Technical Specification
for
Manufacture and Supply of

Turnouts Carrier Tilting Wagon

E-03-0005

April 2019
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1. **SCOPE**

1.1 This document describes the technical requirements for the Turnouts Carrier Tilting Wagon ("TCTW").

1.2 The TCTW shall be Railbound Machine designed to carry and transport new or used, assembled or preassembled - Switch Panel; Closure Panel; Crossing Panel ("Turnouts Panels"), mounted on bearers), with not less than 24.6 [meter] long, and not less than 4.8 [meter] width, and with maximum Turnout Panel payload of 33.1 [ton]. The Turnouts General Layouts Drawings described in Technical Appendix A.

1.3 The TCTW design shall ensure, when towed as a single wagon or part of train formation, a clear and safe running on single and double track/s as well as between station platforms and in tunnels, without exceeding Israel Railways Loading Gauge and Israel Railways Tunnel Cross Sections, specified in Technical Appendix C.

1.4 Unless otherwise and to the extent specified hereafter, the TCTW shall comply in every aspect with the latest edition of EN14033-1, EN14033-2, EN14033-3, EN14363 prEN16860, and Directive 2006/861/EC.

1.5 The TCTW and all its systems shall be designed to carried out the operation on all track types of track found on ISR track network to include:
   a. Main lines;
   b. Construction lines;
   c. Station tracks;
   d. Level crossings;
   e. Turnouts, Crossings and Expansion Switches;
   f. Guarded track to include track with guard or check rails;
   g. Jointed track to include track with standard or insulated joints;
   h. Tracks with axle counters;
   i. Tracks with lubricators systems.

1.6 The TCTW shall be designed to be operated with the same efficiency near high voltage electrical wire line, OCS track with
25k VAC and on non-electrified track with CWR and jointed track. A statement approving it, shall be submitted.

1.7 The TCTW shall be designed to ensure the highest efficient and uniform operation performances, on track with the gradient of 0‰-35‰ at minimum, with the TCTW maximum travelling speed.

1.8 The TCTW shall be designed to conform to the noise reduction and vibration while operating or traveling in accordance with the requirements specified in EN 14033-3. Relevant documents on noise and vibration compliance with the requirements of EN14033-3 shall be submitted.

2. **REFERENCE DOCUMENTS**

The TCTW shall comply with the latest edition of:

- **EN12080** Railway applications – Axleboxes – Rolling bearings;
- **EN13103** Railway applications – Wheelsets and bogies – Non-powered axles – Design method;
- **EN13260** Railway applications – Wheelsets and bogies – Wheelsets – Product requirements;
- **EN13261** Railway applications – Wheelsets and bogies – Axles – Product requirements;
- **EN13262** Railway applications – Wheelsets and Bogies – Wheels – Product Requirement
- **EN13715** Wheelsets and Bogies – Wheels – Wheels tread;
- **EN13749** Wheelsets and Bogies – Methods of Specifying Structural Requirements of Bogie Frame;
- **EN13803** Railway applications. Track. Track alignment design parameters. Track gauges 1 435 mm and wider;
- **EN13979-1** Wheelsets and Bogies – Monobloc Wheels – Technical Approval Procedure;
EN14033-1  Rail bound construction and Maintenance Machines - Technical requirements for running;

EN14033-2  Rail bound construction and maintenance machines - Technical requirements for working;

EN14033-3  Rail bound construction and maintenance machines – General Safety Requirements;

EN14198  Railway applications. Braking. Requirements for the brake system of trains hauled by locomotives;

EN14363  Testing for the acceptance of running characteristics of railway vehicles - Testing of running behavior and stationary tests;

EN15085-1  Railway applications–Welding of railway vehicles and components–Part 1: General;

EN 15085-2  Railway applications. Welding of railway vehicles and components – Part 2: Quality requirements and certification of welding manufacturer;

EN15085-3  Railway applications. Welding of railway vehicles and components – Part 3: Design requirements;

EN 15085-4  Railway applications. Welding of railway vehicles and components–Part 4: Production requirements;

EN15085-5  Railway applications. Welding of railway vehicles and components–Part 5: Inspection, testing and documentation;

EN15329  Railway applications. Braking. Brake block holder and brake shoe key for railway vehicles;
<table>
<thead>
<tr>
<th>Reference</th>
<th>Description</th>
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<tbody>
<tr>
<td>EN15528</td>
<td>Railway applications - Line categories for managing the interface between load limits of vehicles and infrastructure;</td>
</tr>
<tr>
<td>EN15566</td>
<td>Railway applications. Railway rolling stock. Draw gear and screw coupling;</td>
</tr>
<tr>
<td>EN15663</td>
<td>Railway applications - Vehicle reference masses;</td>
</tr>
<tr>
<td>EN 15839</td>
<td>Railway applications. Testing for the acceptance of running characteristics of railway vehicles. Freight wagons; Testing of running safety under longitudinal compressive forces;</td>
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<tr>
<td>EN16116-2</td>
<td>Railway applications - Design requirements for steps, handrails and associated access for staff - Part 2: Freight wagons;</td>
</tr>
<tr>
<td>EN 50153</td>
<td>Railway applications — Rolling stock — Protective provisions relating to electrical hazards</td>
</tr>
<tr>
<td>prEN16860</td>
<td>Railway Applications - Requirements and general principles for securing payload in rail freight transport;</td>
</tr>
<tr>
<td>UIC432</td>
<td>Wagons - Running speed - Technical conditions to be observed;</td>
</tr>
<tr>
<td>UIC510-1</td>
<td>Wagons - Running Gear - Normalization;</td>
</tr>
<tr>
<td>UIC520</td>
<td>Wagons coaches and vans - Draw gear - Standardization;</td>
</tr>
<tr>
<td>UIC527-2</td>
<td>Coaches vans and wagons – Dimensions of buffer heads – Track layout on S-curves;</td>
</tr>
<tr>
<td>UIC533</td>
<td>Railway applications — Rolling stock — Protective provisions relating to electrical hazards</td>
</tr>
<tr>
<td>UIC541-1</td>
<td>Brakes — Regulations concerning the design of brake components;</td>
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</table>
UIC541-4  Brakes – Brakes with composite brake blocks – General conditions for certification of composite brake blocks;

UIC541-08  Brakes — Regulations concerning the manufacture of the different brake parts - Derailment detectors for wagons;

UIC542  Brake parts – Interchangeability;

UIC543  Brake — regulations governing the equipment of trailing stock;

UIC554-1  Power supply to electrical equipment on stationary railway vehicles from a local mains system or another source energy at 220 [V] or 380 [V], 50 [Hz];

UIC895  Technical Specification for the supply of insulated electric cables for railway vehicles;

ISO/IEC8859-8  Information technology - 8-bit single-byte coded graphic character sets. Latin/Hebrew alphabet;

SI60309-1  Plugs, socket-outlets and couplers for industrial purposes - General requirements;

SI60309-2  Plugs, socket-outlets and couplers for industrial purposes - Dimensional interchangeability requirements for pin and contact-tube accessories;

Directive 2006/861/EC  the technical specification of interoperability relating to the subsystem ‘rolling stock — freight wagons’ of the trans-European conventional rail system

Directive 2016/1628  Requirements relating to gaseous and particulate pollutant emission limits and type-approval for internal combustion engines for non-road mobile machinery;

Directive 2014/68/EU  The harmonization of the laws of the Member States relating to the making
available on the market of pressure equipment.

3. **DEFINITIONS**

3.1 Closure Panel as defined in EN 13231-1, section 6.1;
3.2 Crossing Panel as defined in EN 13231-1, section 6.1;
3.3 NoBo as defined in the Agreement, section 11;
3.4 Switch Panel as defined in EN 13231-1, section 6.1;
3.5 TCTW as defined in section 1.1;
3.6 Turnouts Panels as defined in section 1.2;

4. **GENERAL REQUIREMENTS**

4.1 The ISR Railways Tracks Data, which are specified in the Technical Appendix B shall be taken into consideration during the TCTW design process, with the following exception the TCTW shall design for track superelevation $180 \text{ [mm]}$, following EN13803.

4.2 The TCTW frame, suspension, operation systems and braking system shall be designed to enable safe operation with maximum traveling speed and at gradient of up to 35‰, as a single vehicle as well as in train formation.

4.3 The Israeli climate with hot and dusty environmental conditions, specified in Technical Appendix D, shall be taken into consideration during the TCTW design process.

4.4 The TCTW design shall follow the EN standards and UIC codes for environment protection (like: noise; pollution; radiation, etc.).

4.5 The TCTW shall be designed with electric generator to enable operate it, when the main power is fail and/or to energize an additional TCTW.

4.6 The TCTW shall be designed to enable easy access to all its systems in order to perform operation, maintenance tasks and inspection.

4.7 The TCTW and its components welding shall comply with EN15085-1, EN15085-2, EN15085-3, EN15085-4, EN15085-5.
4.8 The TCTW shall have EN 15085-2 certificate for the welding of railway vehicles and components as well as ISO 3834-2 certificate for the manufacture of pressure equipment as defined in Pressure Equipment DIRECTIVE 2014/68/EU or latest. These certificate shall be provided.

4.9 The TCTW shall be designed to comply with the electrical protection measures and protection by earthing of metal parts in accordance with the requirements of EN14033-1; EN14033-2; 14033-3; EN50153; UIC 533. And shall ensure that The electrical resistance from the highest place on the machine to the running rails shall not be more than 0.05 [Ω].

4.10 The TCTW painting shall be carried out in accordance with UIC842-1; UIC842-2; UIC842-3; UIC842-4; UIC842-6.

5. **LOADING DECK PLATFORM REQUIREMENTS**

5.1 The TCTW shall be designed with two inclinable Loading Deck Platform.

5.2 The TCTW shall be designed to load, and unload the Turnout Panels on the deck at horizontal position.

5.3 The TCTW shall be equipped with electronic-hydraulic system, for the deck inclination, which enable the Turnout Panels transporting without exceeding Israel Railways Loading Gauge and Israel Railways Tunnel Cross Sections, specified in Technical Appendix C, TCTW layout drawing including front section view shall be submitted.

5.4 The Loading Deck Platform shall be designed with robust Locking Devices to ensure a secure and firmly fixing of turnouts panels during movement of the Loading Deck Platform and during the TCTW running and travelling.

5.5 The Locking Devices shall be part of Loading Deck Platform, and enabled easy manual adjustment and fixation.

5.6 Loading and locking operation shall possible without access the Loading Deck Platform. Moreover, the TCTW loading deck platform shall be equipped with steel safety Walking Grating to enable the safe reach.
The steel safety Walking Grating shall be with slip-resistant walking surfaces and maintenance-free. It shall comply with the requirements of EN16116-2.

5.7 The TCTW shall be designed to ensure that during the transportation Turnout Panels and loading deck platform are mechanically locked and secured, no hydraulic pressure shall be needed during transportation.

5.8 The TCTW shall be equipped with a Local Control Panel and Wireless Remote Control, technical description shall be provided.

5.9 The TCTW shall be designed to enable at least 1000 [mm] lateral shifting movement of the loading deck platform to ensure safe running on adjacent track on the left or on the right.

6. **FRAME AND UNDERFRAME CONSTRUCTION REQUIREMENTS**

6.1 The TCTW shall be design with the following basic operating characteristics:

<table>
<thead>
<tr>
<th>Operation Characteristics</th>
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<tbody>
<tr>
<td>6.1.1 Nominal Track gauge</td>
<td>1435 [mm]</td>
</tr>
<tr>
<td>6.1.2 Track gauge maximum</td>
<td>1470 [mm]</td>
</tr>
<tr>
<td>6.1.3 Track gauge minimum</td>
<td>1426 [mm]</td>
</tr>
<tr>
<td>6.1.4 Travel speed (towed)</td>
<td>120 [km/h]</td>
</tr>
<tr>
<td>6.1.5 Max gradient</td>
<td>35 %</td>
</tr>
<tr>
<td>6.1.6 Min curve radius on shunting area</td>
<td>120 [m]</td>
</tr>
<tr>
<td>6.1.7 Min curve radius on main lines</td>
<td>142 [m]</td>
</tr>
<tr>
<td>6.1.7 Max superelevation</td>
<td>180 [mm]</td>
</tr>
<tr>
<td>6.1.8 Max axle load</td>
<td>22.5 kN</td>
</tr>
<tr>
<td>6.1.10 Max. weight (loaded)</td>
<td>90 ton</td>
</tr>
</tbody>
</table>

6.2 The TCTW shall have counterweights with lateral movement, to ensure the TCTW central of gravity balance when different Turnout panels are loaded, to ensure safety operation.

6.3 The TCTW shall be equipped with Automatic Empty-load change-over device. Preferable Weighing valves type WM10.

6.4 Frame

6.4.1 The TCTW Frame and attachments shall design to withstand the static loads requirements in accordance to EN14033-1.
The corresponding structural categories shall be F-I or F-II.

6.4.2 The frame shall be made from rolled steel profiles and steel sheets, manufactured in accordance to the most modern process of welding techniques to ensure maximum strength. The elements comprising the structure of the body are duly welded between them and to the under frame in order to obtain and assembly of high resistance able to withstand the working loads.

6.4.3 The TCTW Frame and attachments shall withstand the strength for travelling and working modes requirements in accordance with EN 14033–2.

6.4.4 The Frame shall be equipped with Coupling and Buffers as follows:

- 1 central Draw Gear with an elastic draw system, in accordance with UIC520;
- 1 Draw Hook with a breaking force of 1,000 [KN], in accordance with UIC520;
- 1 Screw coupler with a breaking force of 850 [KN] in accordance with EN15566 and UIC520;
- 2 side buffers with a stroke of 150 [mm], at height of 1060 [mm], in accordance with EN15551 and EN15566 and buffer head in accordance with EN15551 and UIC527-2;
- 1 brake hose with valve.

6.5 Lifting and Jacking Points

6.5.1 The TCTW Frame shall be equipped with lifting points to be safely lifted or jacked, and Brackets re-railing in accordance with EN14033-1.

6.6 Hook for stowage on boats and for towing

6.6.1 The TCTW Frame shall be equipped with stowage hooks suitable for transport on boats, in accordance with the requirements of EN14033-1 and EN16116-2.

6.7 The Frame shall be equipped with the following items:

6.7.1.1 Handrails section;

6.7.1.2 4 lifting hooks for handling;
6.7.1.3 4 Side steps; the lowest step used for boarding the machine shall not exceed the loading gauge;

6.7.1.4 Walking Gratin.

6.8 Bogie and Running Gear
6.8.1 The TCTW Running Gear shall be designed in accordance with EN14033-1, unless specified otherwise.

6.8.2 The Running Gear shall be designed to travel and operate on the horizontal and vertical radii given in technical Appendix B.

6.8.3 The TCTW shall be equipped with a two-axle freight wagon bogie Y25 type with coil springs. Its design shall comply with EN14033-1, EN14033-2, EN14033-3, EN13749, EN15827 and UIC 510-1.

6.9 Wheels and Axles
6.9.1 The Wheels shall comply with the requirements of EN13262 and EN13979-1.

6.9.2 The Wheels shall be made of mono-block steel, category ER7 in accordance with EN13262.

6.9.3 The Wheel Profile shall comply with the requirements of EN13715, and shall have wheel nominal diameter of 920 [mm].

6.9.4 The Wheelsets shall comply with the requirements of EN 13260, EN13103 and EN13104. The design of the Wheelsets shall additionally take into account the forces generated during work.

6.9.5 The Axles shall comply with the requirements of EN 13261, EN13103 and EN13104. The design of the Axles shall additionally take into account the forces generated during work.

6.9.6 The Axles box bearing shall comply with the requirements of EN12080.

6.9.7 The Axles arrangement and axle load shall comply with the requirements of EN15528 and EN15663.

6.9.8 The Axles shall be of unalloyed carbon steel comply with the requirements of EN13261, EN13104 and EN13103 (if applicable).

6.9.9 The Design for longitudinal compressive forces shall comply the requirements of EN14033-1, and EN15839 for running the TCTW in any position in regular hauled freight trains.
6.10 BRAKING SYSTEM

6.10.1 General

The Braking System of the TCTW shall follow requirements of EN 14198.

The TCTW braking system shall be designed for single TCTW and/or train formation towing.

The TCTW shall be equipped with compressed air brake KNORR KE-GP-A. Brake equipment shall be in accordance to UIC543.

The following brake equipment shall be made and supplied by KNORR Germany: Headstock cocks type LH3 1 ¼”; On-off device (Hebrew name Plates-Knorr).

The Braking System shall include an air dryer, water separator and a full flow replaceable filter elements.

The Braking System, air reservoirs shall be equipped with an automatic moisture drain valve.

The brake systems components shall comply with the requirements of EN15329 and UIC541-1.

The brake systems relevant components shall comply with the requirements of UIC542.

The brake system shall be equipped with composite brake blocks, in accordance with UIC541-4;

6.10.2 Parking brake

The TCTW shall be fitted with a hand wheel to keep the train stationary in shut down configuration for an indefinite period of time without energy supply.

The parking brake shall be accessible from both sides of the TCTW.

The parking brake performances shall comply EN14033-1;2

7. ENGINE

7.1 General

7.1.1 The TCTW shall be equipped a Water cooled Diesel-Engine with an output of at least 110 [kW] with an alternator for electric power of 24 [VDC] – with at least 100 [A].

7.1.2 The Engine shall be fixed to the frame by means of metal-rubber springs and dampers.
7.1.3 The Engine emission shall be Stage V, or more advanced Stage, for category railcar engine in accordance with European Directive 2016/1628 or latest. Technical description shall be submitted.

7.1.4 The Engine position shall enable easily accessible.

7.2 Engine Cowling
7.2.1 The Engine Cowling shall ensure low noise level and vibration reduction,

7.2.2 The Engine Cowling shall be designed with easy access to all elements.

7.3 Engine Cooling System
7.3.1 The Engine Cooling System shall enable continuous safe operation of the Engine at the ambient conditions given in Technical Appendix A.

7.3.2 The loss in heat transfer efficiency due to the hot and dusty environment shall be taken into consideration.

7.4 Fuel System
7.4.1 The Fuel System shall include a tank with 150 [liter] capacity.

7.4.2 Fuel System shall be equipped with a sediment bowl and a full flow replaceable element filter.

7.4.3 The fuel tanks shall be equipped with diesel fuel tank filler necks with caps (locked with key) vertically positioned on both side of the TCTW.

7.5 Engine Protection System
7.5.1 Engine protection system shall protect the engine against:

- High coolant temperature;
- Low coolant level;
- Low oil pressure;
- High oil temperature;
- Low fuel level;
- Exceed allowed RPM's.

7.5.2 The engine shall be equipped with dry air filter.

7.6 Exhaust System
7.6.1 The Exhaust System shall be so located that it will cause no adverse temperature rise in any other part of the equipment and so that a minimum of heat and exhaust gas can reach the operator.
7.6.2 All Exhaust System piping shall be properly braced to eliminate shocks at all junctions, and at the interfaces between the manifold and muffler. Vibration dampeners shall be used.

7.6.3 The Exhaust System shall be secure with bracket to prevent expansion, vibration, and stress produced by operation of the machine.

7.6.4 The Exhaust System shall design not to exceed the loading gauge.

7.6.5 The Exhaust System components shall be from stainless steel.

7.7 Air Intake
7.7.1 The air filter for The Engine shall be of adequate size recommended by The Engine manufacturer and be equipped with a highly visible air filter restriction indicator.

7.7.2 The air filter shall be positioned to be readily accessible and shall operate with unrestricted outside air.

8. HYDRAULIC SYSTEM
8.1 The Hydraulic System shall be designed to be powered by the Engine/ Auxiliary Energy System/ External energizing TCTW.

8.2 The Hydraulic System shall be designed to ensure efficient operation under load conditions and ambient conditions in accordance with Technical Appendix A.

8.3 The Hydraulic System shall be equipped with oil cooling system.

8.4 The Hydraulic System shall be equipped with modern control valves guarantee the exact sequence of all hydraulic components.

8.5 The Hydraulic System oil tank shall be equipped with absorption and recoil filters.

8.6 The Hydraulic System reservoirs shall be designed to prevent entry of foreign matter, including water, and sized to protect the Hydraulic System against excessive heat or thermal conditions.

8.7 The Hydraulic System reservoirs shall include: baffles to separate intake and return lines to facilitate the separation of air and foreign matter from the hydraulic fluid; separate pump inlet from the settling portion of the tank to direct flow toward tank walls for maximum heat dissipation.
8.8 The Hydraulic System fluid shall be a Biodegradable synthetic hydraulic oil

8.9 The Hydraulic System shall be equipped with a backup hydraulic pump for emergency operation.

8.10 The TCTW shall be designed to ensure optimal access for cleaning, inspection, maintenance, and servicing of sump filters with an accessible means to empty the reservoir in the event the fluid is to be drained

9. ELECTRIC SYSTEM

9.1 General

9.1.1 The Engine Electric System shall generate 24 [VDC] power for starter, lights, control circuits, etc.

9.1.2 The TCTW shall include an electric generator with at least 10 [kVA] output.

9.1.3 The Electric Systems shall be designed in accordance with the relevant EN standards. Systems operates by means of alternating current (AC) shall designed and installed in accordance with Israel Electricity Law.

9.1.4 The TCTW shall be equipped with at least 8 sockets, 220 [VAC], around the TCTW frame.

9.1.5 All electric and electronic elements exposed to weather influences are in splash-proofed design.

9.1.6 The AC Electric System shall be protected by an Isolated Terra Monitors.

9.1.7 All electrical components shall meet EN and IEC safety requirements.

9.1.8 All electrical cables shall meet the requirements of UIC 895.

9.1.9 The TCTW shall be equipped with Plugs, socket-outlets and couplers, which shall comply with the SI 60309-1 and SI 60309-2 (Israeli standards based on the IEC 60309-1 and IEC 60309-2), to enable receive power supply from a local mains system or another source and/or connection of electrical appliances.

9.1.10 Plugs, socket-outlets shapes shall be of Israeli in used types (http://www.iec60309.com/).
9.2 **Batteries**
Two 12V DC-batteries shall be maintenance free type, in series, mounted on a sliding rack in insulated cabinet.
The batteries shall not produce emission of toxic gasses.
All electrical cables shall meet the requirements of UIC 895.

9.3 **External energizing TCTW**
9.3.1 The TCTW shall be designed to ensure its operation from an external electric power source for various purpose: tunnels, covered places etc.
The TCTW shall be design to receive power supply from a local mains system or another source of energy at 220-230 [VAC] or 380-400 [VAC], 50 [Hz]. System shall meet the requirements of UIC554-1.

9.4 **Lighting**
9.4.1 The TCTW shall include LED lighting system on each end for traveling and parking mode in accordance with EN14033-1;2.
9.4.2 The TCTW shall include LED lighting system on around the frame for working mode in accordance with EN14033-1;2;3.

10. **AUXILIARY ENERGY SYSTEM**
10.1 The TCTW shall be equipped with an additional backup aggregate system, driven by an independent combustion engine to operate the TCTW systems in the event of a partial/full power failure.
10.2 The auxiliary system shall allow normalization of TCTW and all components.
10.3 The auxiliary system shall be designed and shall energize at least one additional wagon with similar configuration in case of system failure.

11. **SAFETY EQUIPMENT**
11.1 The following safety equipment shall be installed on the wagon:
- 4 Rotating beacons (one each corner);
- 2 Electro-pneumatic warning horns (one to each direction);
- Fire alarm system with temperature and smoke detectors;
• 4 Horn push buttons on each corner of the vehicle;
• 4 Engine stop push buttons on each corner of the vehicle;
• 4 Emergency stopping devices for working equipment;
• At least 4 extinguisher elements.
• In case of engine and/or system control failure, the TCTW shall be designed with emergency override to ensure continuity operation.
• Electric derailment detectors comply with the requirements of UIC541-08.

12. **OPERATION AND MAINTENANCE CONTROLLERS SYSTEM**

12.1 The TCTW shall be equipped with Wireless Remote Control and Local Control Panel to enable the TCTW full operation and monitoring, from all sides of the TCTW.

12.2 The Wireless Remote Control and Local Control Panel shall be a smart type.

12.3 The TCTW operation shall be from the Wireless Remote Control and Local Control Panel, an operator choice.

12.4 The Wireless Remote Control during a connection failure shall be cable connected to TCTW to ensure continuity operation.

12.5 The TCTW controllers’ system shall diagnose and monitor faults that may occur in each one of the following vehicle systems: Drive line, Electric; Hydraulic.

12.6 The faults diagnosing and monitoring shall be displayed by computerized system which hardware and software shall be supplied as an integral part of the TCTW.

12.7 All the faults shall be described in coherent and logical messages.

12.8 The TCTW shall be equipped with lockable storage units for the Wireless Remote Control - with charging socket, and for the Local Control Panel.

All Panel labels shall be dual language Hebrew. Translation will be provided by ISR. Hebrew letter characters will be accordance with ISO/IEC 8859-8.
13. **TOOLBOX**

13.1 The TCTW shall be equipped with lockable toolbox in include suitable tools for operation and maintenance.

14. **PRODUCTION PROCESS**

14.1 The TCTW shall be designed and manufactured in accordance to a strict Quality Management System procedures following TSI, ISO9001, EN 14033-1; 2; 3, EN14363 and all other reference documents described in section 2, above.

14.2 The TCTW shall be checked and supervised by a Notified Body ("NoBo"), in accordance with the TSI, ISO9001, EN14033-1; 2; 3 and this Technical Specifications. As defined in the agreement.

14.3 A production process schedule shall be provided as part of the QAP.

14.4 **Quality Control and Quality Assurance Manual**

14.4.1 Together with the proposal the contractor shall submit to ISR a sample of his quality control and quality assurance manual.

14.4.2 The actual quality control and quality assurance plan (QAP), shall be provided as defined in the Agreement.

14.5 **Detailed Design Plan**

The Detailed Design Plan (DDP), shall be performed as defined in the Agreement.

14.6 **Inspection and Tests Plan**

14.6.1 Together with the proposal the contractor shall submit to ISR a sample of his Inspection and Tests Plan (ITP).

14.6.2 The actual Inspection and Tests Plan (ITP), shall include all the tests that will be performed by the manufacturer on TCTW during the production, including tests at major Subcontractors.

14.6.3 All parts for production including from the subcontractors, shall be checked and approved before assembling. All certificates shall be provided.

14.6.4 The ITP shall be provided as defined in the Agreement.

14.7 **First TCTW Manufactured for ISR**

The first TCTW shall be examined by ISR technical team, before entire series manufacturing completion.
14.8 Notified Body Report
Before the FAT the NoBo shall prepare, a full report on the TCTW production in accordance with Section 2 above, to be submitted during the FAT.

14.9 Foreign Acceptance Test
14.9.1 The Foreign acceptance test shall be carried out at manufacturer's premises (FAT) shall be conduct by ISR technical team, accompanied by NoBo by ISR request.

14.9.2 The TCTW FAT shall comply with the requirements of TSI, ISO9001, EN 14033-1; 2; 3 and this Technical Specifications requirements.

14.9.3 The FAT process shall include the TCTWs testing topics: running; travelling; working and safety, and in additional checking all linkage documentation.

14.10 Final Acceptance Test – TCTW Permit to operate
14.10.1 Tasks to be performed by the manufacturer before testing:
- Removal and cleaning the vehicle packaging and inhibiting materials
- Functional tests of all TCTW systems.
- Operation and maintenance personnel training.

14.10.2 The Final Acceptance Test shall include the following testing topics at ISR site:
- Towing and braking abilities in regards with ISR regulations (based on EN and UIC norms);
- Proper operating near axle counters and electric signaling;
- Comply with ISR loading gauge including OCS;
- Running, traveling and Working capabilities;

15. LIST OF DOCUMENTS TO BE SUBMITTED WITH BIDDER’S PROPOSAL
15.1 Technical description of the TCTW and each of its sub-system. Including operation, maintenance, and safety instructions, and
15.2 Reference letters from at least 2 customers.
15.3 Two NOBO certificate of previous TCTW manufacturing, from the same type and/or category.

15.4 TCTW layout drawing, including front section layout drawing, in reference to Israel Railways Loading Gauge specified and Tunnel Cross Sections specified in Technical Appendix C.

15.5 A statement approving that the RSDEV shall be designed to operate with the same efficiency near high voltage electrical wire line, on electrified track with 25k VAC and on non-electrified track with CWR and jointed track.

15.6 The technical description of Engine emission - Stage V, or more advanced Stage, for category railcar engine in accordance with European Directive 2016/1628 or latest.

15.7 The technical description of a Local Control Panel and Wireless Remote Control.

15.8 a sample of manufacturer quality control and quality assurance manual.

15.9 a sample of manufacturer Inspection and Tests Plan (ITP).

16. LIST OF DOCUMENTS TO BE SUBMITTED during FAT

16.1 Relevant documents on noise and vibration compliance with the requirements of EN14033-3 shall be submitted;

16.2 NoBo report including all the documentation the manufacturer which will be submitted to the NoBo, shall be provided in softcopy;

16.3 Parts certificates for production including from the subcontractors

16.4 All FAT linkage documentation in hard copy and softcopy.

16.5 Certificate for the welding of TCTW and components, as defined EN 15085-2.

16.6 Certificate for the manufacture of pressure equipment as defined in Pressure Equipment ISO 3834-2 DIRECTIVE 2014/68/EU.

17. LIST OF DOCUMENTS TO BE SUBMITTED with the TCTW supply:

17.1 The documentation will be provided in English and in Hebrew, both in softcopy and hardcopy formats.
17.2 The documentation package will include:
   a) System description
   b) Operator’s Manual for the TCTW and all systems
   c) Maintenance Manual for the TCTW and all systems which shall include all the preventive maintenance activities and repairs
   d) Safety Instruction for the TCTW and all relevant systems
   e) Engineering documentation including special processes for overhauling maintenance
   f) Pneumatic, hydraulic and electrical electronic detailed diagrams and integrative drawings.
   g) Illustrated parts catalog for all levels of repairs
   h) Fault diagnosis and troubleshooting charts for each system/sub-system.
   i) Inspection procedures and maintenance standards
   j) Table of service tools & equipment
   k) Complete periodic maintenance plan

17.2.1 Operators manual
The User Handbook / Operator’s Manual shall include the following information:
   a) Front cover page.
   b) Opening pages (list of revisions, table of contents, list of figures, list of tables, abbreviations and acronyms, safety conventions etc.)
   c) Chapter 1 – General Description: Scope, Overview, System Introduction, General Structure, Theory of Operation, General
Block Diagram, Functional Description, Interfaces, Technical Data, Drawings;

d) Chapter 2 – Detailed Description: Detailed description per sub-system and assembly, including general information, general structure, main functions, technical data, drawings;

e) Chapter 3 – Controls, displays and HMI;

f) Chapter 4 – System Operation: All operating sequences, steps before placing the system in service, system operation, system shutdown and steps after taking the system out of service;

g) Chapter 5 – Maintenance Guidelines: Includes Maintenance Activities Policy, Crew Level Maintenance Activities Policy;

h) Chapter 6 – Troubleshooting: For both BIT and symptom-based troubleshooting, includes all troubleshooting instructions, charts etc.;

i) Chapter 7 – Maintenance: Includes all maintenance activities of the user.

j) Chapter 8 - Safety Instruction.

17.2.2 Maintenance manual

The Maintenance Manual for each level of repair shall include the following information:

a) Front Cover Page.

b) Opening Pages (list of revisions, table of contents, list of figures, list of tables, abbreviations and acronyms, safety conventions etc.)

c) Chapter 1 – General Description: Scope, Overview, System Introduction, General Structure, Theory of Operation, General
Block Diagram, Functional Description, Interfaces, Technical Data, drawings.

d) Chapter 2 – Detailed Description: Detailed description per sub-system and assembly, including general information, general structure, main functions, theory of operation (General Block Diagram, Functional Description), interfaces, technical data. Pneumatic, oil, fuel, electrical and other systems will also be described according to their functional circuits, drawings.

e) Chapter 3 – Maintenance Guidelines: Includes Maintenance Activities Policy, Crew Level Maintenance Activities Policy.

f) Chapter 4 – Troubleshooting: Both BIT and symptom-based troubleshooting, including all troubleshooting instructions, screens, charts, fault diagnosis and use of any special maintenance tools or testing equipment.

g) Chapter 5 – Maintenance: Includes all maintenance activities for Preventive Maintenance and Corrective Maintenance, overhauling maintenance, such as inspections and maintenance tasks, repair procedures, material used, procedures for assembly and disassembly of sub-systems, assemblies and sub-assemblies, calibrations, topping of consumables etc.

h) Chapter 6 - Safety Instruction

17.2.3 System Description manual

The System Descriptive Manual shall include the following information:

a) Front Cover Page.
b) Opening Pages (list of revisions, table of contents, list of figures, list of tables, abbreviations and acronyms, safety conventions, etc.)

c) Main systems detailed description (engine, fuel, oil, pneumatic etc.).

d) Software main modules description (power up, BIT etc.).

e) Hardware main modules description (EMDEC, Control cards, etc).

f) Appendixes.

17.2.4 Documentation Formats

All Documentation will be provided in the following as follow:

a) Hard copies (6 copies shall be provided)

b) Source files (MS Office, InDesign etc.)

c) PDF files (unlocked and data-copy-enabled).

17.2.5 Technical Documentation Package

The Technical Documentation Package shall be arranged as an interactive electronic technical manual (IETM), namely a high-quality database product. This IETM shall allow for multiple methods of accessing the data using full-text searching tool, or access to the required paragraphs or drawings using the table of contents hyperlinks, as well as for interactive cross-reference within each publication, and between different but related publications (e.g. cross-references between Maintenance Manual and Parts Catalogue).

The Technical Documentation Package shall include spare parts catalogues with illustrated parts breakdown (sub-contractor items included) with a set of section drawings or axonometric/”blow-up” drawings and a list for each one of the drawings including the following data elements:

- Item number on the drawing;
- Item name;
- Contractor’s part number;
Sub-contractor’s part number (for subcontractors parts);
Sub-contractor name;
Quantity per assembly.

All the documentation mentioned above shall be comprehensive to the extent that in the event of a failure of a working part of any manufactured component, maintenance personnel shall be able to refer the parts data books to obtain the model number of the component and order the required part without being compelled to dismantle the component.

This documentation shall be utilized in training inexperienced personnel for operation and maintenance and shall be based on the operation, maintenance and illustrated spare parts catalogue manuals specification.

The IETM user interface shall be in English only.

18. **TRAINING PACKAGE REQUIREMENTS**

As detailed in the Agreement section 5.7.
TECHNICAL APPENDIX A – TURNOUTS GENERAL LAYOUTS DRAWINGS

Will be provided separately
TECHNICAL APPENDIX B – ISRAEL RAILWAYS
TRACKS DATA

ISRAEL RAILWAYS TRACK SUPERSTRUCTURE

B.1. ISR railway network has CWR track with flash-butt and aluminothermic welds, and tracks with insulated joint rails and fishplates, in temporary situation also C-clamp.

B.2. Rail profiles: 60E1, 60E2, 54E1, 50E6, 49E1 and 46E2 in accordance with EN13674-1.


B.5. Standard track gauge: 1435 mm (-2, +5).


B.7. Type of sleepers: Universal monoblock concrete sleepers, Frank-vagon sleepers, wooden sleepers, steel sleepers.

B.8. Minimum number of sleepers of one km of track: 1667.

B.9. Minimum horizontal curve radius:
  ➢ Main line: 141 m;
  ➢ Secondary line: 120 m.

B.10 S-Curve: In some lines there are S-curves with short tangent section (6 m) and there are some without tangent.

B.11 Minimum vertical curve: 3000 m.

B.12 Vertical geometry: Maximum gradient 30‰.

B.13 Maximum cant (superelevation): 150 mm.

<table>
<thead>
<tr>
<th>Speed [km/h]</th>
<th>$V_{\text{max}} \leq 100$</th>
<th>$100 &lt; V_{\text{max}} \leq 160$</th>
<th>$160 &lt; V_{\text{max}} \leq 200$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum cant deficiency [mm]</td>
<td>$\leq 110$</td>
<td>$\leq 100$</td>
<td>$\leq 60$</td>
</tr>
</tbody>
</table>

ISRAEL RAILWAYS TRACK LOAD

B.15. **Maximum traffic speed**: 160 km/h.

B.16. **Potential Traffic load**: 20 MGT per year.
TECHNICAL APPENDIX C – ISRAEL RAILWAYS LOADING GAUGE; ISRAEL RAILWAYS TUNNEL CROSS SECTIONS

Standard gauge ISR

1. 3.800 m - for permissible speed greater than 160 km/h up to 250 km/h.
2. 3.300 m - for speed greater than 60 km/h up to 160 km/h.
3. 0.000 m - for speed up to 60 km/h on the secondary lines, station and marshal yard lines.

Dimensions for new rolling stock. For existing rolling stock high and wide of maximum loading gauge for coach/loco - 0.750 m and 1.660 m.

Dimensions for Infrastructure gauge.

Dimensions for Rolling stock static gauge.

Area between tracks or outside of track for signaling equipment.

Area for passenger platforms, ramps and signaling systems.

Comments:
1. Dimensions on this sketch for straight line only.
2. Calculation of this dimensions in curve (see technical rules ISR).
3. Location of structures on the passengers platforms in relation to terminal tracks (see technical program for passenger station ISR).
4. All basic dimension of the ISR infrastructure reference profile follows the EN 15223 standard.
5. The ISR infrastructure gauge refers to GC Reference Profile.
Depending on tunnel dimension.

<table>
<thead>
<tr>
<th>ISRAEL RAILWAYS</th>
<th>DEVELOPMENT DIVISION</th>
<th>PLANNING DEPARTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dated</td>
<td>04/12/2013</td>
<td>Infrastructure ISR standard gauge with electrification for existing tunnels</td>
</tr>
<tr>
<td>Unit</td>
<td>mm</td>
<td>Drawn by:</td>
</tr>
<tr>
<td>Scale</td>
<td>1:50</td>
<td>Drawn:</td>
</tr>
<tr>
<td>Wording</td>
<td>01</td>
<td>ISRA 1004 v.01</td>
</tr>
<tr>
<td>Drawn</td>
<td></td>
<td>Drawn name</td>
</tr>
</tbody>
</table>
TECHNICAL APPENDIX D – CLIMATE AND ENVIRONMENTAL CONDITIONS

Climate and Environmental Conditions
Max. Ambient temp. +50 °C (shade)
Min Ambient temp. -5 °C
Relative humidity 10% to 90%
Altitude - 400 m to +800 m
Sunny hours per year 3300
UV Radiation MJ/m² per year 360-600
Rainfall mm/year 400-800
Dust Conditions in the atmosphere
(Microgram per m³ atmosphere)

<table>
<thead>
<tr>
<th>Salt Element</th>
<th>Na</th>
<th>Cl</th>
<th>SO₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position:</td>
<td>Season</td>
<td>Season</td>
<td>Season</td>
</tr>
<tr>
<td></td>
<td>Dry</td>
<td>Wet</td>
<td>Dry</td>
</tr>
<tr>
<td>Sea Air at Coast Line</td>
<td>7.3</td>
<td>16.0</td>
<td>12.0</td>
</tr>
<tr>
<td>600 m from Shore</td>
<td>3.1</td>
<td>4.8</td>
<td>4.2</td>
</tr>
<tr>
<td>6000 m from Shore</td>
<td>1.1</td>
<td>1.4</td>
<td>1.5</td>
</tr>
</tbody>
</table>