EngKaplan

INDEPENDENT PROCUREMENT ADVISORY

TECHNICAL SPECIFICATION

Electric Terminal Tractor Fleet (12 units) & Charging Infrastructure

Prepared for [REDACTED] - Mediterranean container terminal

CLIENT

[REDACTED]
Mediterranean container terminal

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SECTION 1

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Distribution

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Document control summary

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Governing law	Laws of the State of Israel

SECTION 2

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SECTION 3

Executive summary

Project context, scope, key requirements.

This specification was prepared by EngKaplan as independent procurement advisor to [REDACTED], a Mediterranean container terminal operator (throughput approximately 800,000 TEU/year), for the planned procurement of an electric terminal tractor fleet. The fleet will replace 14 legacy diesel terminal tractors (average age 11 years, accumulated 28,000 - 42,000 operating hours each) with 12 new battery-electric units of equivalent or higher productivity capability.

The procurement also covers the port-side charging infrastructure - DC fast chargers, transformer additions, distribution panels, and a spare-parts package - sufficient to operate the new fleet on a two-shift duty cycle (16 operational hours per day) with sustained peak loading.

This document is intended for inclusion in tender package RFP-2026-014 (issued separately) as the technical-specification annex. It is the buyer's specification - not the manufacturer's brochure. Vendors are expected to demonstrate compliance against each specification line item in their submission.

Key project parameters

Equipment count	12 (twelve) electric terminal tractors
Configuration	4x2 yard-tractor with fifth wheel, raised cabin
Gross combination weight rating	Minimum 65,000 kg with trailer + 40 ft loaded container
Service environment	Mediterranean coastal climate; high humidity, salt spray, summer ambient up to 40 deg C
Duty cycle	Two-shift, 16 hours per day, sustained peak loading
Charging infrastructure	6 DC fast-charger ports with shared bus; sized for opportunity charging plus end-of-shift
Replacement of	14 diesel terminal tractors retired upon delivery acceptance
Project timeline	Tender award Q4 2026; phased delivery over 6 months; full service Q3 2027
Service-life expectation	Minimum 12 years / 60,000 operating hours per unit

Headline requirements summary

The key engineering requirements that vendors must satisfy:

1. Battery-electric, no hybrid. Pure battery-electric powertrain with on-board energy storage. Hybrid (diesel-electric or fuel-cell) configurations are non-compliant with the client's net-zero programme.

2. Two-shift sustained operation. Vendor must demonstrate that the proposed unit, in the supplied configuration, can sustain 16 operational hours per day across the duty cycle defined in section 11, with the supplied opportunity-charging architecture.

3. Mediterranean climate hardening. Battery thermal management, cabin HVAC, salt-corrosion protection on chassis and high-voltage enclosures, and dust/sand sealing of motor and gearbox housings. Compliance with section 7.6 environmental requirements is mandatory.

4. OEM-direct service support within 200 km. Vendor must demonstrate either an owned or contracted service centre within 200 km road distance with maximum 24-hour response on critical interventions. (See section 15.)

5. Open telematics. Vendor must provide an open API or OPC-UA endpoint for fleet telematics (see section 10). Closed proprietary-cloud-only telematics are non-compliant.

6. Spare-parts continuity guarantee, minimum 12 years. Vendor must commit in writing to spare-parts availability for the full 12-year service life from delivery date.

Compliance with these six headline requirements is a precondition for bid evaluation. Bids that fail any of the six are rejected at the compliance gate without scoring on the evaluation matrix (see section 16).

SECTION 4

Operational profile

The buyer's operational context - what the equipment must do.

The proposed fleet must perform within the following operational envelope. Vendors are expected to demonstrate their proposed configuration against these parameters in their submission, with supporting calculations or reference data.

4.1 Terminal layout & geometry

Total terminal area	Approximately 38 hectares
Quay length	720 m (two berths)
Maximum yard-to-quay haul distance	850 m one-way
Average haul distance per move	480 m round trip
Maximum gradient	4.5% (gate access ramp)
Working surface	Heavy-duty interlocking concrete pavers

4.2 Throughput & productivity

Annual throughput	Approximately 800,000 TEU
Peak-day throughput	Approximately 4,000 TEU
Tractor moves per shift (per unit, average)	110 - 130 moves
Tractor moves per shift (per unit, peak)	160 moves
Average load per move (mixed import / export)	24,000 kg gross trailer + container
Maximum load per move (heavy export)	32,000 kg gross
Required peak fleet availability	11 of 12 units (91.7%)

4.3 Duty cycle (representative)

The following duty cycle was developed by EngKaplan in consultation with client operations from a 30-day GPS log of the existing diesel fleet. Vendors must demonstrate that the proposed unit can sustain the cycle in the supplied charging architecture.

Parameter	Value	Notes
Shift duration	8 hours (two shifts per day, 16 h total)	Continuous operation
Active driving (% of shift)	72%	Higher than industry average
Idle / staging (% of shift)	21%	Used for opportunistic charging
Crew breaks (% of shift)	7%	Two breaks per shift, 17 min each
Average speed - laden	14 km/h	Quay-side, mixed traffic
Average speed - unladen	22 km/h	Yard transit
Maximum operating speed (constrained)	25 km/h	Terminal speed limit
Direction changes per shift (per unit)	210 - 260	Forward / reverse
Acceleration cycles per shift	320 - 380	0 to 14 km/h laden
Estimated kWh consumption per shift	Estimated 110 - 145 kWh	Based on similar comparable port duty cycle

4.4 Environmental conditions

Ambient temperature - operational range	-2 deg C to +42 deg C
Ambient temperature - peak summer 95th percentile	+38 deg C (4-hour sustained)
Relative humidity	20% to 95% (coastal)
Salt-spray exposure	Continuous - terminal is 80 m from waterline
Wind exposure	Sustained 25 m/s; gusts to 35 m/s during winter storms
Dust / particulate	Moderate - some bulk-cargo handling on adjacent berth
Lightning exposure	8 - 12 days of thunderstorm activity per year

4.5 Operator workforce

The terminal employs 36 terminal-tractor operators across two shifts. Average operator tenure is 8 years; average age 41. All operators hold the national Class C-equivalent licence and have completed in-house diesel-tractor certification. Battery-electric operator training (see section 13) must be delivered to all 36 operators plus 4 trainers, in two languages (Hebrew and English).

SECTION 5

Scope of supply

What the vendor must deliver under the contract.

The vendor's scope of supply comprises the items listed below. Items marked 'Required' must be in the base bid. Items marked 'Optional' may be priced separately and the buyer reserves the right to award them selectively.

5.1 Equipment

Qty	Item	Status
12	Electric terminal tractors per specification (see sections 6-11)	Required
1	Per-unit on-board diagnostic software licence (perpetual)	Required
1	Fleet-management telematics package per section 10	Required
12	Sets of OEM operator manuals (Hebrew + English)	Required
12	Sets of OEM service manuals (English)	Required
1	Initial spare-parts kit per section 13.3	Required
2	Cab simulator units for operator training	Optional

5.2 Charging infrastructure

Qty	Item	Status
6	DC fast-charger units per section 12	Required
1	Shared charging bus / power-management controller	Required
1	Transformer or transformer expansion (if vendor solution requires)	Required
1	LV distribution and protection (panels, breakers, RCDs)	Required
1	Charging-yard concrete pads and bollard protection	Optional
1	Cable-management retractable system	Optional

5.3 Services

Qty	Item	Status
1	Site survey and detailed engineering for charger installation	Required
1	Mechanical and electrical installation (turnkey)	Required
1	Pre-energisation testing of charging infrastructure	Required
1	Factory Acceptance Testing on each unit (vendor host)	Required
1	Site Acceptance Testing on each unit (terminal site)	Required
1	Operator training programme (36 operators + 4 trainers)	Required
1	Maintenance training for terminal in-house technicians (6 staff)	Required
1	2-year preventive maintenance contract option	Optional
1	5-year extended-warranty option	Optional

5.4 Out of scope

The following items are **not** part of the vendor's scope and are either provided by the buyer or by separate contract:

- MV electrical supply to the charger location (provided by buyer)
- Civil works for transformer pad and chamber (provided by buyer)
- Disposal of the legacy diesel fleet (separate contract)
- Operator retention / labour matters (buyer responsibility)
- Insurance during operation post-acceptance (buyer responsibility)

SECTION 6

General requirements

Cross-cutting requirements that apply to all equipment.

6.1 Standards compliance

Each unit shall be designed, manufactured, tested and delivered in compliance with the following standards. Where standards conflict, the more stringent shall apply unless the buyer agrees otherwise in writing.

Standard	Subject
ISO 22915-1:2025	Industrial trucks - verification of stability
ISO 3691-1:2023	Industrial trucks - safety requirements
EN 1175:2020	Safety of industrial trucks - electrical/electronic requirements
IEC 61851-1:2017	Electric vehicle conductive charging system - general
SAE J1772 / IEC 62196	Charging connector types (vendor declares which)
IEC 62133-2:2021	Lithium-ion battery safety
UN 38.3	Lithium-battery transport testing
ISO 9001:2015	Vendor quality management system
ISO 14001:2015	Vendor environmental management system
CE Marking	Per Machinery Directive 2006/42/EC

6.2 Country of manufacture

Vendor shall declare country of manufacture for the chassis, the powertrain, the battery pack, and the charger. The buyer applies no country-of-origin restriction provided all units pass compliance gates of section 6.1 standards. However, units assembled in EU, US, UK, Israel, Japan or South Korea receive +5 points in the technical evaluation matrix (see section 16).

6.3 Supply continuity

Vendor shall warrant the continued availability of the supplied model (and direct successors with confirmed parts compatibility) for a minimum of 12 years from final acceptance, including: (a) all consumables and wear items; (b) all electronics control units, including the battery management system and motor controllers; (c) all proprietary software, with at least one annual security/safety update during the warranty period.

6.4 Mediterranean climate hardening

All units delivered shall be configured for Mediterranean coastal operation. The following minimum specifications apply.

Item	Specification	Rationale
Battery thermal management	Active liquid cooling and heating	Passive cooling unacceptable due to ambient
Cabin HVAC capacity	Min. 4.5 kW cooling at 38 deg C ambient	Operator productivity at peak summer
Salt-corrosion protection	C5-M or higher per ISO 12944	Coastal exposure standard
High-voltage enclosure ingress protection	IP67 or higher	Salt spray + driving rain
Motor and gearbox housing	IP66 or higher	Dust + water protection
Wiring harness	Marine-grade tinned-copper, sleeved	Resists salt corrosion
Connectors	Sealed, marine-grade	No standard automotive connectors in HV path
Cathodic protection	On steel chassis, with replaceable anodes	Required for 12-year service life

6.5 Buyer-side service technician training

Vendor shall train six (6) of the buyer's in-house service technicians to a level sufficient to perform first-line preventive maintenance and second-line component swap. Training to be delivered in English at the vendor's facility (or at the buyer's terminal at the vendor's option), minimum 80 contact hours per technician.

SECTION 7

Mechanical specifications

Chassis, drivetrain, fifth wheel, axles, brakes, tires.

7.1 Chassis

Item	Specification	Notes
Configuration	4x2, fifth-wheel terminal tractor	Standard yard-tractor config
Wheelbase	3,000 - 3,600 mm	Vendor declares actual
Gross combination weight rating	>= 65,000 kg	With trailer + 40ft loaded
Curb weight (unladen)	8,500 - 11,500 kg	Vendor declares actual
Frame material	High-strength steel, S700MC or equivalent	For salt-environment durability
Frame coating	Hot-dip galvanised + C5-M topcoat	Coastal corrosion resistance
Service-life expectation	>= 60,000 operating hours / 12 years	Whichever is the lesser

7.2 Powertrain - mechanical aspects

Item	Specification	Notes
Drive configuration	Single rear axle, electric	Two-motor optional - vendor declares
Transmission	Direct drive or single-speed gearbox	No multi-speed transmission
Gear ratio (final drive)	Vendor declares	For peak laden gradeability requirement
Differential lock	Required (manual or automatic)	For wet-pavement conditions
Reverse capability	Same speed and torque as forward	Yard ops are bidirectional

7.3 Fifth wheel

Item	Specification	Notes
Type	Standard 50mm kingpin compatible	JOST or equivalent
Vertical loading capacity	>= 30,000 kg	Buyer load envelope
Horizontal coupling load (D-value)	>= 200 kN	Vendor calc per ISO 8716
Mounting	Air-cushion suspended hi-rise	Reduces shock loading on chassis
Lift mechanism	Hydraulic, single-acting	Self-levelling at coupling point
Sliding capability	Optional - vendor may price separately	Buyer not currently using sliding fifth wheels

7.4 Axles & suspension

Item	Specification	Notes
Front axle - rated capacity	>= 9,000 kg	Steered
Rear axle - rated capacity	>= 36,000 kg	Drive axle, single tyre
Front suspension	Parabolic leaf	Or equivalent
Rear suspension	Air bellows with shock absorbers	Controlled load on coupling
Steering	Hydraulic power steering, full-time	Per ISO 22915
Turning radius (kerb to kerb)	<= 7,500 mm	For terminal-yard manoeuvrability

7.5 Brakes

Item	Specification	Notes
Service brake	Air-actuated drum or disc, both axles	Electronic Brake System (EBS) preferred
Regenerative braking	Required, blended with friction brakes	Min. 30% energy recovery in duty cycle
Parking brake	Spring-applied, air-released	Per EN 1175
Emergency brake	Automatic on loss of air pressure	Per ISO 3691-1
Brake performance test	FAT - 3 hot-stop tests at GCWR	Per ISO 22915-2 deceleration values

7.6 Tyres

Item	Specification	Notes
Size	12.00R20 or vendor equivalent	Vendor declares with rated load
Construction	Steel-belted radial	No bias-ply
Compound	Industrial / port duty	Resists scrub and side load
Tread pattern	Block-tread, omnidirectional	For mixed direction operation
Tyre pressure monitoring	OEM-fitted, displayed in cabin	TPMS per ISO 21750
Spare per fleet	4 mounted spare wheels included	See spare-parts kit, section 13

7.7 Towing eyes & recovery

Each unit shall be fitted with front and rear ISO-standard towing eyes rated for full GCWR recovery. The unit shall be safely recoverable in the event of full battery depletion (no creep capability) without requiring any vendor-specific tooling. Vendor shall provide recovery instructions in the operator manual.

SECTION 8

Electrical & powertrain specifications

Motor, battery, BMS, charging interface, regen, control.

8.1 Traction motor

Item	Specification	Notes
Type	Permanent-magnet synchronous (PMSM)	Or equivalent - induction acceptable
Continuous power rating	>= 130 kW	For sustained 14 km/h laden
Peak power	>= 220 kW for 30 s	For initial acceleration
Continuous torque	>= 1,800 Nm	At drive shaft
Peak torque	>= 3,200 Nm for 30 s	For initial acceleration
Cooling	Liquid-cooled, integrated with battery loop	Or independent loop - vendor declares
IP rating	IP66 minimum	Coastal port environment
Over-speed protection	Hardware + software interlock	Per ISO 3691-1

8.2 Battery pack

Item	Specification	Notes
Chemistry	LFP (lithium iron phosphate) preferred	NMC acceptable with thermal-management justification
Total useable energy	>= 230 kWh	After end-of-life reserve and SOC limits
Total nameplate capacity	Vendor declares	For warranty calculation
System voltage	Vendor declares	600 V DC typical for this class
Cycle-life warranty	>= 4,500 cycles to 80% SOH	At buyer-typical depth-of-discharge
Calendar warranty	>= 8 years	Pro-rated thereafter to 12 years
Thermal management	Active liquid cooling + heating	Mandatory - see section 6.4
Battery management system (BMS)	CAN-bus integrated, externally monitorable	Per ISO 11898
SOC accuracy	+/- 3% across operating range	For range prediction
End-of-life replacement	Modular, swappable in <= 8 hours	Without removing operator cabin

8.3 Charging interface

Item	Specification	Notes
Charging connector type	CCS Combo 2 (IEC 62196-3) preferred	Vendor may propose alternative with justification
On-board AC charger	Optional, 22 kW maximum	For emergency / off-port charging
DC fast-charge port	Required, vendor-declared peak rate	125 kW minimum, see section 12
Charging-while-stationary only	Acceptable	No in-motion / catenary charging
Communication protocol	OCPP 2.0.1 or equivalent	For fleet-management integration
Plug-and-charge	ISO 15118-20	Required for operator convenience
Pre-conditioning capability	Required	Battery thermal pre-conditioning during charge

8.4 Regenerative braking

Item	Specification	Notes
Regen blend with service brake	Required - automatic blending	Per EN 1175
Regen during deceleration only	Or coast-down - vendor option	Operator-selectable preferred
Regen energy capture in duty cycle	Min 30% of braking energy	Vendor calc with proof in FAT
Regen disable on low traction	Required - automatic on wet pavement	Per ISO 3691-1 deceleration profile

8.5 Control system & cybersecurity

Vendor's vehicle control unit (VCU) shall comply with ISO 26262 ASIL-C or higher for safety-critical functions. CAN-bus segregation between powertrain and infotainment networks is required. Cybersecurity per ISO 21434 with documented threat-model and an annual security update covering the warranty period.

8.6 HVAC system

Item	Specification	Notes
Cabin cooling capacity	>= 4.5 kW at 38 deg C ambient	Buyer Mediterranean summer envelope
Cabin heating capacity	>= 3.0 kW at -2 deg C ambient	Winter shoulder period
Recirculation mode	Required, with operator control	For dust and salt-spray management
Filter type	EU3 minimum, replaceable	Replaceable from cabin without service tool
Power source	Powered from traction battery via dedicated DC-DC	Sized so that HVAC at peak does not exceed 4% of duty energy

SECTION 9

Cabin, ergonomics & safety

Operator cabin, controls, visibility, safety systems.

9.1 Cabin construction

Item	Specification	Notes
Cabin type	Closed, climate-controlled	No open / canopy-only
Mounting	Hi-rise, vibration-isolated	Min. 350 mm above chassis
Visibility - 360 degree	Required, glass + camera assist	No mirror-only blind spots
Operator door	Single, full-height, both sides	Pressurised against dust ingress
Operator seat	Air-suspended, lumbar adjustable, with safety belt	ISO 7096 vibration class EM2
Cabin glazing	Tinted, laminated, fragmentation-safe	UV protection >= 99%
Cabin defrost / demist	Front and side, fast-clear	<= 90 s to clear in 5 deg C ambient

9.2 Operator controls & HMI

Item	Specification	Notes
Steering	Power-assisted, tilt-adjustable	Per ISO 10968
Pedal layout	Standard 2-pedal (accelerator + brake)	No clutch
HMI display	>= 9-inch colour touch + readable in direct sun	1000 cd/m^2 minimum
Display language	Hebrew + English + 4 user-selectable	Switchable from operator settings
Emergency stop	Mushroom button, in-cabin and on chassis	Per ISO 13850
Pedestrian-warning sound	Required, AVAS per UN R138	For bystander safety
Operator-presence sensor	Required - tractor disabled if seat unoccupied >5s	Per EN 1175

9.3 Safety systems

Item	Specification	Notes
Forward-collision warning	Required, with auto-emergency-braking	Up to 25 km/h
Reverse-camera + radar	Required	Auto-engage on reverse selection
Side blind-spot sensors	Required, both sides	Audible warning at <= 1 m
Speed limiter	Programmable, default 25 km/h, raised by buyer	Per terminal speed regs
Stability control	Required, with rollover prediction	Per ISO 22915
Roll-over protective structure (ROPS)	Required	Per ISO 3471
Falling-object protection (FOPS)	Required - level II	Container-handling environment
Fire-suppression system	In battery compartment, automatic	NFPA 17A or equivalent
Battery isolator	Driver-accessible from cabin + external	For emergency response

SECTION 10

Telematics & telemetry

Fleet-management, data ownership, integration.

Open and integrable telematics is mandatory. Closed proprietary-cloud-only telematics are non-compliant. The buyer requires the ability to integrate fleet telematics into existing terminal operating system (Navis N4) and into the buyer's central data warehouse without ongoing vendor licensing costs beyond the original purchase.

10.1 Data the buyer must receive

Item	Specification	Notes
Vehicle position (GPS)	1 Hz minimum	For yard-management integration
Vehicle speed	1 Hz	For safety / training analytics
SOC (state-of-charge)	0.2 Hz	For range prediction
SOH (state-of-health)	On change, daily summary	For battery warranty management
Energy consumed (kWh)	On charge cycle + per shift	For TCO modelling
Operator ID	On login event	For training analytics
Fault codes	Real-time on raise + summary daily	For maintenance integration
Charging events	Real-time + summary	For charger utilisation metrics
Tyre pressure (per wheel)	0.05 Hz	For safety + scheduled maintenance
Brake-pad wear	Daily summary	For maintenance scheduling

10.2 Integration architecture

Item	Specification	Notes
Open API endpoint	Required - REST or OPC-UA	No proprietary-only protocols
Authentication	OAuth 2.0 or equivalent	Buyer-managed credentials
Data residency	EU + Israel only	No data transit through unrestricted jurisdictions
Data export	Bulk CSV or Parquet, monthly	For buyer data warehouse
Data retention	Lifetime of vehicle + 7 years post-disposal	For warranty + regulatory
Cybersecurity per ISO 21434	Required - documented threat model	With annual security updates

SECTION 11

Performance & duty-cycle requirements

Quantified performance vendor must demonstrate.

11.1 Performance envelope

Item	Specification	Notes
Maximum speed - laden	>= 25 km/h on level	Speed-limited to 25 km/h in operation
Maximum speed - unladen	>= 30 km/h on level	Speed-limited to 25 km/h in operation
Gradeability laden	>= 8% on dry pavement	4.5% buyer maximum + safety factor
Gradeability unladen	>= 15%	For empty repositioning on grade
Acceleration 0-14 km/h laden	<= 9 s	For yard productivity
Reverse acceleration	<= 11 s 0-12 km/h laden	Bidirectional duty cycle
Service brake stopping distance	<= 10 m from 25 km/h laden	Per ISO 22915 deceleration profile

11.2 Energy / range performance

Item	Specification	Notes
Range per full charge - duty cycle	>= 8 hours operational	Section 4.3 duty cycle profile
Charging time 20% to 80% SOC	<= 45 minutes	At 125 kW DC fast charge
Charging time 0% to 100% SOC	<= 90 minutes	For overnight scenarios
Fleet-level availability	>= 91.7% (11 of 12 units)	In duty cycle, with planned maintenance

11.3 Demonstration in FAT

Vendor shall demonstrate in FAT (factory acceptance test) that the supplied unit meets the performance envelope above. The following tests are mandatory; the vendor may propose additional tests for robustness:

Test	Procedure	Acceptance
Loaded acceleration test	0 to 14 km/h with rated load (32,000 kg)	Time + power draw
Loaded reverse test	0 to 12 km/h reverse with rated load	Time + power draw
Hot-stop brake test	Three consecutive emergency stops at GCWR	No fade beyond ISO 22915 envelope
HVAC capacity test	38 deg C ambient, sustained 4 hours	Cabin held at 22 deg C
Range simulation	Duty cycle on dynamometer	Min. 8 hours operation profile
Charge cycle test	20%-80% with 125 kW DC	<= 45 min
Pre-conditioning test	Battery thermal pre-condition before charge	No charge derate at -2 deg C ambient

SECTION 12

Charging infrastructure requirements

DC fast chargers, transformer, distribution, controls.

12.1 Charger units

Item	Specification	Notes
Quantity	6 fast-charger ports	See section 5.2
Per-port peak power	>= 125 kW DC	Type-2 CCS or vendor-declared
Total connected load (peak)	<= 750 kW	Subject to power-management controller
Power-management controller	Required, dynamic load balancing	Limits to 600 kW grid draw
Charger location	In dedicated charging yard	See site survey
IP rating	IP54 minimum	Outdoor coastal
Operating temperature	-10 deg C to +50 deg C	No derating in operating range
Maintenance access	Front-only service	Vendor declares clearance

12.2 Grid connection

Item	Specification	Notes
Voltage	400 V AC, 3-phase	Standard MV-LV transformer secondary
Power factor (after correction)	>= 0.95 lagging	For grid-side compliance
Total harmonic distortion (THD)	<= 5% per IEEE 519	Or local-grid stricter
Grid-disturbance immunity	IEC 61000-4 family compliance	Resilient to coastal storm events
Black-start capability	Optional, vendor priced	For grid resilience

12.3 Charger software & integration

Item	Specification	Notes
Communication	OCPP 2.0.1	For fleet management
Authentication	ISO 15118 plug-and-charge	Operator-transparent
User interface	Graphical, multilingual + accessibility	Same languages as cabin HMI
Remote monitoring	Real-time charger status	Via vendor or buyer interface
Remote configuration	Required, with audit log	For load-balancing tuning
Open-protocol grid integration	IEC 61850 or equivalent	For grid-aware operation

12.4 Site civils & protection

The charger location requires site protection against vehicle impact (common in terminal yards). Vendor shall propose: (a) bollard installation around each charger; (b) painted floor markings for charger zones; (c) overhead protection if charger is located near a yard-traffic lane.

SECTION 13

Documentation, training & spares

Manuals, training programme, spare-parts kit.

13.1 Documentation

All documentation provided in English by default; safety-critical and operator-facing documentation also in Hebrew. Documentation provided in both digital (searchable PDF) and print format, with one print copy per unit.

Document	Quantity / scope	Notes
Operator manual	Per unit; English + Hebrew	Includes safety procedures
Service manual	Per unit; English	For buyer service technicians
Battery service manual	Per unit; English	High-voltage safety procedures
Parts catalog	One per fleet; English; digital + print	With OEM part numbers and pricing
Wiring diagrams	Per unit; English	Full schematic, layered
Charging-infrastructure manual	One; English	Maintenance + troubleshooting
FAT / SAT certificates	Per unit, signed	Returned by EngKaplan witness
CE declaration of conformity	Per unit	Per Machinery Directive
Compliance certificates	Per standard listed in section 6.1	Per unit

13.2 Training

Vendor shall deliver training to two distinct audiences:

Operators (36 + 4 trainers). Minimum 16 contact hours per operator, covering: (a) battery-electric powertrain familiarisation; (b) safe high-voltage operation; (c) regenerative-braking handling; (d) charging station operation; (e) fault-code identification and operator-level response. Training in Hebrew and English. On-site at the buyer's terminal. Instructor-led with practical exercises.

Service technicians (6). Minimum 80 contact hours per technician, covering: (a) HV safety and personal protective equipment; (b) preventive maintenance procedures; (c) battery removal / installation; (d) component swap (motor, BMS, contactors); (e) charger troubleshooting. Training at vendor facility (or buyer terminal at vendor's option), in English.

13.3 Initial spare-parts kit

The vendor shall include the following spare-parts kit in the base bid. Pricing is also requested for an extended 5-year spares package (priced separately).

Item	Quantity	Notes
Mounted spare wheels (12.00R20)	4	For fleet immediate use
Brake pad sets	2 per vehicle	Service-brake
Air-system filters	2 per vehicle	For dry coastal air
HVAC filters	4 per vehicle	EU3 grade
Headlight assemblies	2 per fleet	LED
Mirror assemblies	2 per fleet	Driver + co-driver side
CAN-bus cable assemblies (assorted)	1 set per fleet	
HV-bus connectors	1 set per fleet	For service interventions
Service-tool kit	1 per fleet	For preventive maintenance procedures
Recommended OEM lubricants and consumables	6 months supply	Per OEM service schedule

SECTION 14

Acceptance criteria

Factory acceptance test (FAT) + Site acceptance test (SAT).

Each unit shall be subject to FAT at the vendor's facility prior to shipment, and SAT at the buyer's terminal prior to commercial release. Both tests shall be witnessed by EngKaplan as the buyer's independent representative.

14.1 Factory acceptance test (FAT)

The FAT confirms that the manufactured unit meets the agreed specification before shipment. The buyer (or buyer's representative) is invited but is not required to attend; if not attending, the FAT report shall be signed by EngKaplan as witness and forwarded to the buyer for acceptance.

Activity	Acceptance criteria	Notes
Visual inspection	No deviations from drawings, no damage	Per check-list
Configuration verification	Match against purchase order	Serial numbers, options
Functional test	All major systems tested	Including HV systems
Performance demonstration	Per section 11.3	Acceleration, brake, range, charge
Safety demonstration	E-stop, presence sensor, AEB	Per section 9.3
Documentation review	All section 13 documents present	In agreed languages
Commissioning checklist	Vendor-supplied, EngKaplan-signed	For each unit

14.2 Site acceptance test (SAT)

The SAT confirms that the unit performs at the buyer's terminal, with the buyer's charging infrastructure, in the buyer's operating environment. SAT extends across both unit and infrastructure.

Activity	Acceptance criteria	Notes
Unit functional handover	Same checklist as FAT, repeated on site	Verifies no shipping damage
Charging compatibility	Each unit charges from each charger	Verifies installation
Telematics integration	Data flows to buyer's OT systems	Per section 10
Operational shake-down	5 days normal duty cycle	No critical faults
Operator handover	All trained operators sign-off	Per section 13.2
Punch list closure	All snags closed within 30 days	Or otherwise mutually agreed

14.3 Liquidated damages

If FAT or SAT cannot be passed by the agreed date through vendor responsibility, liquidated damages of EUR 600 per unit per day shall apply, capped at 8% of contract value. Critical-item failures (battery, motor, BMS) require full unit replacement at vendor's cost.

SECTION 15

Warranty & service terms

Coverage, response times, parts continuity.

Item	Specification	Notes
Whole-machine warranty	24 months from final acceptance	No mileage / hour cap
Battery warranty	8 years to 80% SOH	Pro-rated thereafter to 12 years
Motor + drive warranty	5 years	Including bearings
Chassis structural warranty	5 years	Coastal corrosion failure inclusive
Charger warranty	5 years	Per charger unit
Parts warranty (replacement)	12 months from supply	Pro-rated thereafter
Service-response time - critical	<= 24 hours	Vendor representative on-site
Service-response time - non-critical	<= 5 working days	On-site or remote
Vendor service centre proximity	<= 200 km road distance	See section 6.5
Spare-parts continuity	12 years from final acceptance	Per section 6.3
Software / cybersecurity updates	Annual minimum	For 12 years from delivery
Optional - extended warranty (5 yrs)	Vendor priced separately	See section 5.3

SECTION 16

Vendor evaluation matrix

How submitted bids are scored.

Bids are scored against the matrix below. Each criterion is weighted as shown. Bids must pass the section 3 compliance gate before scoring; non-compliant bids are rejected without scoring. The total score is the weighted sum.

Criterion	Weight	Scoring basis
1. Technical compliance	**40%**	Score of compliance against sections 7-12. Vendor must respond to each spec line item with comply / partially comply / non-compliant. Partial complies require justification.
2. Total cost of ownership	**25%**	Capex + operational energy + scheduled maintenance + battery replacement + tyre replacement, NPV over 12 years at buyer's discount rate.
3. Service / aftercare	**15%**	Local service centre presence, response time, parts continuity, training quality.
4. Reference projects	**10%**	Past port-equipment EV deployments of comparable scale and climate.
5. Country of manufacture origin	**5%**	See section 6.2 - origin bonus.
6. Vendor financial standing	**5%**	Verified via independent business credit data.
TOTAL	**100%**	

Compliance gate

Bids must pass **all six headline requirements from section 3** before scoring on this matrix. Bids that fail any of the six are rejected. The buyer will not award solely on lowest cost: a bid scoring 65% or below on technical compliance shall be rejected even if the lowest cost.

SECTION 17

Standards & references

Full standards bibliography.

All standards listed below apply to the design, manufacture, testing, and acceptance of the equipment. Where the vendor proposes a more recent edition or an equivalent national standard, the vendor must provide a concordance document showing equivalence for the buyer's review.

Standard	Title / scope
ISO 3691-1:2023	Industrial trucks - safety requirements - Part 1: self-propelled industrial trucks
ISO 22915-1:2025	Industrial trucks - verification of stability - Part 1: general principles
ISO 22915-2	Industrial trucks - verification of stability - Part 2: counterbalance trucks
ISO 7096:2020	Earth-moving machinery - laboratory evaluation of operator seat vibration
ISO 9001:2015	Quality management systems
ISO 11898	Road vehicles - controller area network (CAN)
ISO 13850	Safety of machinery - emergency stop function
ISO 14001:2015	Environmental management systems
ISO 15118	Road vehicles - vehicle to grid communication interface
ISO 21434	Road vehicles - cybersecurity engineering
ISO 21750	Road vehicles - tyre pressure monitoring systems
ISO 26262	Road vehicles - functional safety
ISO 12944	Paints and varnishes - corrosion protection
IEC 61851-1:2017	Electric vehicle conductive charging system - general
IEC 62196	Plugs, socket-outlets, vehicle connectors - charging interface
IEC 62133-2:2021	Lithium-ion battery safety
IEC 61000-4	Electromagnetic compatibility
IEC 61850	Communication networks for power utility automation
IEC 60529	Degrees of protection (IP code)
IEEE 519	Recommended practice for harmonic control
SAE J1772	Electric vehicle conductive charge coupler
UN 38.3	Lithium-battery transport testing
UN R138	Quiet road transport vehicles - acoustic vehicle alerting system

Standard	Title / scope
NFPA 17A	Wet chemical extinguishing systems
OCPP 2.0.1	Open charge point protocol
Machinery Directive 2006/42/EC	CE marking

SECTION 18

Submission requirements & contact

How vendors should respond to this specification.

18.1 Submission requirements

Bids shall be submitted in electronic form to the buyer's procurement officer (contact details in RFP-2026-014). Each bid must include:

- Compliance response - full line-by-line response to sections 6-15 of this specification, marking each line as Comply / Partially Comply / Non-Compliant with justification
- Technical proposal - including all relevant calculations (energy consumption, gradeability, range)
- Charging infrastructure proposal - including site survey, single-line diagram, transformer sizing
- Reference projects - minimum 2 prior port-equipment EV deployments at comparable scale
- Total Cost of Ownership model - 12-year NPV at buyer's discount rate (provided in RFP-2026-014)
- Capex breakdown - by line item per section 5 scope
- Project schedule - delivery, installation, FAT, SAT, training
- Vendor financial statements - last 3 years
- Signed confidentiality undertaking

18.2 Q&A round

Vendors may submit questions in writing during the Q&A round. Questions and answers will be circulated to all invited bidders. The Q&A window closes 21 calendar days before the bid submission deadline.

18.3 Procurement advisor contact

This specification was prepared by EngKaplan as independent procurement advisor to the buyer. EngKaplan is the buyer's technical-question contact during the Q&A round. EngKaplan does not represent any vendor and has no commercial interest in the contract award.

Procurement advisor	EngKaplan
Lead contact (technical questions)	Gil Kaplan, P.E. - gil.kaplan@engkaplan.com
Coordination contact	Lior Kaplan - lior.kaplan@engkaplan.com
Address	Rakefet 32, Carmei Yosef 7611202, Israel
Web	engkaplan.com
Trading status	Trading name under Gil Kaplan - Israeli sole proprietorship - VAT 010228823

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