300x1600.			
4.7.3	Processor: minimum 8 core.			

4.7.4	RAM: minimum 6 GB.			
4.7.5	Internal memory: minimum 64GB.			
4.7.6	Main camera resolution: minimum 12MP.			
4.7.7	Front camera resolution: minimum 8 MP.			
4.7.8	Connectivity: • Positioning system GPS • Wi-Fi Direct • Bluetooth.			
4.7.9	Operating system: preinstalled operating system 64bit.			

LOT 5 – Electric bus and charging station

Consisting of:

- Item 5.1 – Electric bus;
- Item 5.2 – Charging station.

I. Technical documentation to be provided by the tenderer / the contractor:

Following documentations shall be provided by the tenderer / contractor:

- **The concept design** of the Items 5.1 and 5.2 in DWG and PDF format;
- **The detailed design** of Items 5.1 and 5.2 in DWG and PDF format;
- **As-built design** of Items 5.1 and 5.2 in DWG and PDF format after issuance of the Provisional Acceptance.

The tenderer / contractor documents shall also include:

- Document describing the brand, model, type, and technical specifications of electric bus and charging units;
- "Information Form" containing technical details of electric bus;
- Schematic technical drawings containing measurements of the electric bus's passenger entrance floor height, measured from the level of the road surface when the vehicle is empty, including dimensions of all passenger doors on the vehicle;
- The interior layout plan of the electric bus;
- Dimensions of all passenger doors in the vehicle;
- Different views regarding the number and design of windows;
- Bus interior layout plans;
- Detailed information about the placement of the system and technical features (cooling capacity, compressor power, amount of gas, type of gas, flow rate of cold and hot air that can be given to the indoor environment) during the manufacture of the vehicle;
- Detailed technical report under the SORT 2 test conditions on electric buses, including their cruising capability, consumption values, calculation methods, and conditions (including performance report of 350 km cruising capability with 100% charged battery);
- The test report that the batteries and/or electric buses have successfully passed the safety tests required by ECE-R100 or international equivalent standards obtained from independent test organizations.
- Detailed description of the organisation of the proposed maintenance service during the warranty period including name of the authorized service provider.

- Copy of the original type approval certificate which contains the brand, type and commercial name of the offered electric buses, showing that they have been homologated in the M3 category by a competent authority in one of the EU member states.

Other documentation to be provided by the contractor:

- Original certificate of origin documents;
- Operation and maintenance manuals - all supplies must be offered with original set of operation and maintenance manuals in English and in Turkish language (if commercially available). If manuals are not in Turkish language, a “Quick Guide” in Turkish shall be supplied;
- Warranty document of the manufacturer and/or authorized dealer/distributor of manufacturer.

II. Design and manufacture:

- The Minimum Mean Distance Between Failure (MDBF) and Mean Distance Between Service Failure (MDBSF) values shall be given at the design stage. The MDBF value for the entire fleet shall not be below 15,000 km operating values and the MDBSF value shall not be below 150,000 km operating values.

  The data that shall be the basis for MDBF and MDBSF calculations shall be collected during the 6-month period in the passenger operation after the Provisional Acceptance of the last vehicle. For calculations; 20 electric buses shall be taken as basis.

  If MDBF and MDBSF values are not below the above-mentioned values for the entire vehicle fleet, the reliability of the vehicles shall be confirmed.

  If these values are below the specified values for the entire fleet; GMM and the contractor shall jointly examine the vehicle or specific systems. Corrective and preventive action on system or equipment shall continue until the guaranteed values are reached. In this case, the improved system shall be examined and the warranty period shall be extended until a permanent solution is found.

  During MDBF and MDBSF tests GMM shall keep operating mileage records of the vehicles and monthly report malfunctions, reliability, and availability.
- Motor design: Tenderers can choose among the various possible motor designs (asynchronous motor or synchronous motors, hub axle mounted motor / axle etc.), as long as fulfilling requirements.
- Battery: There shall be a test report that the batteries and/or electric buses have successfully passed the safety tests required by ECE-R100 or international equivalent standards obtained from independent test organizations. The contractor shall demonstrate that it fulfils the requirements of the latest version of the relevant safety and test standard, and shall submit test report to GMM at the delivery of vehicles.
- Brake system: Repair kits for all valves in the air system shall be described in the spare parts catalogues.
- Tires: The contractor shall specify the brand and origin of the front axles they recommend before manufacturing.
- Passenger Information Screen: The contractor shall obtain the approval of GMM on the selection and characteristics of the screen.
- Vehicle tracking interface: The contractor shall create a web-based "Vehicle Tracking Interface " for tracking purposes, which shall be commissioned after delivery, and shall make them available to GMM during the warranty coverage.
- For vehicle tracking interface, the design of the interface functions and screen shall be carried out after the contract, by GMM and the contractor.

- CCTV: If GMM wishes to install additional cameras, the contractor shall provide needed infrastructure support. All maintenance, failure intervention forms of the camera recording system, as well as the computer software and equipment for accessing the computer and camera recording system (connection cable, connection converter, etc.) shall be supplied by the contractor included in the bid price and delivered to GMM in a working manner.
- The costs of the transmission of information via GPRS shall be borne by the contractor during the warranty period.

III. Inspection and acceptance

Inspection during production

- The compliance of items with the technical specifications shall be determined by the technical personnel appointed by GMM, in accordance with the provisions and procedures set forth in the "Regulation on Inspection, Examination, and Acceptance Procedures for Procurements" in effect.
- Inspections shall be conducted at the contractor's production facilities.
- Expenses including travel, accommodation, meals, etc. shall be covered by the contractor.

Acceptance

- Inspection and acceptance procedures shall be carried out in accordance with the "Regulation on Inspection, Testing, and Acceptance Procedures for Procurement" in effect.
- Inspection and acceptance procedures shall be conducted by the previously established Inspection and Acceptance Commission.
- Inspection and acceptance procedures shall not be carried out until all goods are supplied to GMM by the contractor.
- Upon the contractor's delivery of the supply in accordance with the tender documentation or notification to GMM that the goods are ready for delivery in accordance with the documentation, GMM shall commence inspection and the **Provisional Acceptance** procedures.
- Needed examinations (including laboratory) shall be carried out if deemed necessary by the Inspection and Acceptance Commission in GMM own laboratories or laboratories belonging to other public institutions or in private laboratories if needed.
- All costs related to laboratory examinations (including whether the results are positive or negative) shall the responsibility of the contractor.
- **Final Acceptance** shall be made after the expiry of the warranty period.
- A mobile repair team shall be employed to intervene in technical failures that may occur during the transportation of vehicles to the place to be indicated by GMM.
- All costs relating to any permission, licensing, certification, testing, calibration, or other documentation of the supplies shall be borne by the contractor.

License plate and registration

- For the issuance of license plates for the vehicles, an expense of all documents required for the traffic registration procedures shall be the responsibility of GMM.
- In the case of vehicles being imported from abroad, an expense of all documents required for customs procedures, including license plates, shall be borne by the contractor.

IV. Delivery

Delivery time

The contractor shall deliver Electric Buses and Charging Units within **300 calendar days** from the date of the contract, in a ready-to-use condition. The entire supply shall be delivered in a single instalment within the specified delivery period.

Delivery location

The contractor shall deliver Electric Buses to Gaziantep as specified by GMM.

Contractor shall deliver Charging Units to Gaziantep Gaziulaş Bus Workshop and/or garages designated by GMM.

All transportation and installation expenses related to electric buses and charging units shall be covered by the contractor.

Commissioning requirements for Items 5.1 and 5.2

Full commissioning shall be borne by the contractor.

Consumptions on site during the commissioning shall be borne by the contractor.

The contractor shall make available to himself all tools, materials and equipment required for transport, assembling, installation and commissioning.

The contractor shall provide all tools and equipment needed for testing of supplies.

The contractor shall perform onsite commissioning of the supplies by trained and authorized personnel including unloading, furnishing to designated location, unpacking, assembling and connection to main supply and removal of packing materials from site in accordance with Article 29 of Special Conditions.

Connection to main electrical, mechanical, water, air and/or gas supplies from the existing infrastructure shall be done by the contractor according to the rules and regulations of Türkiye. Recovering of any damage to building structure that may occur during the installation and commissioning is under the responsibility of the contractor.

Application to relevant authorities for a subscription to utility connections such as electricity, water, other. shall be the responsibility of the contractor.

All software shall be delivered and installed in electronic version. All software shall be licensed to GMM.

V. Operation / Detection of type defect and sanctions

In the event of the recurrence of the same malfunction in transmission components, installations, electronic controls, suspension systems, brake systems, bodywork, chassis, electric motors, main and auxiliary power systems, electrical systems, steering systems, charging systems, batteries, air conditioning systems,

CCTV, passenger information, and other units and/or specific parts (up to 5 occurrences per vehicle within a year), the malfunctioning part/system shall be considered as a type defect. In such cases, the contractor shall be responsible for replacing parts/equipment and any other affected parts, covering all labor and material costs.

The faulty products that fall under type defects shall be replaced with improved parts. In cases where the parts have been improved or undergone version changes, even if they are not considered type defects by the manufacturer, replacement shall be carried out with the approval of GMM.

The contractor shall respond in writing to the written notification made by GMM regarding the "Type Defect" issue within a maximum of 30 (thirty) calendar days.

Type defects shall be addressed within a reasonable plan acceptable to GMM.

VI. Health & Safety

The contractor shall be fully responsible for applying the Health and Safety procedures in accordance with the legislation published by the Republic of Türkiye Ministry of Family, Labor and Social Services during the manufacturing, delivering, assembling, installation, commissioning and testing. Moreover, the contractor will be responsible for advising GMM of any Health & Safety risks associated with supplies provided and of suitable protective measures.

Supplies shall be designed to operate safely taking into account the characteristics of the terrain and its surroundings, atmospheric and meteorological conditions, structures, and obstacles located in the vicinity either on the ground or in the air in such a way as to cause no nuisance or pose no danger under any operational or servicing conditions or in the event of an operation to rescue persons.

The contractor shall comply with all national and international standards related to manufacturing.

Substances used for the manufacturing and repair of electric buses and charging stations should not be harmful to the health of employees engaged in the operation, repair and maintenance of electric buses and charging stations. Example of such materials are: insulation materials, friction materials, paints, gaskets, diverse fluids, and others.

Asbestos and asbestos-containing material, carcinogenic materials, lead (PB) and polyvinyl chloride (PVC) are prohibited from use on public transport vehicles.

VII. Warranty requirements

The replacement of the charging units (max 2 times) (disassembly and assembly) shall be done by the contractor.

Only original or approved by the manufacturer(s) spare parts should be used in any repair service. The contractor shall keep an adequate stock of original spare parts to ensure smooth operation during the repair and maintenance processes of the vehicles. All kinds of spare parts, consumables (except vehicle tires), shell be covered by the warranty.

The equipment needed for maintenance and repair operations of the bus, such as control, test equipment, vehicle-specific hand tools, other., shall be delivered to GMM as "2 set for 20 vehicles" 1 (one) year before the warranty end date.

Line editing and loading software shall be provided with the delivery of the vehicles. The contractor should provide available software updates during the warranty period.

During the warranty period, the contractor shall have a roadside assistance team for vehicles that break down during the trip.

During the warranty period, all scheduled maintenance, consumable replacements, and repair services for the vehicles shall be performed by the contractor's technical team at GMM's workshop or authorized service center. All spare parts used for repair and maintenance services shall be original parts compatible with the vehicle.

The contractor is responsible for repairing the malfunctions that cannot be repaired at the workshops, repairing them at the vehicle manufacturing plant. If the repair is not possible, the contractor is obliged to replace the faulty equipment with a new one.

During the warranty period, if a malfunction covered by the warranty occurs for the same reason in more than 10% of the same device, unit, equipment, component or part within the last 12 months, malfunction shall be considered as a type defect / chronic malfunction.

For equipment, units, devices, parts, and other determined to be chronically defective, the contractor shall carry out needed reinforcements, modification, material replacement, renewal, disassembly, and assembly operations for all vehicles within the specified period.

The contractor shall be responsible for any equipment (devices, materials, components, etc.) sourced from aftermarket suppliers and used on the vehicles during the manufacturing or warranty period. Any problems arising from such equipment shall be the sole responsibility of the contractor.

The maintenance and repair work carried out by the contractor shall be monitored by GMM.

To keep track of and statistical information such as maintenance, breakdowns, and materials, detailed information entry into the software used by the contractor shall be performed.

The "opening of a fault record" and "closing of a fault record" process shall be carried out by the contractor.

During the warranty period, periodic maintenance shall be carried out by the contractor according to the intervals specified in the technical documents. The contractor shall prepare maintenance schedules for these maintenance activities and submit them to GMM in advance.

After delivery, if the equipment such as electronic fare collection, fleet tracking and management system belonging to GMM is installed on the electric buses, the technical personnel to be assigned by the contractor shall be present during the assembly period and installation to be carried out shall not affect the warranty.

All technical infrastructure and systems for remote monitoring and reporting shall be installed. Remote monitoring shall be ensured via Canbus system and GPRS.

The batteries shall be under warranty by the contractor for at least 5 (five) years (except in cases of accidents and vandalism) which shall ensure 80% maintained state of charge. In this regard, the contractor shall submit the warranty document.

Capacity measurements of the battery shall be made every year during the warranty period and shall be submitted to GMM. These measurements shall be recorded and the battery packs that do not meet the conditions and are found to have deteriorated that shall adversely affect the daily cruising distance km figures shall be replaced by the contractor.

When the batteries show any malfunction or complete economic life within the warranty period, disposal procedures shall be carried out by the contractor, and the contractor shall not charge any fee. After 5-year battery warranty period is over, the disposal procedures shall be carried out by GMM.

The charging stations shall be fully compatible with the designated Fleet Management System (FMS). The compatibility shall encompass seamless integration, allowing for effective communication and data exchange between the charging stations and the Fleet Management System. The charging stations shall support the necessary protocols and interfaces as specified by the Fleet Management System to ensure optimal functionality.

All charging stations covered by this agreement shall possess the capability to communicate instantly with the Fleet Management System. This instant communication shall enable real-time monitoring, control, and data retrieval from the charging stations without any significant delay. The communication process shall adhere to industry standards for efficiency and reliability.

The Fleet Management System shall have the capability to instantly retrieve comprehensive and up-to-date information from each charging station within the network. This information shall include but is not limited to charging status, energy consumption, operational diagnostics, and any relevant data necessary for effective fleet management. The charging stations shall be equipped with the necessary sensors and communication modules to facilitate this instant information retrieval.

All charging stations shall be specifically designed and configured to meet the unique requirements of fleet management. This includes the ability to adapt to varying usage patterns, scalability to accommodate growing fleets, and resilience to handle diverse charging demands. The charging stations shall also support remote management and diagnostics to ensure proactive maintenance and troubleshooting capabilities within the fleet management framework.

The charging stations shall comply with relevant industry standards for communication protocols, interoperability, and cybersecurity to facilitate seamless integration with the Fleet Management System. This compliance is essential to ensure a robust and secure ecosystem for fleet electrification.

The charging stations shall be designed with future technological advancements in mind, allowing for software updates and enhancements to maintain compatibility with evolving Fleet Management System requirements. This future-proofing shall ensure a sustainable and adaptable charging infrastructure for the continued effectiveness of the fleet electrification initiative.

The guarantee of the air conditioning system is included in the bus guarantee and shall not be shorter than the bus guarantee period.

VIII. Fleet availability

Fleet availability refers to the operational availability rate of 20 vehicles in the Availability Fleet and shall be calculated daily.

A maximum of 2 vehicles shall be reserved for maintenance or breakdown activities, all remaining vehicles shall be included in the total number of vehicles for the Availability rate. The availability ratio shall be found by subtracting the number of vehicles that cannot be put into operation from the total number of vehicles and dividing the number obtained by the total number of vehicles.

Example:

If 2 of the 20 vehicles that should be ready for operation today could not be put into operation due to maintenance or malfunction, the availability rate shall be calculated as (20-2) / 20 = 0.90, that is, 90%.

Availability rate shall not be lower than 90% for each day.

It shall not be accepted for the contractor's after-sales service team to make inter-vehicle or in-vehicle spare parts changes to ensure availability. The contractor shall keep a sufficient variety and quantity of spare parts ready for the Service in its own stock.

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
5.1.	**Electric bus (The bus)**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 20			
5.1.0	**General operation data**			
	GMM prepared a study about the bus lines indicating where vehicles are planned to be used and what would be their operation data (Table 1) The contractor is obliged to ensure that operating conditions are met in the technical design of the vehicles. • A: Line Starting point • B: Line End point • Dead distance: The bus is located from "Parking Area to Point A" for the first service and " from Point A to Parking Area" at the end of the day • The distance of out-of-service (km) the bus travels (without passengers) to get to its "area" • Route: Total distance (km) between points A and B • Service: Line x 2 (total km of "A B" + "B A") • Intermediate charging: Charging during the end-of-service break time			
	Gaziantep Electric Bus Operation Data: • Length of route: 18 km			

	• Service length: 36 km • Single vehicle daily service total distance: 324 km • Dead distance / Range without passengers: 48 km • Line slope ratios: Maximum slope: %14, Average slope: %12 • End of Service break Time: 9 - 18 Minutes • Service Occupancy Rate: %75 • Daily Working Time:18 Hours • Average air conditioner working time per day is 16 hours (April, May, June, July, August, September, October) • Peak Hours: Morning 06:30 - 09:00, Evening 15:30-19:30			
	Average temperature values in GMM: Gaziantep Climate Months 1 2 3 4 5 6 7 8 9 10 11 12 Year Highest Temperature (°C) 19,0 22,7 28,1 34,0 37,8 39,6 44,0 42,8 40,8 36,4 27,3 25,2 44,0 Average Maximum Temperature (°C) 7,6 9,4 14,0 19,7 25,4 31,1 35,3 35,3 31,1 24,2 16,1 9,8 21,5 Average Temperature (°C) 3,0 4,3 8,1 13,2 18,6 24,0 27,7 27,4 22,8 16,1 9,3 4,8 14,9 Average Lowest Temperature (°C) -0,8 0,0 3,0 7,3 11,8 17,0 21,1 20,9 16,2 10,0 4,4 1,0 9,3 Lowest Temperature (°C) -17,5 -15,6 -11 -4,3 2,5 4,5 10,6 12,1 3,4 -2,8 -9,7 -15 -17,5 Average precipitation (mm) 96,6 84,0 73,5 53,4 32,7 6,7 2,5 2,2 5,8 36,2 63,0 96,1 552,7			
5.1.1	**Main functional requirements**			
5.1.1.1	Bus type: 18m Articulated 4-door electric bus with batteries and overnight fast charging at the depot only.			

	Electricity consumption: Maximum 1.4 kWh/km, under SORT 2 test conditions. The bus shall be the model of the delivery year.			
5.1.2	**General terms**			
5.1.2.1	Electric buses shall be manufactured and equipped with all equipment for traffic in line with the measurements, values and equipment shown in the relevant legislation containing the technical requirements for urban public transportation vehicles in accordance with the provisions of the Highway Traffic Law No. 2918, AITM and 2001 / 85 / EC Regulations.			
5.1.2.2	The passenger carrying capacity shall be at least 94 people + 1 wheelchair, in total 95 passengers. Comfort ratio refers to the ratio of the number of seated passengers to the total number of passengers in the vehicle. A minimum comfort rate of the bus shall be 35%.			
5.1.2.3	The bus shall be low-floor and/or low-entry.			
5.1.2.4	The bus shall be air-conditioned.			
5.1.2.5	Cutting and piercing materials harmful to human health shall not be used on surfaces that people may come into contact.			
5.1.2.6	The parts and equipment on each delivered bus shall be identical in terms of size, brand, model, and catalogue numbers.			
5.1.2.7	The electric buses should have an electronic display system which at least shows the bus driver the status of: • Mileage and energy consumption of electric buses, battery capacity, charging time, charging			

	status of batteries, heat and fault information, warning and warning systems data of electric motors, efficiency information, battery charging times of chargers, warning, and warning systems.			
5.1.2.8	Compliance with standards and documents: According to the standardization documents in force, the bus must be manufactured according to the national and international regulations on the technical conditions that electrically operated vehicles containing the battery group of road vehicles must meet. The latest updated version of the following standards shall be used: • ECE R51.02 - Approval of Noise Emission in Motor Vehicles; • 70/221/EEC (Annex II) - Rear Protection Equipment; • 1003/2010/EEC - Rear Registration Plate Location; • ECE R79.01 - Steering System; • ECE R28 - Audible Warning Devices {HORN); • ECE R13, R90 - Braking Devices; • ECE R39 - Speedometer Equipment; • 1005/2010/EC - Towing Devices; • ECE R46.03 - Indirect Vision Devices; • 19/20,11/EC - Mandatory Identification Signs and Labels; • ECE R48.05 - Placement of Lighting and Light Signal Devices;			

	• ECE R121 - Definition of Command, Warning, and Indicators; • ECE R43.01 - Safety Glasses and Materials; • ECE R54, R117 - Tires; • ECE Rl22 - Heating Systems; • 95/28/EC, ECE R118 – Fire Resistance; • ECE R10.03 - Electromagnetic Compatibility (Radio Interference); • ECE R107.07 - Motor Vehicles {Provisions Relating to the Approval of Vehicles of Category M2 or M3 in terms of their General Structure); • ECE-R14, R16 – Seat Belt (for only driver seat and wheelchair safety belts) • ECE R100 - Special Requirements Relating to the Structure, Functional Safety and Hydrogen Emission of Battery-Powered Vehicles; • DIN 40050-9: Road Vehicles shall be covered by IP protection; • ECE 1 0/2012 - Vehicle access and maneuverability.			
5.1.3.	**Electric motor**			
5.1.3.1	The electric motor in the bus must have a central system or hub, with a total power of at least 200 kW.			
5.1.3.2	The start of the vehicle shall be by pushbutton or ignition key.			
5.1.3.3	The motor shall be controlled by electronic unit that evaluates information such as demands from the driver, battery, road-load status, other and produces the most appropriate results.			

5.1.3.4	Even while using the highest power and torque, there shall be no problems due to overheating of the motor. The bus shall have a cooling system to prevent heating problems.			
5.1.3.5	The control the motor temperature shall be done by sensors. In an event of overheating of the motor and simultaneous failure of the cooling system, the bus engine shall be protected. In an event of a temperature increase, the motor protection system shall be activated and transmitted to drive diagnostic screen as fault information.			
5.1.3.6	The motor shall be capable of charging during movement, where conditions are appropriate. There shall be no separate motor for charging. It shall have electrodynamic braking feature.			
5.1.3.7	When the bus is loaded at the highest level of carrying capacity, it shall be able to accelerate continuously until at least 70 km/h on the straight road and it shall continue the same speed until the charge rate is reduced to %30. Acceleration of the bus shall be limited to prevent sudden acceleration and unnecessary battery drain. Battery range shall be increased by reducing heating and cooling performance and acceleration, and by reducing consumption when the battery is at a critical level.			
5.1.4	**Batteries**			
5.1.4.1	Range:			

	• Minimum 350 km per full charge tested under SORT 2 test conditions while HVAC is turned off. • Minimum 200 km per full charge tested under SORT 2 test conditions while HVAC is turned on.			
5.1.4.2	The battery shall be Li-ion LFP or LTO.			
5.1.4.3	The charge rate of batteries shall never drop to 0%.			
5.1.4.4	The loss in battery performance shall not be more than 3% per year.			
5.1.4.5	Battery replacements shall be easy, simple, and safe.			
5.1.4.6.	There shall be a test report that the batteries and/or electric buses have successfully passed the safety tests required by ECE-R100 or international equivalent standards obtained from independent test organizations. The contractor shall demonstrate that it fulfils the requirements of the latest version of the relevant safety and test standard, and shall submit this test reports with technical offer.			
5.1.4.7	There will be two charging input sockets on the right and left side in the same line of the vehicle.			
5.1.4.8	Battery management shall be provided by electronic control module. This control module shall perform the following operations: • Monitoring the battery charge rate and notification of critical levels, • Monitoring of battery temperature and notification of critical levels, • Charge current and fill rate monitoring, • Monitoring of instantaneous voltage values during Charge / Discharge,			

	• The battery should be installed with a cooling system or software to limit the overheating of the batteries and not to cause any danger. • Detection and notification of malfunctions, Creation and recording of statistical information (energy consumption per km, total number of charges/discharges of the battery, average full charge time, historical charging time and quantities, etc.).			
5.1.5	**Lamps for interior lighting**			
5.1.5.1	Concourse: From front to rear, the ceiling, preferably in the form of two rows, it shall be illuminated by lamps with transparent housing.			
5.1.5.2	The energy of the interior light switches shall come directly from the battery.			
5.1.5.3	All interior lighting shall preferably be arranged on at least two lines.			
5.1.5.4	With all the lamps on, the lighting intensity on each passenger seat seating surface shall be at least "100 Lux".			
5.1.5.5	The door-top lighting lamps shall light up as long as the doors remain open.			
5.1.5.6	The interior lighting shall not make reflections that prevent the driver from seeing outside.			
5.1.5.7	All lamps in the interior of the car (interior lighting, door top) shall be LED type (Color: Cool white).			
5.1.5.8	When the front door is opened by the driver, the illumination lamps of the front area shall come on, when the door is closed, it shall turn off.			

	However, the driver shall also be able to manually turn the front zone lighting on or off at any time.			
5.1.5.9	When the light switch is turned on while the car is parked, the interior lighting lamps shall turn off automatically after 10 minutes, and when the light switch is turned off and turned on again, a time setting shall be available that shall turn off again at the end of the set time.			
5.1.6	**Installations, diagnosis and information communication line**			
5.1.6.1	Electrical cable lines shall be passed through the channels, all channels shall be protected and insulated against the external environment.			
5.1.6.2	Connection sockets of the bus in areas exposed to external influences shall comply with the protection requirement of at least IP54 in the IEC 60529 standard.			
5.1.6.3	During the installation of electronic control units care shall be taken not to be directly exposed to high temperature and / or the thermal insulation of these equipment shall be made.			
5.1.6.4	If there is a liquid tank in the immediate area of the electronic control units and fuse panels, necessary protection and isolation measures shall be taken.			
5.1.6.5	The track lights to be located on the sides of the bus shall be LED type. All electronic and electrical system of the bus; shall have the approval of the latest level of the 72/245/EC directive or the ECE-R10 electromagnetic compatibility regulation of the United Nations Economic Commission for Europe against the			

	electromagnetic effects generated by itself and to which it shall be exposed externally.			
5.1.6.6	The bus shall be equipped with all kinds of warnings, signs, and lighting equipment in accordance with traffic safety and order.			
5.1.6.7	There shall be an audible warning system (intermittent and at least 65 Db) which shall be activated at the time of the reversing process. This warning shall continue during the entire rollback process.			
5.1.6.8	On-board fault detection system/systems shall read the data in all control units on the bus.			
5.1.6.9	The electronic control units shall be independent of the chassis number and recognizable by the bus system after installation (without the need for any other application).			
5.1.6.10	If the fuses of the sections that do not have a direct effect on the movement of the bus (air conditioning, headlight, lighting, windshield wiper arm, etc.) are blown, the bus shall be movable and give a warning.			
5.1.6.11	The sockets and terminal blocks used in the installation connections shall be the clawed type that does not dislodge because of vibration.			
5.1.6.12	The communication of the systems and control units on the bus shall preferably take place via the Can-Bus system. Within the remote monitoring and reporting systems, it shall be ensured that the Can-Bus system is compatible with Remote Monitoring System to be established by GMM.			
5.1.6.13	At different points of the bus passenger area (front-middle-rear in total, min. 4 in total), there shall be			

	charging tips with USB output where passengers can charge their mobile phones and tablets. The positions of these charging tips shall be determined with the approval of GMM.			
5.1.6.14	The contractor shall provide the support in case of installation of a Wi-Fi modem (the modem shall be provided by GMM) to be installed in the bus for in-vehicle wireless internet service.			
5.1.6.15	When planning the installation locations of electronic control units; a design that shall keep the installation length / quantity to a minimum shall be taken into consideration.			
5.1.6.16	To eliminate installation failures, a layout design shall be made in a way that large disassembly operations related to body and bus equipment are not required.			
5.1.6.17	All control and insurance panels that require driver intervention shall be above road ground level in the bus interior area and / or outside the bus, easy to open, with a cover and a uniform key.			
5.1.6.18	In the event of a possible fire or short circuit, precautions shall be taken to prevent damage to the entire electrical system of the bus.			
5.1.6.19	All electrical cables shall have numbers for that line.			
5.1.7	**Other**			
5.1.7.1	The bus shall be equipped with an electrically operated horn and in a way that it can be easily removed and installed.			
5.1.7.2	In the bus: There shall be a "Fire Detection and Warning System" that detects "excessive heat/flame" in the motor and battery areas.			

	This system shall comply with the Regulation of Manufacturing, Modification and Assembly of Vehicles (Araçların İmal, Tadil ve Montajı Hakkında Yönetmelik) published in the Official Gazette No. 29869 of the Ministry of Industry and Technology (formerly known as the Ministry of Science, Industry and Technology) dated 26 October 2016.			
5.1.8	**Indicator display and troubleshooting system**			
5.1.8.1	All electronic control units shall be connected to each other via an information network (Can-Bus) and "on-board computer", thus creating a comprehensive error detection.			
5.1.8.2	Detected faults shall be transmitted to the driver via the LCD screen on the front display.			
5.1.8.3	Through the "On-board Diagnostics" on the screen, it shall be possible to access the current faults of the control unit, as well as any previously recorded faults (active or passive). Additionally, the ability to delete fault records will be available to the GMM.			
5.1.8.4	Using the screen, the measurement values, fault codes, and other information recorded on the bus shall be available and displayed.			
5.1.8.5	All fault warnings on the driver display shall be in Turkish characters and/or in the form of an easy-to-understand "symbol".			
5.1.9	**Information system line dashboard**			
5.1.9.1	There shall be 3 electronic line indicator boards (2 rows of writing) in the front-upper, rear-upper part and side of the bus.			

5.1.9.2	Line display dimensions and pixel pitches shall be as follows: • Front panel minimum;14 – 16 x 110 - 128-pixel pitch 10 – 12 mm; • Side panel minimum; 14 – 16 x 110 - 128-pixel pitch 10 -12 mm; • Back panel minimum; 16x32 pixel pitch 10mm.			
5.1.9.3	The system shall have a control unit to send information to the line indicators and upload the prepared panel files. The indicators shall work depending on the controller.			
5.1.9.4	The light intensity of the line indicators shall be at least 5,000 cd/m2.			
5.1.9.5	The exterior color of the line indicators and the background color of the viewport shall be black.			
5.1.9.6	SMD LEDs of 590 ±10 nm, high light intensity and 120o (degrees) reading angle shall be used in line indicators. The life span of LEDs used in LED screens shall be at least 100,000 hours.			
5.1.9.7	An anti-glare system shall be used in line indicators. The stop codes and names of the line indicators in all three directions (front, side, and rear) shall be easily read day and night.			
5.1.9.8	The LEDs on the line indicators shall be operated using the scanning method.			
5.1.9.9	Line indicators should consist of modules and these modules should be connected to each other using lock-type connectors.			

	In the modules, at least double-layer PCB structure should be used to prevent performance loss of the electronic unit in case of overheating and overcooling.			
5.1.9.10	Each receiving card must have an LED on it indicating that communication is taking place.			
5.1.9.11	The separators used in the line indicator should be easy to remove and install on the PCB boards.			
5.1.9.12	Indicators should not be affected by vibration. Indicators should work in the temperature range of at least -30 ºC ~ +70 ºC.			
5.1.9.13	On the front sign, the "start and arrival" stop names and line number of the line shall be written, on the side sign the line number and the names of the stops on the route shall be written, and on the sign on the rear façade there shall be only the line number.			
5.1.9.14	Line signs shall be in a contained section which is easy to assemble/disassemble and protected from moisture, water, and dust.			
5.1.9.15	The line dashboard shall be programmable in a way that it can display line information sequentially in a cyclical manner or in the form of flowing text.			
5.1.9.16	Line dashboards shall be operated from the "control panel" mounted at a convenient point in the driver's seat.			
5.1.9.17	There shall be an LED system in to read the line names and line numbers on the electronic panels in the sunlight during the day and in the dark at night. LEDs shall pop up at least 120 degrees reading and SMD LED. There shall be a color (RGB) panel and if needed, special messages (holiday greetings or			

	congratulatory messages) can be written on the front panel. Line colors shall be notified by GMM. Light Dependent Resistor (LDR) must be available for automatic adjustment of light intensity during day and night.			
5.1.9.18	Uploading line information shall be done quickly via wireless (via WIFI or GPRS) and/or wired transmission (RS485). It shall also be available in a manual method, with which it shall be possible to transfer easily and quickly from the control panel via USB with all the line information. The compiler program shall be handed over to GMM so that the line codes can be updated.			
5.1.10	**"DUR'' warning system**			
5.1.10.1	In the "Front-Roof" zone (next to the driver's cabin, above the aisle), there shall be a passenger notification panel with the inscription "DURACAK" on it, which shall light up when the stop button at any point is pressed and at a point and dimensions (preferably 45x10cm) that are easily visible to all passengers.			
5.1.10.2	The design of the stop buttons to be installed at different points of the bus shall be to "minimize accidentally pressing, thereby improving the quality of driving and transportation".			
5.1.10.3	On the handpoles in the aisle, on the side walls of the facing seats, on the disabled passenger seating area, etc. The height of the stand buttons to be installed at the points from the ground shall not exceed 1.2 m.			
5.1.10.4	The buttons for disabled passengers inside and outside the vehicle shall be at appropriate heights and the driver shall be able to see the use of these buttons			

	separately on the dashboard with an illuminated warning.			
5.1.10.5	"DUR" shall be written at an appropriate point on all stop buttons inside and outside the bus.			
5.1.10.6	When the stop buttons are pressed, each button shall provide an audible and light warning on the dashboard for the door closest to it. The audible warning shall not be in the form of a continuous sound, but shall be in the form of a momentary sound to inform that the button has been pressed, and the illuminated warning shall continue until the door is opened.			
5.1.10.7	The colours of the Stop buttons shall contrast with those of the bus interior for clarity.			
5.1.11	**Passenger pricing system**			
5.1.11.1	The validator (item 4.2), the Obu and the necessary equipment shall be provided by GMM.			
5.1.11.2	Preparation of the validator's installation site (feeding line and installation floor) shall be carried out by the contractor before delivery.			
5.1.11.3	Preparations to facilitate the installation of the data transfer antenna shall be made by the contractor prior to delivery (preparations include drilling operations and installation shots that need to be done to connect the antenna).			
5.1.11.4	The device (loudspeaker, amplifier, and installation) to ensure the audible transmission of information from the validator to the passengers shall be installed and operational by the contractor prior to delivery. There must be at least 1 x 5-ohm speaker that can give sound to outside of the bus. An entrance can also be made to the existing amplifier system on the bus.			

5.1.11.5	The installation site of the validator and its attachments shall not obstruct the view on the right side of the driver and shall be at a distance accessible to the driver.			
5.1.11.6	The validator shall be positioned in a way as to be suitable for the ergonomic use of the passengers entering and to allow the control / follow-up of the ticket used by the driver. It shall also not obstruct the driver's line of sight.			
5.1.12	**Passenger information screen**			
5.1.12.1	Behind the driver's cabin there shall be a minimum 21" LCD flicker-free screen mounted at a height visible to all passengers.			
5.1.12.2	The screen shall be connected to the validator system and the information from it shall be visually announced to the passengers.			
5.1.12.3	Display mounting shall be carried out considering the vibration values inside the bus.			
5.1.12.4	The LCD screen shall be at least 1440x900 Full HD resolution and the screen ratio shall be 16:10.			
5.1.12.5	The brightness level of the screen shall be at least 250 cd/m2.			
5.1.12.6	The screen response time shall be max. 5 ms.			
5.1.12.7	The monitor shall not be thicker than 50 mm.			
5.1.12.8	The display case shall be made of compact oven-painted metal.			
5.1.12.9	The internal ventilation of the screen shall be such that no additional ventilation is required.			
5.1.12.10	The LCD Screen shall have AV, VGA and HDMI input.			

5.1.12.11	There shall be a single power cable on the outside of the screen.			
5.1.12.12	After the power goes out and arrives, the screens shall start automatically.			
5.1.12.13	In-vehicle passenger information screens shall be fan-less and operate 24/7.			
5.1.13	**Vehicle tracking interface**			
5.1.13.1	All data to be read directly from the BMS (Battery Management System) on the bus or indirectly with the ECU and diagnostic data such as the location, speed, and fault information of the systems other than the battery from the ECU shall be available to be transferred to the contractor's IP energy monitoring system via GSM every maximum of 3 seconds. MQTT protocol in case of direct transmission: in case of integration of data from another platform into the contractor's energy monitoring system, REST services shall be used.			
5.1.13.2	Inquiries based on license plate, date, fault type, etc. shall be available, reports can be obtained and statistical information can be accessed			
5.1.13.3	The interface shall be accessed by authorized persons designated by GMM via password.			
5.1.13.4	The contractor is responsible for the location of the vehicle, the compilation of the Can-Bus information requested by GMM (speed, temperature, charge, fault code, statistical information, etc.) and making it ready for transmission (interface and software).			
5.1.13.5	The data collected from the location and on-board systems (Can-Bus, line indicator, battery, engine, brake, etc.) shall be collected on the on-board			

	computer and transferred to the Vehicle Tracking Database via GPRS.			
5.1.13.6	The Vehicle Tracking Database shall be located on GMM servers.			
5.1.14	**CCTV system**			
5.1.14.1	CCTV system shall minimally include: The number of cameras will be 8 and their locations will be determined by the administration on the vehicle. The CCTV screen will be able to show 8 cameras at the same time. There will be a 10-inch driver monitoring screen that will show the rear view when the reverse gear is engaged and the necessary hardware/software for the CCTV system. The 10 inch CCTV screen will not be affected by vibrations and the protector holding the screen will be solid.			
5.1.14.2	The camera recording system shall connect to the internet via Wi-Fi and the 3G and/or 4.5G networks within the vehicle, allowing for real-time viewing of the images and the ability to download them instantly. The contractor will provide remote monitoring web interface programs, necessary software, and user accounts. The camera specifications will be as follows: • It should have a minimum resolution of 2 MP; • It should have passenger counting capability; • It should have motion detection functionality; • The cameras in the vehicle should be viewable remotely in real-time;			

	• It should be capable of recording in H264 and H265 formats; • It should support IP4 (Internet Protocol 4); • It should have an IP56 protection rating; • Meeting European Union security standards; • It should comply with the EN50130-4 standard for immunity to environmental electromagnetic interference; • It should comply with the Electromagnetic Pollution Standard Caused by Electronic Equipment EN55032 and FCC Part 15 standards.			
5.1.14.3	All equipment in the camera recording system (recorder, cameras, connection connectors, connection cables and POE router switches, etc.) shall comply with EN 50155 standard and shall be in a structure that shall not be affected by vibration, sudden voltage fluctuations and impacts specified in the standard content. The camera recording system will have the following features: • The recording device will be an NVR (Network Video Recorder); • It will have a minimum of 8 channels; • The recommended cameras, recording devices, and software in the system will be compatible with the ONVIF platform; • The hard drives used in the recording unit will be 2x6 TB 3.5-inch drives designed for 24/7 continuous operation, and this information can be verified from the manufacturer's official website; • It will have Ethernet input, HDMI port, 2 USB 3.0 ports, and a VGA output.			

5.1.14.4	The camera recording system recorder shall be capable of recording the images and sounds of the digital (IP) cameras to be located on the vehicle (digital camera and sound recording).			
5.1.14.5	Camera recordings shall be connected to USB/Ethernet ports with the help of the laptop computer and recordings shall be transferred to the laptop computer.			
5.1.14.6	There shall be no limitation on the licensing of the surveillance software and cameras.in the system. GMM shall not have any restrictions in creating and modifying camera and recorder configuration. If there is licensing of the surveillance software; this license restriction shall not depend on the camera IP or MAC address.			
5.1.14.7	The camera recorder and all system equipment must be compatible with mobile applications (usable in moving environments, vehicles).			
5.1.14.8	The connection of the digital (IP) cameras to the system to the camera recorder shall preferably be made with the POE switch and the power supply of the digital cameras shall be made through the switch.			
5.1.14.9	The products in the system shall not be from the products that have been discontinued (End of Life).			
5.1.15	**Heating, ventilation and Air conditioning**			
5.1.15.1	The cooling/heating of the passenger and driver areas shall only be done by the air conditioning system. Detailed information about the placement of the system on the vehicle and its technical features (cooling capacity, compressor power, amount of gas, type of gas, flow rate of cold and hot air that can be			

	given to the indoor environment) during the manufacture of the vehicle shall be provided.			
5.1.15.2	The ventilation system of the bus (taking the fresh air from outside into the vehicle) shall be controlled from the air conditioning control panel. An amount of fresh air that the system takes in can be adjusted gradually or it shall be in the form of on/off. The system shall also be able to cool with fresh air.			
5.1.15.3	The air conditioner should be adjustable between 18-28 °C. Climate control can be disabled with a fault detection device and the air conditioner can be set to the desired temperature.			
5.1.15.4	Air conditioner cooling capacity shall be at least 55 kW.			
5.1.15.5	The vehicle shall have a heat pump that can operate between -20˚C and +45˚C: The heat pump shall heat with thermal cycle up to -20 ˚C. At 0 ˚C outdoor temperature, the Co-efficient of Performance (CoP) value of the heat pump shall not fall below 2.20. At -15 ˚C outdoor temperature, the CoP value of the heat pump shall not fall below 1.50. When the heat pump is operating in heating mode, min. at -7 ˚C outdoor temperature, it shall be able to provide 20 kW heating capacity. The air ducts for the cabin in the vehicle shall blow both the cabin and the glass throughout the vehicle.			
5.1.15.6	The air conditioning compressor shall be driven by a separate electric motor. The heating-cooling system can be activated and deactivated under all conditions			

	(when the vehicle is going uphill, at a standstill, at maximum speed, etc.).			
5.1.15.7	The use of air conditioning shall not affect the number of passengers carried and the maximum bus speed.			
5.1.15.8	The system shall automatically adjust the ambient temperature according to the temperature value set by the driver. The setting temperature of the air conditioner shall be digitally monitored by the driver from the control panel via a digital display.			
5.1.15.9	When the air conditioner malfunctions, the malfunction warning lamp/warning shall come on the instrument panel.			
5.1.15.10	After the outlet of the evaporator fans of the air conditioner, cold/hot air shall be transmitted to the blowing vents by passing through the ventilation duct. Air transmission shall not be made by releasing cold/hot air freely into the cable trays on the right and left of the vehicle. Air ducts shall be covered with insulation material against heat transfer.			
5.1.15.11	While there are passengers in the vehicle with all seats occupied and 2 people per m2, the fresh air supplied to the interior per hour per passenger shall not be less than 12 m3.			
5.1.15.12	The direction of the airflow in the driver's cabin should be adjusted without creating a disturbing airflow.			
5.1.15.13	Temperature difference of more than 5°C shall not occur between the temperatures of the driver's feet, knees, hands, shoulders, and head.			

5.1.15.14	Vehicle heating or cooling shall be carried out without using any external fuel other than electricity.			
5.1.15.15	The elements of the air conditioning system shall be protected from outdoor conditions (rain, mud, dust, etc.) and shall not deteriorate due to outdoor conditions. During the exterior cleaning of the bus, it shall be water resistant and protected. All equipment and parts that may be affected by water, electronic or non-electronic, such as control units inside the vehicle, should be in areas that shall not be in contact with dust and water, or should be placed in closed compartments.			
5.1.15.16	All fan motors on the system shall preferably be of brushless type for quiet operation and ease of repair and maintenance.			
5.1.15.17	There shall be suction filters in the system. Suction filters shall be washable.			
5.1.15.18	The floor of the vehicle must be designed in accordance with thermal insulation compliant with TSE.			
5.1.15.19	The glasses of the vehicle shall be capable of refracting the sunlight (reducing its effect), having low heat permeability, and providing heat insulation. This feature on the glasses shall not reduce the amount of light entering the vehicle below the legal amount.			
5.1.15.20	There shall be separate grilles to heat and cool the driver's cabin, and the flow rate of the grilles shall be adjustable.			
5.1.16	**Steering system**			

5.1.16.1	The vehicle shall have an electric or electro-hydraulic steering system, and it shall work as speed sensitive.			
5.1.16.2	The steering wheel shall be located on the left side of the vehicle, according to the direction of the vehicle going forward.			
5.1.16.3	The position of the steering wheel can be adjusted in the up-down and forward-backward directions.			
5.1.16.4	The turning circle diameter of the vehicle shall not exceed 25 meters.			
5.1.16.5	Steering system shall comply with ECE-R79 technical regulation.			
5.1.17	**Brake system**			
5.1.17.1	The brake system shall have all equipment (valve arrangements, expansion vessels, compressed air tanks, air cooling devices, moisture dryers, etc.) that ensure safe operation. A regenerative brake is required.			
5.1.17.2	In the vehicle; There shall be dual-circuit, self-adjusting, air-cooled disc brakes at the front and rear.			
5.1.17.3	There shall be operating brake (foot brake), hand brake and EBS, ABS, ASR (or equivalent) braking system.			
5.1.17.4	The operating brake shall control all the wheels at once.			
5.1.17.5	In the double-circuit braking system; A failure in one brake arrangement shall not affect the other brake arrangements.			

5.1.17.6	Brakes; During use, it shall not produce disturbing noises (70 dB) for passengers and the environment.			
5.1.17.7	Brake pads which pass the 71/320/AT "Brake Type Approval Tests" and which are approved for mass production shall be used for each vehicle type produced by vehicle manufacturers. A certificate of conformity with the standard shall be given upon delivery of the vehicle.			
5.1.17.8	Brake system shall meet the provisions of ECE-R13.			
5.1.17.9	The pad monitoring system shall show the pad wear rate or give a warning in case of low pad level, which can be displayed on the driver's instrument panel. When the wear on the pads reaches a critical level, a continuous warning shall appear on the instrument panel.			
5.1.17.10	When the vehicle needs to be towed with the engine not running, there shall be a spare air reservoir that shall open the brakes or a mechanism that shall perform operation.			
5.1.18	**Compressed air equipment**			
5.1.18.1	In vehicles; There shall be an air equipment that supplies the compressed air from the compressor that feeds the brake, door and similar systems that need to work with air.			
5.1.18.2	Air compressors shall be installed in all vehicles as a single type and of the same brand, capable of producing enough air for the system.			
5.1.18.3	The air compressor should be in an easily accessible place and should be connected to the piping with a flexible connector (pressure resistant spiral hose, etc.) so that vibrations are not transmitted to the pipework.			

5.1.18.4	All pipe installations through which compressed air passes shall be separated by holders so that they do not rub against each other and shall be fixed with rubber bearing clamps.			
5.1.18.5	Compressor, expansion tube, valves and filters in the air equipment installation shall be fixed in a way that they are not exposed to vibration.			
5.1.18.6	When the compressed air tanks of the suspension and brake system are empty, the time to reach the required operating pressure shall be at most 5 minutes at idle speed. When the engine is not running, the pressure of the filled tanks shall not fall below the safety limits before at least 8 brake strokes.			
5.1.18.7	There shall be a water separator discharge valve system that automatically separates the condensed water, moisture and oil coming/escaping from the compressor and an air dryer with replaceable filter elements in the compressed air. The air dryer filter shall have the feature of separating water and oil, and the water and oil shall be evacuated before they reach the compressed air system.			
5.1.18.8	All kinds of components and parts working with compressed air in the compressed air equipment and brake system shall be the same brand and type in all vehicles.			
5.1.18.9	To prevent malfunctions that may occur during the operation of the air compressor installation under overload, there shall be a safety valve in the system that shall provide air evacuation.			
5.1.18.10	Main valves such as the multi-way valve that regulates the pressure of the air coming from the compressor and distributes it to the valve and air			

	tanks shall be in an easily accessible section as a group.			
5.1.18.11	Compressor sound level shall be at a level that does not disturb the driver and passengers.			
5.1.19	**Suspension system**			
5.1.19.1	The suspension system shall be air cushioned and reinforced with shock absorbers.			
5.1.19.2	The system shall be capable of providing the sufficient strength and suspension at full load and in all road conditions for Gaziantep. It is essential to provide constant height for all loads.			
5.1.19.3	Shock Absorbers shall not have difficulty in absorbing loads and it shall be of the type used under heavy service conditions.			
5.1.19.4	The front axles shall be of independent suspension type or rigid type, appropriately selected in terms of passenger comfort and driving safety. The contractor shall comply with the legal regulations in force in Türkiye regarding the maximum load on the axles			
5.1.19.5	The vehicle shall have suspension bellows and shock absorber reinforced suspension system. There shall be at least 2 springs at the front, 2 shock absorbers, at least 4 springs in the middle, 4 shock absorbers, at least 4 springs at the rear, and 4 shock absorbers. There shall also be an "Electronic Controlled Active Suspension System", Kneeling and Lowering-Raising system.			
5.1.19.6	Vehicles shall automatically return to the standard cruise position when the vehicle floor level changes			

	to be made by the driver, considering the road roughness or when the relevant conditions disappear.			
5.1.19.7	Suspension deterioration should be reported on the driver's panel.			
5.1.19.8	Suspension system elements shall operate at least (-30° C +45° C). It shall also be resistant to mineral oils.			
5.1.19.9	Measures shall be taken to prevent the airbags in the suspension system from coming off even under the most difficult conditions			
5.1.20	**Tires and rims**			
5.1.20.1	Road type patterned tires shall be used on the front axle. Preferably traction type patterned tires or road type patterned tires shall be used on the rear axle.			
5.1.20.2	Tires shall be suitable for use on city buses.			
5.1.20.3	Tires shall be silica-added, steel-wire, tubeless type and suitable for coating.			
5.1.20.4	Wheels shall be flat type one piece.			
5.1.20.5	The date of manufacture of tires shall not exceed six (6) months on the delivery date of the vehicle.			
5.1.20.6	With the "Tire Pressure Monitoring System", the tire pressures of the vehicle shall be constantly monitored. System; If the pressure is below the minimum, it shall give a warning (with light and sound) to the driver.			
5.1.20.7	"Tire pressure query" shall be made by the driver manually via the front display.			
5.1.20.8	Tires must meet the provisions of technical regulations ECE-R54 and ECE-R117.			

5.1.20.9	It shall be an independent suspension or rigid type, with shafts mounted on maintenance-free bearings and equipped with ABS.			
5.1.20.10	An automatic chassis lubrication system shall be placed on the axle or the buses shall have axles that do not require a chassis lubrication system.			
5.1.21	**Bumper**			
5.1.21.1	The bumper of the vehicle shall protect the chassis of the vehicle against impacts from the front and rear and shall be in an elastic structure resistant to impacts. It shall be attached to the vehicle chassis. Bumpers may consist of more than one piece.			
5.1.21.2	When necessary, there shall be tow bars with chassis connection at the front and/or rear in accordance with the 77/389/EEC regulation for towing the vehicle. A suitable place in the front and/or rear bumpers shall be designed in accordance with the drawbars.			
5.1.22	**Vehicle dimensions**			
5.1.22.1	Dimensions (interior height, seat sizes, and other) shall be in accordance with Turkish Traffic Law and Regulations and Assembly Regulations (2001/85 AT)			
5.1.22.2	The length of the bus shall be 18,000 mm ± 5%.			
5.1.22.3	The width of the bus shall not exceed 2,550 mm.			
5.1.22.4	The height of the bus shall not exceed 3,700 mm.			
5.1.22.5	Low floor - Passenger entrance height of the bus shall not exceed 340 mm.			
5.1.22.6	The bus should comply with the regulation ECE-R 107.08.			

5.1.23	**Chassis**			
5.1.23.1	The chassis shall be manufactured from a material suitable for bus production, resistant to abrasion, cracking and breaking, warping, bending, and buckling, used in the vehicle industry.			
5.1.23.2	An application shall be made to the entire chassis in a way that provides resistance against corrosion.			
5.1.23.3	There shall be tow bar mounting points resistant to pulling the vehicle in front and/or rear of the chassis. The vehicle shall be delivered with the tow bar mounting points assembled.			
5.1.23.4	There shall be support profiles suitable for jacking the vehicle at suitable points of the chassis. Appropriate markings shall be found at these points.			
5.1.23.5	The chassis shall be manufactured from a material suitable for bus production, resistant to abrasion, cracking and breaking, warping, bending, and buckling, used in the vehicle industry. An application shall be made to the entire chassis (in case it is not stainless) that shall provide resistance against corrosion.			
5.1.23.6	The profiles used shall be of at least ST 44 quality, or at least 14.003 quality			
5.1.23.7	The contractor shall control all welding and soldering.			
5.1.23.8	While the body frame is being manufactured, it shall be ensured that assembly and manufacturing errors do not exceed tolerance values by using modern measurement systems.			
5.1.24	**Bodywork**			

5.1.24.1	Side and top panels shall be made of aluminum or composite material resistant to fire, corrosion, and impact.			
5.1.24.2	In case of composite material, the structure (compounds) of the material shall be notified to GMM as a technical document. There shall be no legal obstacle for GMM to produce/produce the composite material for repairing buses in the future, and the contractor shall guarantee that the contractor or 3rd person/institution under any name (patent, etc.) shall not demand extra fees from GMM.			
5.1.24.3	Measures (coating, painting, other) shall be taken against rust and corrosion on all profiles and other surfaces used.			
5.1.24.4	All side and ceiling spaces of the bodywork and vehicle floor shall be covered with insulation materials that do not harm human health against sound and heat permeability, in accordance with international norms.			
5.1.24.5	Parts of the bus that carry a fire risk shall be fire resistant and compliant with ECE R118.			
5.1.24.6	All exterior doors opened in the vertical direction shall preferably be equipped with at least two shock absorbers to reduce the weight of the door, the opening speed and prevent the self-closing of the door, or all exterior doors opened from the vertical direction shall have a mechanism to be fixed with a spindle after opening.			
5.1.24.7	All interior and exterior covers on the vehicle shall be of screwed/locked safety type.			

5.1.24.8	All covers on the floor to reach the parts of the vehicle that shall require intervention in maintenance and repair shall be secured with a screw/lock mechanism. Covers shall be liquid tight.			
5.1.24.9	Pipes used for passenger handrails shall have a grip-enhancing outer surface.			
5.1.24.10	Pipes and other elements used for passenger handrails shall be made of stainless material or covered with a suitable material that does not corrode, spill, crack, color or paint.			
5.1.24.11	The handles to be mounted on the horizontal pipes shall be made of hard plastic and shall have a long life.			
5.1.24.12	The number of these handles shall be determined by the maximum number of passengers.			
5.1.24.13	Recessed screws shall be used in the fixing points of the grips and uprights.			
5.1.24.14	Fenders shall be made of galvanized sheet enough to be withstand impacts such as tire bursts or shall be made of metal that is resistant to abrasion, impact, and corrosion. During the first take-off of the vehicle, a mudguard or similar part should be placed on the fender skirts to prevent the tires from throwing stones. type of shield shall be fitted.			
5.1.24.15	Measures (ventilation shutter, forced ventilation, other) shall be taken for the air circulation of the batteries, engine, and other heated equipment.			
5.1.24.16	There shall be 1 wheelchair area with access from the middle section and conveniently located for easy exit. In this area, there shall be equipment including			

	handle, seat belt, "touch" stop button. A similar area should be reserved for prams.			
5.1.24.17	In the special areas reserved for disabled passengers, there shall be an "information sign", the content of which shall be determined by GMM.			
5.1.25	**Roof body**			
5.1.25.1	The top of the roof shall be made of corrosion-resistant material designed not to keep rainwater.			
5.1.25.2	The inside surface of the ceiling shall be of light colored material that does not crack from heat/cold. The inner surface shall be covered with an easily dirt-proof, easy-to-clean material.			
5.1.25.3	The joints on the inner surface shall be covered with a suitable lath or other aesthetic method in a way that they are inconspicuous.			
5.1.25.4	Polyurethane or equivalent insulation material that does not harm human health shall be used in accordance with international norms to provide thermal insulation between the inner and outer surfaces of the ceiling,			
5.1.25.5	Roof-mounted equipment enclosures should be designed with construction and insulation to prevent damage to ceiling equipment in climatic conditions.			
5.1.26	**Doors**			
5.1.26.1	The bus shall have 4 double body doors in the form of 2-2-2-2.			
5.1.26.2	The bus doors shall be in accordance with (2001/85 AT), free passenger passage width shall be minimum 1200 mm for double wing doors.			
5.1.26.3	At the middle door, an electrically insulated ramp should be installed, complying with Directive			

	2001/85/EC or in Rule 107 of the UNECE which allows getting of wheelchairs for people with disabilities and baby carriages on with a minimum load capacity of 300 kg.			
5.1.26.4	The front service door of the bus shall be equipped with light and sound signaling system, with different signals when opening and closing for the convenience of passengers with disabilities.			
5.1.26.5	Doors shall be electrically operated.			
5.1.26.6	Each passenger door shall be the right and left 90° inward swing opening.			
5.1.26.7	The joining edges of the doors shall be surrounded by rubber or equivalent material. If the passenger's hand or arm is caught between the two door wings, there shall be a gap where the passenger shall not be harmed thanks to the elastic structure of the rubber material. When there is a possibility of jamming (when the door is forced), there shall be a system that shall stop the "closing" movement and allows the "opening" movement.			
5.1.26.8	The door security system shall also be supported by sensors. If the sensors detect an obstacle between the door wings, they shall not close the doors. In this case, a warning shall appear on the driver information display.			
5.1.26.9	There shall be an audible and visual warning on the instrument panel indicating that the doors are open. Light warning shall be separately for each door.			
5.1.26.10	If any of the bus doors are open, the vehicle shall not move. While the bus is in motion, the doors shall not open even if the driver presses the door open button.			

	With all doors closed, the vehicle shall not move unless the accelerator pedal is pressed by the driver, even if all conditions favor the vehicle's mobility.			
5.1.26.11	In case of door failure, in conditions where the door is not closed and therefore the vehicle cannot move, if the driver deems necessary, he shall be able to make the vehicle move when the door is open, with a button or a mechanism. This button shall be protected by a seal or similar equivalent system, and the driver shall be able to use the button by breaking the seal when necessary.			
5.1.26.12	Each door shall give an independent warning and each door shall have a separate on-off button on the instrument panel.			
5.1.26.13	The doors shall have a mechanism that can be opened manually when necessary.			
5.1.26.14	The passenger entrance floor height of the bus shall be measured from the road plane and shown on the figure when the vehicle is empty.			
5.1.27	**Ramp for disabled**			
5.1.27.1	There shall be a ramp for disabled in the vehicle. The ramp for disabled shall carry a minimum load of 300 kg.			
5.1.27.2	The ramp shall be electronic or manual type on-off.			
5.1.27.3	It shall be available for pavements of different heights.			
5.1.27.4	When the ramp for disabled is open, the door shall not be closed and the bus shall not be able to move.			

5.1.27.5	The ramp for disabled and all other aspects in the bus shall be designed and manufactured in accordance with the ECE-R107 technical regulation.			
5.1.28	**Windows and glasses**			
5.1.28.1	All windows shall be protected against leakage.			
5.1.28.2	The windows shall be made of low thermal conductivity glass that shall reduce the impact of sunlight. The light transmittance shall comply with the applicable regulations in Türkiye and shall be at the legally permitted maximum tint level.			
5.1.28.3	Precautions have been taken regarding the color, shape, material, and other features of the front apron to mitigate sunlight reflections.			
5.1.28.4	The bus windows shall comply with the 92/22/AT regulation, have the ECE-R43 certification, and bear the "E" marking.			
5.1.28.5	The front windshield can consist of a maximum of 2 (two) parts. The rear window can consist of a maximum of 2 (two) parts. (The section where the route sign is located on the front, rear, or side can be a separate part.)			
5.1.28.6	There shall be a ventilation window on the driver's side, and the driver shall be able to manually open and close the window.			
5.1.28.7	The windows shall be designed in a way that does not obstruct the visibility of mirrors. Precautions shall be taken against fogging and similar conditions.			
5.1.28.8	The front windshield and front door should be equipped with hidden defrosting resistors to prevent			

	icing and fogging. It should effectively prevent fogging under all operating conditions.			
5.1.28.9	The bus shall have at least 4 opening windows for ventilation purposes.			
5.1.29	**Flooring, floor covering and insulation**			
5.1.29.1	The flooring material shall have sufficient strength to support the maximum passenger load.			
5.1.29.2	The floor covering shall be made of PVC material with a thickness of at least 2 mm.			
5.1.29.3	The hardness of the material shall be in the range of 75-90 shore A according to ISO 7619 standard.			
5.1.29.4	The side wall cavities of the body structure shall be filled with foam panels or equivalent materials that provide sound and thermal insulation properties. The ceiling voids shall be filled with special insulation or similar equivalent materials. The engine compartment shall be covered with a special filling material that is resistant to sound, heat, and fire (95/28/AT or ECE R118).			
5.1.29.5	The outer surface of the flooring, which is in contact with the lower part, shall be covered with an insulating material that protects against adverse effects of external weather conditions such as moisture, heat, impact, fire, and flames. Full insulation shall be provided against these effects, and it shall be compliant with ECE R118.			
5.1.29.6	The floor covering joints shall be securely attached to the floor and sealed with a waterproof material to prevent separation. Materials that comply with the fire class standards used in public transportation shall be utilized.			

5.1.29.7	The extension of the floor covering shall be upward to prevent water from affecting the side walls.			
5.1.29.8	The contractor is responsible for taking all necessary insulation measures to reduce engine noise and external noise effects.			
5.1.30	**Passenger seats**			
5.1.30.1	Passenger seats shall be made of a single-colored fiberglass or plastic material with anti-static treatment and durability features against graffiti and vandalism.			
5.1.30.2	The seating arrangement shall comply with the current European standards (ECE R107.05).			
5.1.30.3	The number of passenger seats shall be in accordance with the requested comfort ratio.			
5.1.30.4	The contractor shall obtain the approval of GMM regarding the seat colour and design before applying them.			
5.1.31	**Paint and exterior design**			
5.1.31.1	Buses shall be coated to prevent rust and corrosion.			
5.1.31.2	The paint used for both interior and exterior areas shall have high thermal resistance and be non-flammable.			
5.1.31.3	The contractor shall be responsible for creating a pattern for the electric bus, if deemed necessary by GMM, to make it distinguishable in urban areas. Once the pattern is determined and approved by GMM, it shall be applied to both the interior and exterior areas of the bus.			

5.1.31.4	The paint and designs shall have properties that shall not be damaged during the pre-departure cleaning of the bus, both internally and externally.			
5.1.32	**Internal equipment, safety exits and markings**			
5.1.32.1	In the driver's cabin, there shall be one approved medical first aid kit.			
5.1.32.2	Each vehicle shall have 2 pieces of triangle reflectors and warning flags.			
5.1.32.3	Each vehicle shall have 2-wheel wedges.			
5.1.32.4	There shall be a total of 2 fire extinguishers with CO2 propellant, suitable type, weighing 5 or 6 kg, located next to the driver's cabin and in a suitable location within the vehicle compartment.			
5.1.32.5	The vehicle shall have uniform interior and exterior door keys, and 3 keys shall be provided per vehicle.			
5.1.32.6	The "Emergency Exits" in the vehicle shall be in the specified number and meet the minimum dimensions as defined in the ECE-R107 technical regulation.			
5.1.32.7	The necessary markings ("EMERGENCY EXIT" signs, instructions, etc.) shall be made around the emergency exits, and breakable hammers with attached ropes shall be installed.			
5.1.32.8	Every bus shall have at least two fire blankets for fire intervention purposes. (200x160cm, Fiberglass fabric, compliant with CE EN 1869 standard)			
5.1.32.9	There shall be warning labels in visible locations inside the vehicle for passengers to easily see.			
5.1.32.10	External supports for flags shall be provided on both sides of the front mask.			

5.1.32.11	Each cabin shall have a suitable coat hanger in accordance with the cabin design.			
5.1.32.12	There shall be 2 spare wheels (to be kept in the maintenance garage).			
5.1.32.13	Connection to the electrical installation of the bus for installing equipment for ticketing shall be possible.			
5.1.33	**Mirrors**			
5.1.33.1	There shall be adjustable convex mirrors on the front right and front left sides of the vehicle, providing visibility of the sides and rear.			
5.1.33.2	There shall be a platform mirror on the front right exterior rear-view mirror that can show blind spots.			
5.1.33.3	The right and left exterior rear-view mirrors shall be adjustable type.			
5.1.33.4	The right and left exterior rearview mirrors shall be heated type.			
5.1.33.5	The mirrors shall comply with the provisions of ECE-R46.			
5.1.34	**Windscreen wipers and sun visors**			
5.1.34.1	The front windshield wipers shall be driven by at least one electric motor located in the centre. The wipers on the right and left sides of the front windshield shall receive their motion from these motors.			
5.1.34.2	There shall be a windshield washer system in the front windows.			
5.1.34.3	The system shall have a speed adjustment for continuous and intermittent operation.			

5.1.34.4	The wiping area of the wipers on the front windshield shall be designed to include the driver's side mirror visibility.			
5.1.34.5	The system, through a synchronized mechanism, shall allow for appropriate visibility on both the left and right sides of the front windshield, thanks to its cleaning and washing function.			
5.1.34.6	The driver's protection from sunlight shall be ensured by the presence of easily adjustable sunshades on the left side and front windshield, providing sufficient protection and shall be electrically controlled.			
5.1.34.7	The material of the sun visors shall be dust-repellent, dark-coloured, and designed to not disturb the driver even in bright sunlight.			
5.1.35	**Driver’s cabin**			
5.1.35.1	The driver's cabin shall be designed using heat-resistant, non-flammable, impact-resistant, and transparent materials. It should be constructed in a way that restricts external access to the driver.			
5.1.35.2	The area located behind the driver shall be constructed using non-transparent or dark-colored materials that are resistant to breakage and impacts, and do not easily reveal the interior. The material used should be in accordance with the overall appearance of the vehicle.			
5.1.35.3	The side of the driver cabin that is visible to the passengers, at the same height as the seats, shall be constructed using a dark-colored material that is not easily see-through from the inside. It shall be made of either a non-transparent material or a transparent material that does not reveal the interior. The upper part shall be made of transparent glass or a durable,			

	shatterproof, and scratch-resistant material like transparent fiberglass, ensuring it does not obstruct the driver's view.			
5.1.35.4	The side where passengers board the bus should be designed to act as a driver's cabin door.			
5.1.35.5	The driver cabin shall be designed in a way that does not restrict the driver's movement and field of vision (such as doors, rearview mirrors, etc.).			
5.1.35.6	The driver cabin shall be designed in a way that does not hinder the driver's easy exit in case of emergencies.			
5.1.35.7	The driver's cabin door cannot be opened from the outside unless the driver wants it. In a case of an emergency (such as the driver's health problem), the door can be opened from the outside if the driver does not prevent it intentionally.			
5.1.35.8	There shall be a suitable storage compartment, shelf, or cabinet in the driver cabin where the driver can place their personal belongings.			
5.1.35.9	There shall be a 3-point seat belt in the driver's seat.			
5.1.35.10	The seat belts shall comply with the ECE-R14 and R16 regulations.			
5.1.35.11	The driver's seat shall be adjustable in terms of vertical and horizontal movement, and the backrest shall be reclining towards the rear.			
5.1.35.12	The driver's seat shall have a lumbar support and an adjustable seat cushion suspension to adjust its firmness.			
5.1.35.13	All areas of the bus shall comply with the relevant provisions of Regulation 2001/85/EC or ECE-R107.			

1. Item number	2. Specifications required	3. Specifications offered	4. Notes, remarks, ref to documentation	5. Evaluation committee's notes
5.2	**Charging station**			
	Manufacturer's name; product model/type:			
	Country of origin:			
	Quantity: 10			
5.2.1	A charging unit AC-DC shall charge 2 vehicles at the same time within maximum 6 hours (from %0 to %100). Charging unit shall be suitable for the fast charging.			
5.2.2.	10 full charging units shall be installed and put into operation by the contractor in the specified garages.			
5.2.3	Charging units will not have software restricted to just one vehicle. It will charge any vehicle that is plugged.			
5.2.4	Full charging units shall be plug-in type.			
5.2.5	When the battery reaches 100% full charge, the charging process shall be automatically interrupted by the system and it shall give an audible/light warning to the environment.			
5.2.6	Charging socket type shall be "CCS Combo 2". 4 type sockets and are universal in accordance with the IEC62196 standard.			
5.2.7	Charge units should be capable of operating in the open area when appropriate housing is provided. It shall be at least IP 56 protection class.			

5.2.8	Charge units shall have communication features; battery voltages, current, approximate charging times, current occupancy amounts, energy values per bus, battery cell temperatures, battery and charging station fault information shall be monitored remotely and displayed. Technical infrastructure shall be established for remote monitoring and reporting of information via GPRS.			
5.2.9	In charging units; output short circuit protection, protection against reverse polarity connection, protection against high voltage and high temperatures shall be provided.			
5.2.10	Charge units shall comply with EMC IEC 61000 standards.			
5.2.11	Charge units shall comply with TS EN 61851 series standards or related equivalent international standards.			
5.2.12	Chargers shall operate at 300kW DC-DC and charge plugs shall have the appropriate current and voltage capacity for fast charging and shall be of the appropriate type.			
5.2.13	Charging sockets on the bus; against dust and water min. It shall have IP56 protection class and shall have VDE or equivalent international certificate.			

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