
Tender No. 11/20

**For Examination of the Use of Mass
Transportation Electric Vehicles (MTEV) in
Israel**

TENDER CONDITIONS AND INSTRUCTIONS

Volume F

June 2020

General Description of the Trial Run Phase.

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1) Preliminary Phase:

- a) Familiarization with the system and its specifications.
- b) Ongoing dialogue with the manufacturer towards an active site visit & Test.
- c) Writing a Test Plan to be Performed at the Manufacturer's Site.

2) The overall Test Program will cover the following areas & components:

- a) The MTEV selected (should be tested under the relevant configuration).
- b) Charging station, Capabilities & Performance.
- c) Passengers Boarding station.
- d) Maintenance & Logistics Center. Virtual lane travel route - Preparation required, accessory (depending on Ayalon Highways route implementation decision).
- e) Operational Control Center (OCC) Dashboard.
- f) Connectivity - required protocols and relevant interface to Israel (compatible APIs).
- g) Adaptation to Israeli transport infrastructure (mechanical, geometric, etc.).

3) Basic elements to be tested/demonstrated at the manufacturer site:

- a) Basic vehicle performance -
 - i) Velocities.
 - ii) Turns & maneuvers.
 - iii) Normal & Emergency stops.
 - iv) Incline/decline performance.
 - v) Endurance & Battery performance.
- b) Autonomous driving capabilities (if applicable).
- c) Teleoperation control & driving capabilities (if applicable).
- d) Detailed tour of existing public infrastructure where the vehicle is in active service: intersections, gradients, turns, obstacles, road types, designated passenger terminals & boarding stations, specific road/traffic sign, designated road marking, mix traffic & mix road users conflicts, legislative / regulatory changes implemented for the vehicle, driving restrictions.
- e) Overview of different infrastructures implementation for the vehicle: electricity, road infrastructure (marking, sensors), connectivity (communication protocols, software), local traffic laws / traffic signs that may restrict / endanger the vehicle.
- f) Maintenance policy and adaptation to Israel. Average repair times and MTBF data. All manufacturer-defined applicable maintenance levels will be demonstrated checked. Manufacturer will define what part of maintenance will be done independently in Israel and what part only by the company technician.
- g) Logistics – Chain supply of spare parts to include LLI, Amount of spare parts recommended in country, .
- h) Storage – separated cars Vs vehicle as is, specific equipment.
- i) Safety:
 - i) Specific/non-specific Rescue vehicle – operational checklist.
 - ii) BIT capabilities and reliability of the system.
 - iii) Quick fix procedures – percentage of on road quick fixes due to basic malfunctions, process & regulations.

- iv) *Compatibility with hazardous materials (passenger protection, environment, handling).*
- v) *Failure state analysis, to include execution of TBD safety scenarios regarding passengers, staff & environment.*
- vi) *Car evacuation process.*
- vii) *Passengers Boarding station- Risks, adjustments required.*
- j) *Installation constraints: required size, charging capabilities, passengers' interface, ticketing & payment process.*
- k) *Path integration: Detecting obstacles, constraints in the route.*
- l) *Presentation of an operating system - control and scheduling system, precision capabilities, ticketing - acquisition, audit, enforcement.*
- m) *Control Center capabilities (if applicable).*
- n) *Teleoperation capabilities (if applicable).*
- o) *Ongoing Operations: Real time communication with driver/passengers, stations, safety/advanced control capabilities.*
- p) *Fault/malfunction alert & handling, backup & redundancy modes, abnormal events operation.*
- q) *System dependencies: GPS, Video signals, Communication, etc.*
- r) *Ongoing operations – driver/operator qualifications and training requirements.*
- s) *Constructions Infrastructure requirements (adjustments for vehicle).*
- t) *Communication requirements, including direct connection with emergency services (police, medical services, fire department, etc.).*
- u) *Emergencies: Passengers rescue/extrication procedures & demonstration.*
- v) *Passengers application & real time schedule update mechanism.*

4) Sterile zone test phase (In Israel)

- a) *A dedicated and closed site shall be carried out where the vehicle will be operated while not interrupted by an uncontrolled external party.*
- b) *The sterile test site will include a basic battery charging system that simulates (as close as possible) an operational system and should allow engineering measurements that complies with an operational charging station*
- c) *Minimum requirements from the sterile site:*
 - i) *Allows long and continuous ride without forced stops.*
 - ii) *Allows ride up to its operational velocity + 15%.*
 - iii) *Allows road markings.*
 - iv) *Allows the establishment of basic dedicated infrastructure on site (such as a charging station, parking / vehicle storage).*
 - v) *Allows night ride (with / without lighting).*
 - vi) *Has access to electricity, water & communication infrastructure.*
 - vii) *Allows testing in two-lane road section with mixed road users (various vehicles, pedestrians, etc.).*
 - viii) *Allows large turn radii at velocities up to 50 mph.*
- d) *The following topics will be tested at this time:*
 - i) *Vehicle & Car Ride characteristics -*
 - (1) *Travel / Power Performance, time between Charges, velocities (see also Battery Performance).*

- (2) velocities: Maximum + Current Consumption measurements (different Environmental Conditions); Intermediate + current consumption; Minimal.
 - (3) Behavior during maneuvers: acceleration, deceleration, turns, lane change, braking, emergency.
 - (4) Gradient performance: velocity measurement, current consumption (different Environmental Conditions).
- ii) Rotation radius: to be defined separately by Ayalon Highways.
- iii) Carrying/loading capacity – absolute capability and performance measurements (acceleration, current consumption, air conditioning).
- iv) Emergency Operations: Emergency stops, emergency rapid evacuation of passengers including disabled, emergency exits and operation complexity in the event of an accident / fire / smoke in the passenger compartment.
- e) Battery performance
 - i) Normal Charge Mode testing, SUPER Charge testing (if applicable). Electrical equipment will be accordingly tested.
 - ii) Momentary / sustained energy consumption throughout the day.
 - iii) Ability to reach daily distance.
 - iv) Accelerations and decelerations & battery consumption measurements.
 - v) Decelerations during different braking scenarios.
 - vi) Appropriate electrical equipment use - air conditioner Vs battery consumption.
 - vii) Impact of hot / cold day on vehicle endurance.
 - viii) Different loading methods – max air conditioning, number of passengers, etc.
- f) "Passengers Experience" -
 - i) Physical sensations during acceleration / deceleration, turn maneuvers in different seat locations.
 - ii) Boarding / leaving the car.
 - iii) Acoustics and noise level in cars, creaking, ability to understand the Public Address System.
 - iv) Convenience of sitting and standing in different places - including comparison of different cars.
- g) Path Perception- (if defined by Ayalon Highways as a requirement)
 - i) Capability performance testing in several environmental descriptors. Time to learn new path, if any) and time to execute.
 - ii) Road trip problems (unexpected hiding changes, blur, communication disconnections, roadblocks, rain / fog / sun blindness restrictions).
 - iii) Different sensors' performance and adaptation to Israeli infrastructure (sensors in and specifically out of the car along the lane).
- h) Immunity to environmental disruption - will only test what has not been tested / licensed in advance.
 - i) The impact of massive cellular use inside / outside the cars.
 - ii) EMC interference in the driver's environment & along the vehicle.
- i) Configuration and fit for passengers
 - i) "Low floor" - use and applicability.
 - ii) Passengers capacity: Density per car. Verify number of passengers.

- iii) Travelers of various types (physical size, age, accompanying luggage - soldiers' bags, bicycles, scooter, backpacks, working with laptops).*
- iv) Adaptation to a travelers with special needs (according to Israeli standards only).*
- v) Driving capabilities (manual) - normal driving.*
- vi) Driver Assignment Analysis: Tasks During driving, , LOS & FOV, Driver Workload*
- vii) Remote driving (Teleoperation) – a basic test if applicable.*

5) public and dynamic "live" environment Test Phase:

- i) This test phase will only be carried out if relevant infrastructure in Israel will be ready.*
- ii) This site's requirements will be set separately if required (also dependent on the sterile site's capabilities).*