

Sub-Section 1 TECHNICAL REQUIREMENTS

Requirements	Response:
1. GENERAL REQUIREMENTS	
<p>1.1. The Purchaser seeks robust, environmentally friendly and service-proven buses that can successfully achieve their planned operating life under the described operating conditions. An operating lifetime of buses of not less than 10 years is required.</p> <p>1.2. White Color</p>	
<p>1.3. The bus manufacturer must have IATF16949, ISO 9001, ISO 14001, ISO 18001, ISO 26262 (or newer) certificates</p>	
2. MODEL, MAIN SIZES AND DIMENSIONS	
<p>2.1. Bus model shall be of a modern design, all buses shall be produced not earlier than 2022 year. Specially noted that the Purchaser require the latest model by the bus manufacturer compliant with these requirements (these relates first to the overall external design of the buses and also the traction method applied).</p>	
<p>2.2. Model / type: Monocoque construction left hand drive, low-floor Shuttle /Transit bus with one or two passenger doors on the curb side and step-free access from the door, powered by an energy storage system (ESS) battery and electric traction motor(s) and or pneumatic.</p>	
<p>2.3. Length: 18-31ft; Width: Maximum 97in; (without side mirrors) Height: Maximum 129 in; (with A/C/battery pack)</p>	
<p>2.4. Weight: The Maximum Gross Vehicle Weight (GVW): 32,000lbs.</p>	
<p>2.5. Clearance between the vehicle and the road, no less than 12in. This is to ensure enough ground clearance but also low floor accessibility</p>	
<p>2.6. Minimum 18 passengers (excluding driver and disabled) both seated and standing Minimum number of fixed seated passengers (excluding driver and disabled) 10</p>	

Requirements	Response:
2.7. Number of wheelchair spaces: minimum of 1 with ADA compliant restraints systems.	
2.8. Gradeability of the bus: at least 25%	
3. TRACTION MOTOR, ENERGY STORAGE SYSTEM (ESS) BATTERY AND CHARGING SYSTEM	
3.1. Traction Motor(s)	
<p>3.1.1. The traction motor(s) shall be synchronous, low power consumption, low noise, protected from humidity and dust during operation and compliant with the following minimum requirements:</p> <ul style="list-style-type: none"> • Traction motor(s) power output: Minimum of 130kW • Traction motor(s) torque: Minimum of 280Nm 	
3.1.2. The command and control of the traction motor(s) operation will be managed through an electronic command unit (ECU). This will be integrated with the electronic management system of the bus through the controller area network (CAN).	
3.2. Energy Storage System (ESS) Battery	
3.2.1. The electric bus must be equipped with an ESS based on a rechargeable battery. Please specify battery chemistry.	
3.2.2. Battery capacity must be minimum 80 kWh.	
3.2.3. The capacity of the ESS battery should allow a range of at least 120 miles on a single charge in normal operating environments	
3.2.4. The ESS (standard) battery warranty period shall be four (4) years.	
3.2.5. The time needed to reach from 0% to 80% state of charge should not exceed 120 minutes on a 50KW DC charging station and should also have lower AC charging capabilities.	
3.2.6. The battery state-of-charge (SOC) status level should be displayed on the driver's dashboard.	
<p>3.2.7. The ESS of the bus must be encased in a structural protective enclosure, sealed from moisture, dirt and debris. The enclosure of batteries shall isolate against high voltage risk from inadvertent contact with the exterior of the enclosure.</p> <p>High voltage warning and safety labels shall be clearly affixed to the exterior of the ESS enclosure.</p>	
3.2.8. All high voltage electrical cabling/conduits interfacing with the ESS and the high voltage electrical system throughout the bus shall be clearly identified in with industry standard high contrast colour relevant to the surrounding structure (i.e. bright orange).	

Requirements	Response:
3.3. Charging System (Plug In)	
3.3.1. Charging ports shall be accessible by means of an exterior access panel on the vehicle. The charging ports access panel shall prevent ingress of moisture, dirt and debris.	
3.3.2. Charging port shall provide a minimum of 7 kW input power for AC charging and 50 kW input power for DC charging.	
4. RUNNING GEAR	
4.1. Steering gear	
4.1.1. Hydraulic or electronic power-assisted steering.	
4.2. Axles	
4.2.1. Front: Suspension System with antiroll bar in order to increase the handling behaviour. Independent Suspension	
4.2.2. Rear: Trailing Arm Rear Suspension system with anti-roll bar in order to improve handling behaviour. Independent Suspension	
4.3. Wheels and tires	
4.3.1. All alloy rims radial tubeless all-season tires with reinforced side walls (metal rim) to minimize scuff damage and abrasions from curbs.	
4.3.2. All wheels and tires must be the same size.	
4.3.3. BRAKE SYSTEM	
5. General	
5.1. The bus is to be equipped with: dual-circuit air and electro-mechanical brake system with regenerative braking, Anti-lock Braking System (ABS), Anti-Slip Regulation (ASR), and Electronic Braking System (EBS).	
BODY	
6. Body construction	
6.1. The body shall be a monocoque frame, modern design. The bus must have a driver door.	
6.1.1. The bus manufacturer shall state: - the quality of steel, aluminium or composite material(grade) for the bus body frame and panelling, and the width, height and thickness of tubular profiles of the main frame of the bus.	
6.1.2. All parts of the body including frame and panelling must effectively be protected against corrosion for the whole service life of the bus	

Requirements	Response:
(10 years) by the application of an appropriate anti-corrosion protection.	
6.1.3. For safety reasons in respect of maintenance and repair the body and especially the underbody shall not have any sharp edges and corners.	
6.1.4. Equipment compartments and hatches	
6.2. All equipment compartments shall be easily accessible. They shall open widely to exclude any injury of personnel. In closed and opened states, the doors and covers of hatches and compartments shall be securely fastened.	
6.2.1. All exterior and interior compartments for electrical and electronic equipment must be dustproof and waterproof.	
6.2.2. Doors	
6.3. The bus must have (1or 2) passenger doors on the right side.	
6.3.1. Each door shall be clearly marked as an emergency exit inside.	
6.3.2. Passenger door must be equipped with an emergency opening system. In case of emergency it must be possible to open the passenger doors from inside the passenger compartment manually in case of failure of the compressed air system and/or electrical system. Emergency door buttons must be mounted internally at each door and must be easily accessible. It must not be possible to open the doors manually if the bus is moving at a speed of 3 mi/h or more.	
6.3.3. The door/s must have firmly attached rubber seals to ensure tight closure and protection of the inside of the bus against draft, dust, water and snow.	
6.3.4. The door/s wings edges must be solid to reduce risk of any damage and to preserve their functionality in case of contact with the curb	
6.3.5. The design of the door wings must completely exclude any seizure, pinching or other physical damage to passengers when the door closes.	
6.3.6. The driver must be warned with light and sound signals about any malfunction of the doors.	
6.3.7. Glazing	
6.3.8. The front windscreen shall be a single piece laminated safety glass unit, mounted by means of gluing, with an adhesive cellophane dividing layer. The front windscreen shall be heated for adequate de-icing and defogging to ensure visibility for the driver in all climate conditions.	

Requirements	Response:
<p>6.3.9. The driver's side window glass must have a sliding opening window. This must be heated, tight in the closed position and equipped with a latch. The glass must ensure good visibility of the left rear-view mirror. All windows and door glasses must be manufactured using laminated glass, solidly fastened, completely and durably sealed, free of rattle / vibration when the bus is driving.</p>	
<p>6.3.10. Mirrors</p>	
<p>6.4. External rear-view mirrors: two heated, electronically adjusted, replaceable spherical mirrors.</p>	
<p>6.4.1. External lights, sound signals</p>	
<p>6.5. Exterior lighting: the taillights must be LED.</p>	
<p>6.5.1. Upon starting the bus, whether in daytime or at night, Daytime Running Lights DLRs must be automatically turned on.</p>	
<p>6.5.2. An audible reversing alarm should be provided.</p>	
<p>6.5.3. DRIVER'S CABIN</p>	
<p>7. General requirements</p>	
<p>7.1. The driver's cabin shall be separated from the passenger compartment by a partition.</p>	
<p>7.1.1. The bus must have keyless ignition and start/stop button.</p>	
<p>7.1.2. Handrails, lining and other components must not cause any glare or reflection.</p>	
<p>7.1.3. The left sidewall of the cabin should have a reliable protection from the cold and heat. The coating must be waterproof, dirt-resistant and keep its shape regardless of temperature, mechanical and other influences.</p>	
<p>7.1.4. A power operated driver side window shall come with active defogging and defrosting.</p>	
<p>7.1.5. The driver's cabin shall be equipped with a 12V socket and a compartment providing storage space for the driver's personal belongings.</p>	
<p>7.1.6. Driver's seat</p>	
<p>7.1.7. The driver's seat should be a modern, ergonomic design, vibration protected, fully adjustable for height, with seatback tilt, front/rear slide, seat tilt. It shall have the following characteristics and features:</p> <ul style="list-style-type: none"> • Integrated three-point seat belt; 	

Requirements	Response:
<ul style="list-style-type: none"> • Adjustable vertical shock absorber; • Horizontal adjustment; • Seat tilt adjustment; • Backrest adjustment; • Armrests 	
Dashboard	
<p>7.2. The dashboard, switches, indicators and other control lamps and other devices must be dust-proof and water resistant (Ingress Protection to standard IP 54).</p>	
<p>7.2.1. The instrument panel is to comply with modern industry standards. Cluster must be fully digital. All displays and indicators on the dashboard, without exception, must be illuminated with LEDs. Indicators can be displayed by use of a digital screen. Control indicators must include at least:</p> <ul style="list-style-type: none"> • Speedometer/odometer • traction motor temperature indicator • lighting devices indicator • door opening indicator • energy storage system (ESS) battery state-of-charge (%) • instantaneous energy consumption (kWh/mi) • average energy consumption for current trip (kWh/mi) • EBS indicator • parking brake indicator • lower beam indicator • brake pad wear indicator • electronic unit indicator <p>The dashboard must include a warning sign “red STOP”, which is activated, along with at least the following red indicators:</p> <ul style="list-style-type: none"> • the operating temperature of the ESS cooling system is too high • the operating temperature of the traction motor cooling system is too high • low level of coolant in the cooling system (ESS or traction motor) • risk of fire in the ESS • risk of fire in the traction motor • The dashboard must have multimedia touchscreen and navigation. • Radio 	
<p>7.2.2. The switches of turn indicator and wipers located on the steering column shall be of a high-quality, providing a guaranteed</p>	

Requirements	Response:
minimum number of switching of at least 1,500 per day and designed for not less than 10 million switching during the lifetime.	
7.2.3. Driver's cabin ventilation, heating and lightning	
7.3. The driver's cabin ventilation system must be provided with an individual regulation control with at least three (3) blowing levels. The direction of airflow towards the driver's seat and the windscreen must be regulated with air choke valves.	
7.3.1. The driver's cabin must be heated separately from the passenger compartment with a separate heater and temperature controls adjustable by the driver.	
7.3.2. The driver's cabin must be lighted by LED lamps. A switch for the cabin light is to be located on the dashboard.	
7.3.3. BUS PASSENGER COMPARTMENT	
8. Floor and floor cover	
8.1. The floor must be flat and smooth without raised parts or elements or sharp edges, which could cause inconvenience or injuries to passengers.	
8.1.1. The floor shall be made of durable, water-resistant and fireproof plywood with a thickness of at least 12 mm. Plywood must consist of at least eight (8) layers.	
8.1.2. All corners and protruding parts of the floor (steps, platforms, floor hatches, edges, etc.) shall be protected by tear-proof plates or strips made of high-quality milled aluminium, properly fixed.	
8.1.3. Entry areas	
8.2. Special attention should be paid to the solidity and corrosion resistance of the entry and exit areas. The construction of the entrances should be made of hardwearing and rust-free materials or of similar materials, including joints, welds and fasteners (bolts) in combination with high-quality protection against corrosion and aggressive substances (e.g. salty water).	
8.2.1. Electric ramp must be integrated in bus.	
8.2.2. Walls and ceiling	
8.2.3. The interior of walls and ceiling shall be made of fireproof, dirt-proof, waterproof, graffiti-resistant and easy to wash plastic material, e.g. acrylonitrile butadiene styrene (ABS) moulding parts for the walls and PU rigid foam panels for the ceiling lining.	
8.3. The lining must also provide for good thermal and sound insulation. The ceiling lining must ensure ventilation of the roof structures and	

Requirements	Response:
reduce the noise level inside the passenger compartment (e.g. via the use of mesh made of aluminium alloy).	
8.3.1. Handrails, stanchions and partitions	
8.4. The passenger compartment must be provided with tubular handrails and stanchions covered with anti-slip mechanically strong coating. The handrails and stanchions must be coated in a contrasting colour to facilitate visibility to passengers with a visual impairment.	
8.4.1. All the screw heads and nuts used for fixation of handrails and stanchions shall be made of stainless steel and be free of burrs to avoid any damages to passengers' clothes. The bolt heads and nuts must be completely countersunk.	
8.4.2. Seats	
8.5. The seats in the low-floor area of the bus must be fixed to the sidewalls. Looking forward or parameter seating	
8.5.1. There must be enough space between the seats and partitions to accommodate the legs and feet of seated passengers. The seat frames must be made of galvanised steel or similar corrosion-resistant material. The seats must be fastened with stainless steel bolts or equivalent.	
8.5.2. The seats must be of an anatomical type. The seats shall not have rough or uneven edges. The seats and seat-backs must be made of reinforced plastics, attached to the frame. The seat covers shall be made of material that is soft, shape-retaining, waterproof, dirt-repellent, heat-resistant, scratch-resistant and wear-resistant.	
8.5.3. Passenger standee area	
8.6. Wheelchair restraint system must be ADA compliant	
8.6.1. Heating, air conditioning and ventilation	
8.7. The bus must be equipped with an integrated heating, air conditioning and ventilation system for the passenger compartment. The system shall ensure equal distribution of warm and cool air throughout the passenger compartment. The driver's cabin must be heated, air conditioned and ventilated separately from the passenger compartment.	
8.7.1. The heating system shall be designed to ensure the equal distribution of warm air throughout the interior of the bus.	
8.7.2. The bus shall be equipped with at least one roof hatch	
8.7.3. SAFETY AND ENVIRONMENT	
15 The bus is to be equipped with a carbon dioxide fire-extinguisher (of standard size, at least 12 lbs).	

Requirements	Response:
15.1 The extinguishers shall have instructions for use in English and Spanish languages.	
15.2 The applied materials are to be compliant with modern technology, shall be environment-friendly and be suitable for recycling.	
15.3 The bus is to be equipped with and include suitable storage for a reflective warning triangle for placement on the road in the event of an emergency.	
15.4 Space shall be provided for the fitting of one or more first-aid kits.	