

## SPECIFICATION RT57-00-04-90/91/92/93

### ELECTRICAL DRIVEN ARTICULATED BUS, 120 – 170 SEATER LOW FLOOR OR LOW ENTRY

An electrical bus, low floor or low entry body, 120 – 170 seated and standing capacity that complies with the requirements of the “Compulsory Vehicle Standard” issued by the SABS (SANS 10370 and SANS 20107); and the Road Traffic Act and Regulations as well as NCRS requirements, and complies to the following, is required:

#### SECTION A: ELECTRICAL DRIVE SYSTEM

##### 1. CHARGING

- 1.1 Direct Current Fast Charging (DC FC) optional.
- 1.2 Open Charge Point Protocol 2.0.0 (OCPP2.0.1)

Particulars of offer: \_\_\_\_\_  
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##### 2. ELECTRONIC STORAGE SYSTEM

- 2.1 The operating profile will need to compliment one (or all) of the below listed ranges, and integrate into the operational topography and schedules of peak/off-peak demand (see EVSC), inclusive of a 20% energy reserve.
- 2.2 Recommendation to be included with bid, effective kW/km to be included with ESS specification, with expected life of storage unit to be maximized.
  - (A) range 150-200km range (at least 1.5kW/km)
  - (B) range 200-300km range (at least 1.5kW/km)
  - (C) range 300-350km range (at least 1.5kW/km)
  - (D) range 350-450km range (at least 1.5kW/km)
- 2.3 Compact and light weight batteries as far as possible, located in low collision areas to optimize operational effectiveness. Batteries are to align with the energy specifications (limitations) within each cost category.
- 2.4 The vehicles power pack shall have electronically incorporated protection features, and audible warning lamps and buzzers that protect the vehicle (as far as possible) of abuse, excessive idling, subsequent damages on components, or any other external input that may cause damage to power pack componentry

Particulars of offer: \_\_\_\_\_  
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(A) \_\_\_\_\_  
(B) \_\_\_\_\_  
(C) \_\_\_\_\_  
(D) \_\_\_\_\_

##### 3. ELECTRONIC STORAGE SYSTEM LIFE

- 3.1 Expected service life to be at least 8 -10 years

Particulars of offer: \_\_\_\_\_  
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**4. CLIMATIC CONDITIONS**

4.1 Temperature ranges of -5°C to 45°C, at relative humidity between 5% and 100%

Particulars of offer: \_\_\_\_\_  
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**5. BRAKES & REGENERATION**

5.1 Disc brake all round, with integrated ABS or greater, OR Integrated pedal mechanical or electro-magnetic brake, staged prior to wheel brake engagement.

5.2 Brake regeneration preferred where possible

Particulars of offer: \_\_\_\_\_  
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**6. OPERATING PERFORMANCE**

6.1 Power and Torque capacity limitations to align with operating profile, with smooth effortless operation throughout operation.

6.2 E-machine typically 160-240kW, but supplier to maximize operational efficiencies

6.3 Average speed 19km/h to 80km/h, should comfortably negotiate operational topography of 16% gradient.

Particulars of offer: \_\_\_\_\_  
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**7. WARRANTY SUPPORT**

7.1 Suppliers are to include and cost for any specialized or additional services required to uphold the initial base warranty period.

Particulars of offer: \_\_\_\_\_  
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## SECTION B: BODY CONSTRUCTION

### 1. STRUCTURE

- 1.1 SANS 1563/ECE 66, anti-rust, preference made to low weight and coastal durability. The superstructure/monocoque should last the expected operating life of 15 to 20 years
- 1.2 Two external rear view mirrors must be fitted, or the ITS equivalent.
- 1.3 The front bumper and rear bumper must be GRP moulded.
- 1.4 Towing hitch – front end – as supplied with chassis
- 1.5 A spare wheel carrier must be fitted to the chassis and clearly marked.
- 1.6 A swing out battery carrier in a separate lockable body side locker, incorporating a toolbox must be fitted on the left-hand side of the body.
- 1.7 Vehicle Length 18.0m but not exceeding 22m
- 1.8 Vehicle Width 2.5 – 2.6m
- 1.9 Vehicle Height (Road to highest point) not exceeding 3.5m
- 1.10 Angle - Departure & Approach greater than 9.5°, unobstructed by any standard road/operational interfaces
- 1.11 Floor Height above Road – Average 340mm
- 1.12 Curb kneeling (curb level LHS entrance, bus kneeling on both sides of bus, not tilting to the LHS only) 300mm, aligning with operational curb infrastructure.
- 1.13 The under structure must be covered with rubberizing or greater to be applied to maximize weather protection
- 1.14 Thermal insulation must be done in such a manner to support geographical operation, integrated with body and chassis component, prevention of drivetrain convection
- 1.15 The vehicle shall provide sufficient thermal comfort in both hot and cold weather conditions and ventilation throughout the interior.
- 1.16 Variable messaging shall be provided so that it is visible from any passenger position in the bus, whether seated or standing forwards, backwards or sideways. Variable messaging shall provide next stop information and instructions for emergency situations and shall be audible as well as visual.
- 1.17 Noise emittance internal/external: vehicle noise on the outside is compulsory and shall be no less than 60dBA and not exceeding 65dBA (internal); and no less than 65dBA and no more than 70dBA (external).
- 1.18 Wheelchair and priority seating signage shall comply with SANS 10207 and SANS 10370. Other required signage and passenger information shall comply with the operators' conditions of carriage and municipal and provincial service delivery requirements.
- 1.19 All surface elements throughout the bus interior shall have a smooth rounded finish to minimise risk of injury in a crash.

Particulars of offer: \_\_\_\_\_

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## 2. ARTICULATION

- 2.1 Allow for sufficient manoeuvring of vehicle through operation,
- 2.2 The articulation must be fitted with anti-jack-knife features to prevent jack-knife situations
- 2.3 Easily removable bellows must be fitted.

Particulars of offer: \_\_\_\_\_  
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## 3. FLOOR

- 3.1 The floor must be calculated on a passenger weight at an average of 84kg, and 300kg for a wheelchair passenger.
- 3.2 The floor material must typically be 12-16mm base material, weather protected.
- 3.3 The material to be equivalent or greater than marine ply medium density, covered with high wear, slip-resistant (greater than R10 slip material), and the colour shall be in accordance with colour scheme (check livery).

Particulars of offer: \_\_\_\_\_  
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## 4. DRIVER'S COMPARTMENT

- 4.1 RHS drive, enclosed driver compartment with rear curtesy screen, internal vehicle access through latch door/passenger control gate, integrated vehicle controls and operation with enclosed(locked) safety override controls.
- 4.2 The drivers' compartment shall not contain a screen at the side, and the driver shall have unobstructed communication with passengers.
- 4.3 The driver's seat must be fully adjustable, comfortable high-density foam, weight adjustment (suspension), with integrated 3-point seatbelt.
- 4.4 Mirrors shall be provided for the driver to view the whole passenger cabin, including the wheelchair space and priority seats, without leaving his/her seat and without shoulder movement.

Particulars of offer: \_\_\_\_\_  
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### Optional

- 4.5 Cameras and displays must be offered as an optional extra as per requirement of the end user.

Particulars of offer: \_\_\_\_\_  
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## 5. DOORS AND ENTRANCE

- 5.1 Passenger doors must be see-through, inward leaf swing, operated by the driver; and include an accelerator dis-engagement, overhead emergency valve for manual operation. Doors must have covered or hidden linkages, with sensitive edge closing sensors, audible warning when activated, and be fitted with overhead step lighting.
- 5.2 At least three Passenger Door on the Right-Hand Side (RHS) of the bus, if the bus is part of a BRT service. (For a Quality bus service, the door on the RHS can be replaced by additional seating.)

- 5.3 Passenger Door height - RHS 340mm (align to operational station curb infrastructure so that boarding and alighting is level, at 1:50)
- 5.4 One Passenger Door on the Left-Hand Side (LHS) of the bus, aligned to station infrastructure.
- 5.5 Passenger Door height – LHS - 340mm (align to operational bus stop curb infrastructure so that boarding and alighting is level, at 1:50)
- 5.6 Passenger Door Width 1100mm (clear width)
- 5.7 Passenger Door Height 2000mm
- 5.8 The passenger door alignment must be within the parameters to ensure infrastructure support. The passenger door may contain a handrail, accessible when the door is folded, to assist when boarding and alighting.
- 5.9 The Boarding Ramp must be provided on every door, and must be 100% automated, discrete/hidden stow away design preferred, operated by driver, with manual emergency stow away in case of failure.
- 5.10 The Boarding ramp extension must be between 480 – 600mm and align with infrastructure provision to enable level boarding at most stops.
- 5.11 Boarding ramp slope must not exceed 1:12 (SANS10370).

Particulars of offer: \_\_\_\_\_

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## 6. PASSENGER SEATS, INCLUDING THE WHEELCHAIR SPACE

- 6.1 Maximized seating capacity, front facing, alignment of standing with permissible GVM, typically 120 – 170 total, but not limited.
- 6.2 The Seating Configuration (standard) should be typically, 2x2, but not limited, and can face forward and rearward. Seating must be at least 450mm wide and deep, with 250mm knee space before the next seat (except priority seats, see below).
- 6.3 Seats with a typical knee space may be provided only above the wheel arch, or at very rear of the vehicle. Perch seats may be provided between the lowered portion at the front of the bus and the raised rear portion, making use of the available space to standing passengers.
- 6.4 The configuration must compliment walkways that allow access to and exit from compulsory wheelchair and priority seating.
- 6.5 Seating capacity for **two (2) wheelchair** space must be made available, facing rearwards.
- 6.6 The seating capacity wheelchair space must be situated internally front right behind the driver's compartment, backward facing with padded backrest.
- 6.7.1 The capacity must be an unobstructed wheelchair space of 1,800mm (1.8m) in length and 900mm in width, with 3-point strap belts/wheelchair restraint.
- 6.7.2 The second wheelchair capacity must be an unobstructed wheelchair space of 1,500mm (1.5m) in length and 900mm in width, with 3-point strap belts/wheelchair restraint
- 6.8 The backrest material shall be no less than 80mm thickness, high-density foam, designed to restrict wear and tear, and easy to clean.
- 6.9 Handrails shall be provided in the wheelchair space, aligned with **SANS 10370 and ISO 10542**, with an assigned stop request button, within reach of a passenger in a wheelchair.
- 6.10 A horizontal handrail must be provided on the side of the wheelchair space affixed to the side of the bus, and a dropdown rail on the open side of the space, which must remain upright whilst the vehicle is in motion, if not used.
- 6.11 A vertical station may be used instead of a drop-down rail if it can provide support to the wheelchair passenger whilst not blocking their use, entrance to and exit of the wheelchair space.
- 6.12 Seating capacity for at least **eight (8) Preferential/Priority** seats must be allocated.

- 6.13 Preferential/Priority seats, as per **regulation 245**, to be located in close proximity to the passenger doors.
- 6.14 Priority seats must be facing either to the front or rear and shall contrast to regular seats, made from moulded plastic or other material that is low impact in an emergency, (typically red shell/frame), aligned to **SANS 20107**.
- 6.15 The seats must be at the same level as the entrance/exit and shall have a minimum of 300mm clear space in front of each seat, to accommodate assisted walking equipment/dog guide, and a uniform height between 430-490mm.
- 6.16 Flip Down Seating shall be provided within the wheelchair space, but shall not reduce the length and width of the wheelchair space when the flip down seating is not in use.
- 6.17 The seating capacity of flip down shall be maximized
- 6.18 All seat material must be high density foam, fire resistant, comfortable back and base support, with washable vinyl (check livery) with superior durability and non-fading properties.
- 6.19 Grab handles (Handholds) shall be provided within the backrest of each seat, made from high density plastic, and must be accessible at the corner of each seat (except the flip up seats).
- 6.20 Seatbelts must be fitted to all unprotected seats as well as the flip up seats where there is an open space in front of the seat with no other seating in front, or rail or partition.
- 6.21 Arm rests may be provided on seats facing open areas or abutting steps, except the side-facing seats in the wheelchair space.
- 6.22 A partition may be introduced at the manufacturers discretion but shall not restrict access.

Number of seats: \_\_\_\_\_

Seat configuration: \_\_\_\_\_

Particulars of offer: \_\_\_\_\_

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### **Optional**

6.23 Optional anchor point to be fitted as per SANS10370 (ISO 10542)

6.24 Option of back-to-back seating arrangement.

Particulars of offer: \_\_\_\_\_

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## **7. HANDRAILS**

- 7.1 Handrails (vertical and horizontal) shall be provided at arm's length intervals throughout the bus.
- 7.2 Provision of fixed handrails and handholds for Standing Passengers must be available with sufficient walkway widths and movement capability, shall ensure the comfort of standing passengers, but not obstruct their movement within the standing space, or when alighting from a seat.
- 7.3 Handholds shall not be substituted for handrails but shall be provided in addition to them.
- 7.4 A continuous handrail from the entrance door to the first available priority seat shall be provided.
- 7.5 Hand rails are required in the coupling area of the articulated bus.

Particulars of offer: \_\_\_\_\_

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## 8. WINDOWS

### 8.1 Windscreen

8.1.1 A tinted windscreen with wipers plus windscreen washer must be fitted.

8.1.2 Two pull down/adjustable sunvisors must be fitted for protection that do not completely obstruct vision when used.

8.1.3 Heater/demister for windscreen with hot and cold air must be fitted and be incorporated with all driver line of sight areas.

Particulars of offer: \_\_\_\_\_

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### 8.2 Side Windows

8.2.1 Bonded windows, with ergonomically tint/insulation suited for operation (20-30% dimming of light transmission)

8.2.2 All windows in the passenger space shall be openable at the top for airflow, with an easy-to-use window mechanism

Particulars of offer: \_\_\_\_\_

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## 9. EMERGENCY EXIT

9.1 Alignment with regulation R252, single piece roof exits preferred over mechanical units.

9.2 Side or rear emergency exits must be provided.

9.3 These emergency exits must be clearly marked.

Particulars of offer: \_\_\_\_\_

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## 10. SAFETY

10.1 Accessible and un-obstructed fire extinguishers (driver plus one), regulatory emergency exits and markings to align

Particulars of offer: \_\_\_\_\_

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## 11. ELECTRICAL:

11.1 Preference must be made on extended life componentry (LED) where possible, interior lighting operational at 1st stage power-on, daytime running lights off separate driver interface.

11.2 An audible reverse buzzer must be installed.

11.3 Regulation of the height of the suspension must be managed from a switch on the driver's dashboard, and the height range of 340-300mm tested daily with the boarding ramp and automatic door operation.

11.4 Operationally specific audio-visual interface shall be included.

11.5 An external route identification signage must be fitted to the front, curb side and possibly rear.

- 11.6 Real-time visual information with an audible next stop announcement must be fitted into the internal audio-visual interface, visible from any seating position on the bus (front, rear and sideways facing). The audio-visual interface must be able to project instructions on what to do in an emergency.
- 11.7 An audible sound to notify door opening and closing must be fitted.
- 11.8 The pushbutton next stop must be fitted on the handrail and shall emit a sound that is audible to the driver. The profile shall be raised and contain Braille lettering.
- 11.9 The passenger stop requests must link up with drivers warning interface.
- 11.10A driver's microphone connected to announcement speakers must be fitted.
- 11.11The auxiliary power supply must be allocated for power tap-in and mounting points/bases for all auxiliary equipment, with single battery source utilization as far as possible (auxiliary batteries accepted but not preferred)
- 11.12Auxiliary equipment fitment must be operationally suited, typical provision for destination display mounting points (Front, LHS, and interior), with accessible power tap-on/tap-off points, APTMS, AFS, BUS-PSD. This will include operational audio-visual equipment operationally specific such as announcement speakers, routes display.

Particulars of offer: \_\_\_\_\_

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**12. TELEMATICS AND DIAGNOSTICS**

- 12.1 Base product access to vehicle diagnostic codes, tests, and other relevant base telematics.
- 12.2 The tooling would support the "special", tools needed for maintenance in the first five years of vehicle life, for example (but not limited) hub sockets, drift/seal tools, blink code testers, calliper adjustors, maintenance access keys etc.

Particulars of offer: \_\_\_\_\_

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**13. FINISH:**

- 13.1 All metal shall be thoroughly cleaned and primed and painted with two coats of prime and good quality automotive enamel to match the departments colour spec.
- 13.2 As per the operational livery, superior weather protection and permissible fading over 5 years, smooth exterior finish with applicable durability standards SANS 279, SANS 5146, SANS 7253, ASTM G53

Particulars of offer: \_\_\_\_\_

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**14. DRAWINGS:**

- 14.1 A detailed sketch or full drawing of the body offered, showing all leading dimensions, must be submitted with tender.

Particulars of offer: \_\_\_\_\_

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