

**ISRAEL RAILWAYS LTD.**  
**INFRASTRUCTURE DIVISION**  
**TRACK AND RIGHT OF WAY DEPARTMENT**

**Technical Specifications**  
**for Manufacture and Supply of**  
**FISHPLATES SETS**

**for**

**Rails Joints:**

- **Fishplates Sets with 4 or 6 holes for 60E2 Rail Joints**
- **Fishplates Sets with 4 or 6 holes for 54E1 Rail Joints**
- **Fishplates Sets with 4 holes for 50E6 Rail Joints**
- **Transition Fishplates Sets with 4 holes for 60E2 /54E1 Rail Joints**
- **Transition Fishplates Sets with 4 holes for 54E1/50E6**
- **Transition Fishplates Sets with 4 holes for 54E1/46E2**

**No. E-01-0040**

**February 2019**



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**1. SCOPE**

1.1 These technical specifications describe the requirements for manufacture and supply of:

a) Rolled steel Fishplates with 4 or 6 holes and suitable Fastening Accessories ("**The Standard Fishplate Sets**"), to be assembled together on two rail segments with one of the following rail profiles: 60E2; 54E1; 50E6, to be assembled together on two rail segments with the same Rail Profile 60E2 or 54E1 or 50E6 into The Standard Mechanical Rail Joint ("**The Standard Mechanical Rail Joint**"),

and

b) Rolled steel Transition Fishplates with 4 holes and suitable Fastening Accessories ("**The Transition Fishplate Sets**"), to be assembled together on two different rail profiles of the following: 60E2/54E1; 54E1/50E6; 54E1/46E2 into The Transitional Mechanical Rail Joint ("**The Transitional Mechanical Rail Joint**"), all for use on railway tracks.

1.2 The Standard Fishplate Sets and The Transitional Fishplate Sets, together, shall be defined as The Fishplates Sets ("**The Fishplates Sets**").

1.3 The Standard Mechanical Rail Joint and The Transitional Mechanical Rail Joint, together or alone, shall be defined as The Rail Joint ("**Rail Joint**").

1.4 The Fishplates Sets shall be of the following types:

**1.4.1 Fishplates Sets Types:**

1)	Fishplates Sets with 4 holes for 60E2 Rail Joints (for one rail);
2)	Fishplates Sets with 6 holes for 60E2 Rail Joints (for one rail);
3)	Fishplates Sets with 4 holes for 54E1 Rail Joints (for one rail);
4)	Fishplates Sets with 6 holes for 54E1 Rail Joints (for one rail);
5)	Fishplates Sets with 4 holes for 50E6 Rail Joints (for one rail);
6)	Transition Fishplates Sets with 4 holes for 60E2/54E1 Rail Joints (for two rails - left and right in the track);
7)	Transition Fishplates Sets with 4 holes for 60E2/54E1 Rail Joints (for two rails - left and right in the track);
8)	Transition Fishplates Sets with 4 holes for 54E1/46E2 (for two rails - left and right in the track);.



1.5 The main components of The Fishplates Sets types shall be as follows:

1.5.1 **Fishplates Sets with 4 holes for one 60E2 Rail Joints:**

	<b>Component description</b>	<b>quantity</b>
1)	Fishplates 60E2 with 4 holes	2
2)	Square Head Bolts	4
3)	Hexagon Nuts with Collar	4
4)	Wedge Lock Washers	4

1.5.2 **Fishplates Sets with 6 holes for one 60E2 Rail Joints:**

	<b>Component description</b>	<b>quantity</b>
1)	Fishplates 60E2 with 6 holes	2
2)	Square Head Bolts	6
3)	Hexagon Nuts with Collar	6
4)	Wedge Lock Washers	6

1.5.3 **Fishplates Sets with 4 holes for one 54E1 Rail Joints:**

	<b>Component description</b>	<b>quantity</b>
1)	Fishplates 54E1 with 4 holes	2
2)	Square Head Bolts	4
3)	Hexagon Nuts with Collar	4
4)	Wedge Lock Washers	4

1.5.4 **Fishplates Sets with 4 holes for 50E6 Rail Joints:**

	<b>Component description</b>	<b>quantity</b>
1)	Fishplates 50E6 with 4 holes	2
2)	Square Head Bolts	4
3)	Hexagon Nuts with Collar	4
4)	Wedge Lock Washers	4

1.5.5 **Transition Fishplates Sets with 4 holes for 60E2/54E1 Rail Joints:**

	<b>Component description</b>	<b>quantity</b>
1)	Transition Fishplate 60E2/54E1 with 4 holes (gauge side left)	1
2)	Transition Fishplate 60E2/54E1 with 4 holes (field side left)	1
3)	Transition Fishplate 60E2/54E1 with 4 holes (gauge side right)	1
4)	Transition Fishplate 60E2/54E1 with 4 holes (field side right)	1
5)	Square Head Bolts	8
6)	Hexagon Nuts with Collar	8
7)	Wedge Lock Washers	8

**1.5.6 Transition Fishplates Sets with 4 holes for 54E1/50E6 Rail Joints:**

	<b>Component description</b>	<b>quantity</b>
1)	Transition Fishplate 54E1/50E6 with 4 holes (gauge side left)	1
2)	Transition Fishplate 54E1/50E6 with 4 holes (field side left)	1
3)	Transition Fishplate 54E1/50E6 with 4 holes (gauge side right)	1
4)	Transition Fishplate 54E1/50E6 with 4 holes (field side right)	1
5)	Square Head Bolts	8
6)	Hexagon Nuts with Collar	8
7)	Wedge Lock Washers	8

**1.5.7 Transition Fishplates Sets with 4 holes for 54E1/46E2 Rail Joints:**

	<b>Component description</b>	<b>quantity</b>
1)	Transition Fishplate 54E1/46E2 with 4 holes (gauge side left)	1
2)	Transition Fishplate 54E1/46E2 with 4 holes (field side left)	1
3)	Transition Fishplate 54E1/46E2 with 4 holes (gauge side right)	1
4)	Transition Fishplate 54E1/46E2 with 4 holes (field side right)	1
5)	Square Head Bolts	8
6)	Hexagon Nuts with Collar	8
7)	Wedge Lock Washers	8

**2. REFERENCE DOCUMENTS**

EN10025-2	Hot rolled products of structural steels - Part 2 Technical delivery conditions for non-alloy structural steels;
EN10168	Steel products – Inspection documents;
EN 10204	Metallic products - Types of inspection documents;
EN 13674-1	Railway applications - Track - Rail - Part 1: Vignole railway rails 46 kg/m and above;
prEN 16843	Railway applications - Mechanical requirements for joints in running rails;
ISO898-1	Mechanical properties of fasteners made of carbon steel and alloy steel Part 1: Bolts, screws and studs



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	with specified property classes - Coarse thread and fine pitch thread;
ISO898-2	Mechanical properties of fasteners made of carbon steel and alloy steel - Part 2: Nuts with specified property classes - Coarse thread and fine pitch thread;
ISO965-1	General-purpose metric screw threads — Tolerances — Part 1: Principles and basic data;
ISO965-4	general purpose metric screw threads — Tolerances — Part 4: Limits of sizes for hot-dip galvanized external screw threads to mate with internal screw threads tapped with tolerance position H or G after galvanizing
ISO 4759-1	Tolerances for fasteners — Part 1: Bolts, screws, studs and nuts — Product grades A, B and C;
ISO 6157-1	Fasteners -- Surface discontinuities - Part 1: Bolts, screws and studs for general requirements;
ISO 6157-2	Fasteners -- Surface discontinuities - Part 2: Nuts;
ISO 6305-4	Railway components - Technical delivery requirements - Part 4: Untreated steel nuts and bolts and high-strength nuts and bolts for fish-plates and fastenings;
ISO9001	Quality management systems – Requirements;
ISO10684	Fasteners — Hot dip galvanized coatings;
DIN25201-4	Design guide for railway vehicles and their components - Bolted joints - Part 4: Securing of bolted joints.

*Note – the latest edition of the referenced document should be considered*

### 3. **DEFINITIONS**

- 3.1. **Bolts and Nuts** shall have the meaning assigned to it in Section 5.2 aforementioned;
- 3.2. **Clearance Capacity( $J_c$ )** as defined in prEN16843, section 4, Table 2;
- 3.3. **The Fishplates Sets** shall have the meaning assigned to it in Section 1.2 aforementioned;



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- 3.4. **ISR** Israel Railways LTD.
- 3.5. **The Inspector** shall have the meaning assigned to it in Section 9 aforementioned;
- 3.6. **Maximum Rail Length for Jointed Track**( $L_{jt,max}$ ) as defined in prEN16843, section 4, Table 2;
- 3.7. **Rail Joint** shall have the meaning assigned to it in Section 1.3 aforementioned;
- 3.8. **Rail Profile 46E2** as defined in EN13674-1, Annex A, figure A.2;
- 3.9. **Rail Profile 50E6** as defined in EN13674-1, Annex A, figure A.13;
- 3.10. **Rail Profile 54E1** as defined in EN13674-1, Annex A, figure A.15;
- 3.11. **Rail Profile 60E2** as defined in EN13674-1, Annex A, figure A.24;
- 3.12. **Standard Mechanical Rail Joint** as defined in prEN16843, section 3.2;
- 3.13. **Steel Grade R260** as defined in EN13674-1, section 5;
- 3.14. **The Transitional Mechanical Rail Joint** as defined in prEN16843, section 3.3.
4. **GENERAL REQUIREMENTS**
- 4.1. The Fishplates Sets shall be manufactured with different design in accordance with rail profiles: 60E2; 54E1; 50E6 and 46E2 rails in reference to the Fishplates Sets types, which are described in section 1.4 and 0 (Rail profiles are in accordance with EN 13674-1).
- 4.2. The Fishplates Sets shall be designed to be part of railway tracks enable railway vehicles having axle load of up to 22.5 [ton/axle] running safety at maximum speed of 60 [km/h].
- 4.3. The Fishplates Sets shall be designed to ensure that it cannot be damaged as a result of rail maintenance work (tamping, dynamic stabilization, etc.) or by the operations for sleeper replacing.
- 4.4. All the Fishplates Sets components shall be designed to resistant Israel climate condition, in accordance with Technical Appendix B. High corrosion environment shall be considered as well.



## 5. THE FISHPLATES SETS - COMPONENTS REQUIREMENTS

### 5.1. Steel Fishplate

#### 5.1.1. Steel Fishplate - General

The Steel Fishplates length in reference to the Fishplate Type shall be as follows:

	<b>Fishplate type</b>	<b>Total Length of Fishplate (Lf) – Minimum Length</b>
1)	Fishplates 60E2 with 4 holes	600 [mm]
2)	Fishplates 60E2 with 6 holes	900 [mm]
3)	Fishplates 54E1 with 4 holes	600 [mm]
4)	Fishplates 54E1 with 6 holes	900 [mm]
5)	Fishplates 50E6 with 4 holes	600 [mm]
6)	Transition Fishplates 60E2/54E1 with 4 holes	800 [mm]
7)	Transition Fishplates 54E1/50E6 with 4 holes	800 [mm]
8)	Transition Fishplates 54E1/46E2 with 4 holes	600 [mm]

#### 5.1.2. Steel Fishplate – Characteristics

The Steel Fishplates shall be manufactured from a hot rolled section, cut to length and holed.

The Transition Fishplate shall be machined to the required shape, welding process is not permitted.

The grade of steel shall fulfil EN10025-2, Table 7.

The steel for the manufacture of Steel Fishplates shall be S355JR with the following Chemical Composition and Mechanical properties:

Steel Grade		% by mass							Tensile strength	Elongation
Steel Name	analysis	C max.	Si max.	Mn max.	P max.	S max.	N max	Cu max	MPa	A min. %
S355JR	Ladle	0.24	0.55	1.6	0.035	0.035	0.009	0.55		
	Product	0.27	0.6	1.7	0.045	0.030	0.010	0.6	450-600	17

The rolled bar shall be saw or disc cut without deform the section or change the properties of the steel. Each cut shall be clean and free from burrs, the edges shall be deburred.

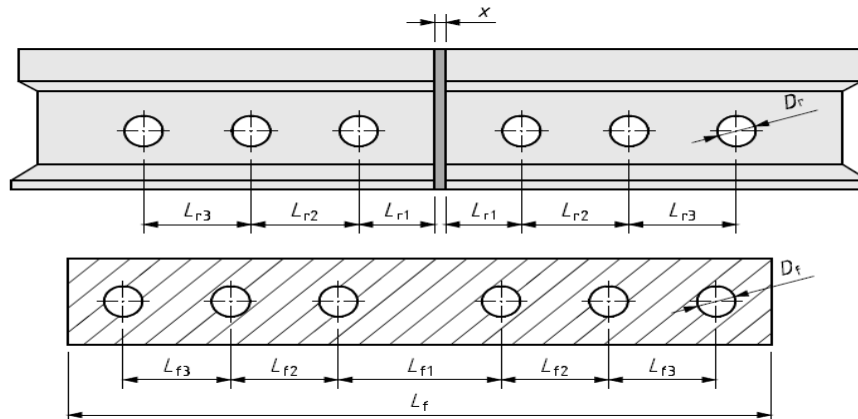
The Steel Fishplate minimum length shall conform with the requirements of section 5.1.1 aforementioned.

The holes diameter and their position in the fishplate (also the transition Fishplate) shall be in accordance with requirements hereinafter. The position of the Steel Fishplate hole center shall be



consolidated with The position of the Rail hole center, as described in Technical Appendix A – Fishplate Bolt Hole Position in The Rail Web

dimensions, tolerances and roughness shall be described in the manufacturer drawing, and shall conform with the requirements of prEN16843, Annex B.



symbol	length
$L_f$	See section 5.1.1 above
$L_{f1}$	130 [mm]
$L_{f2}$	170 [mm]
$L_{f3}$	170 [mm]
$D_f$	28 [mm]

The Steel Fishplate, quality, manufacturing tests and acceptance conditions shall conform with the requirements of these technical specifications.

Straightening operation shall be carried out with gradual pressure and without impact.

The holes in the Steel Fishplate shall be produce with smooth drilling. The edges shall be deburred.

### 5.1.3. Steel Fishplate – Technical Drawings and Technical Descriptions

The technical drawing and technical description of Steel Fishplates for each type described in section 5.1.1 aforementioned, including dimensions, material main characteristics, coating description, heat treatment, marking, etc., complying with the prEN16843, shall be submitted.

### 5.1.4. Steel Fishplate – Component Acceptance Test



The Steel Fishplates visual inspection, surface finish, geometry, mechanical properties and chemical composition tests results shall conform with the requirements of these technical specification, and prEN16843, Annex B, EN10025-2, table 7, and in additional EN 10204, Type 3.1; or Type 3.2, these results shall be submitted.

5.1.5. Steel Fishplate – Packing and Delivery

The Steel Fishplate, Packing and Delivery requirements are described in section 11.

5.2. **Bolts and Nuts**

5.2.1. The Bolts and Nuts – General

The Fishplate Set shall include 6 or 4 Square Head Bolts M24X150 and Hexagon Nuts with Collar with width across flats of 39 [mm] ("**Bolts and Nuts**"), on each rail.

5.2.2. Bolts and Nuts - Characteristics

The Steel Bolts and Nuts shall conform with the requirements of ISO6305-4; ISO898-1 and ISO898-2,

The Bolts shall be manufactured from single piece, without welding. The head shall be upset by hot-working.

The Bolts shanks shall be perfectly smooth and straight, without flow or cracks. The head shall be clearly cut and correctly centered in relation to the shanks.

In additional, no folding of the metal shall occur on the head at the point of junction with the shank. The contact surfaces of the steel Bolts and Hexagon Nuts with Collar must be level and perpendicular in relation to the longitudinal axis.

The complete surface of The Bolts and Nuts shall be suitably re-burred. Care shall be taken to ensure that the re-burring doesn't give rise to any tearing of the metal or leave any roughness on the contact surfaces.

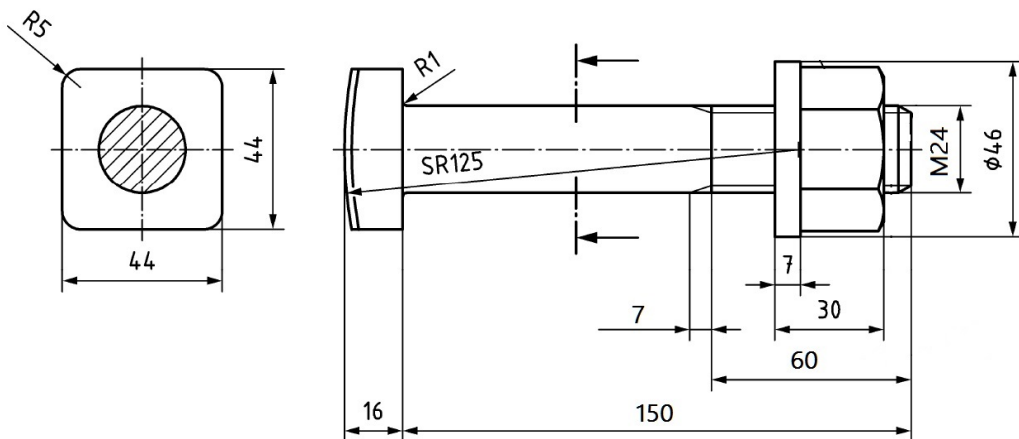
The threads shall be clean, uniform and complete. If the threads of The Bolts and Nuts are stripped or if there is a lack of material, they shall not be accepted.

The Bolts and Nuts shall be hot dip galvanized coated to conform the requirements of ISO10684.

The Bolts and Nuts shall be free from any trace of grease, paint, etc. before the galvanization.

The Bolts and Nuts dimensions shall conform with the requirements described in Figure, hereinafter.

The Bolts and Nuts tolerances shall conform with the requirements of ISO965-1, ISO965-4 and ISO4759-1.



The Bolts and Nuts quality, manufacturing tests and acceptance conditions shall conform with the requirements of these technical specifications and ISO6305-4; ISO898-1 and ISO898-2.

The steel making process and grade of steel shall obtain the following mechanical properties:

The Square Head Bolts steel property class shall be 4.6.

The Hexagon Nuts with Collar steel property class shall be 5.

the Square Head Bolts Tensile strength, shall be 400 [N/mm<sup>2</sup>].

the Hexagon Nuts with Collar Tensile strength, shall be 500 [N/mm<sup>2</sup>].

The Square Head Bolts steel chemical composition shall conform the requirements of ISO898-1, table 2

Property class	Chemical composition limit (cast analysis, %)a		
	C max.	P max.	S max.
4.6	0.55	0.05	0.06

The Hexagon Nuts with Collar steel chemical composition shall conform the requirements of ISO898-2, table 3

Property class	Chemical composition limit (cast analysis, %)a		
	C max.	P max.	S max.



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5	0.58	0.06	0.15
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The Square Head Bolts Surface discontinuity shall conform with the requirements of ISO 6157-1.

The Hexagon Nuts with Collar discontinuity shall conform with the requirements of ISO 6157-2.

5.2.3. Bolts and Nuts – Technical Drawings and Technical Descriptions

The technical drawings and technical descriptions of Bolt and of Nut, including dimensions, material main characteristics, coating description, heat treatment, marking, etc., complying with ISO6305-4; ISO898-1, ISO898-2, ISO965-1, ISO965-4, ISO4759-1, ISO10684, ISO 6157-1, ISO 6157-2, shall be submitted.

5.2.4. Bolts and Nuts – Components Acceptance Tests

The Bolts and Nuts visual inspection, surface finish, geometry, mechanical properties and chemical composition tests results shall conform with the requirements of these technical specification and ISO6305-4; ISO898-1, ISO898-2, ISO965-1, ISO965-4, ISO4759-1, ISO10684, ISO 6157-1, ISO 6157-2, and in additional EN 10204, Type 3.1; or Type 3.2, these results shall be submitted.

The Bolts and Nuts certificates of galvanization shall be submitted.

5.2.5. Bolts and Nuts – Packing and Delivery

The Square Head Bolts and Hexagon Nuts with Collar, Packing and Delivery requirements are described in section 11.

5.3. Wedge Lock Washers

5.3.1. Wedge Lock Washers – General

the fishplate set shall include 6 or 4 Wedge Lock Washer ("**Wedge Lock Washers**") on each rail.

5.3.2. Wedge Lock Washers – Characteristics

The Wedge Lock Washers shall be manufactured from carbon steel, through hardened,

The minimum tensile strength shall be equal or higher than 580 [MPa].

The Minimum Hardness shall be equal or higher than 465 [HV].

The Wedge Lock Washer inner diameter dimension shall fit to be fasten with The Square Head Bolts M24, the outer diameter dimension shall not be larger than the dimension of the Square Head Bolt.



The Wedge Lock Washers shall comply with Junker testing demonstrate that at least 80% of the tightening force is maintained for 2000 load cycles in conform with DIN25201-4, test report shall be submitted.

The conditions of manufacture of the Wedge Lock Washer obtained from bars of the same casting must be identical.

The Wedge Lock Washers shall be regular and clean, and free from superficial cracks, flaws, burrs, and deficiency in metal, folds, or any other defects likely to affect the use for which they are intended.

The Wedge Lock Washer shall be corrosion protected by zinc flake coating or equivalent process. The Wedge Lock Washers must be free from any trace of grease, paint, etc., before the corrosion protect process.

5.3.3. Wedge Lock Washer – Technical Drawing and Technical description

The technical drawing and technical description of Wedge Lock Washer, including dimensions, material main characteristics, coating description, heat treatment, marking, etc., and the relevant standard number, shall be submitted.

5.3.4. Wedge Lock Washers – Components Acceptance Tests

The Wedge Lock Washer visual inspection, surface finish, geometry, mechanical properties and chemical composition tests results shall conform with the requirements of these technical specification and the relevant standards, and in additional EN 10204, Type 3.1; or Type 3.2, these results shall be submitted.

The Wedge Lock Washers certificates of corrosion protection process shall be submitted.

5.3.5. Wedge Lock Washers – Packing and Delivery

Wedge Lock Washers, Packing and Delivery requirements are described in section 11.

6. **TECHNICAL DRAWINGS**

6.1. A complete set of technical drawings of Fishplate Sets assembled in Rail Joints for each Fishplate Set type, in additional Technical drawings of each component of the Fishplate Set shall be submitted.

Each drawing shall include the dimensions, tolerances, material main characteristics, coating description, heat treatment, marking, etc.

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## 7. **QUALITY CONTROL AND QUALITY ASSURANCE**

- 7.1. The Fishplate Sets shall be manufactured under a comprehensive quality control management system, which shall ensure confidence consistently compliance in the conformity of the finished product, including documented evidence, all in accordance with these technical specifications and ISO9001, prEN16843, EN10025-2, ISO6305-4, ISO898-1, ISO898-2, ISO10684, ISO965-1, ISO965-4, ISO4759-1, ISO 6157-1 and ISO 6157-2, DIN 65151, EN 10204, and any other relevant standard to provide assurance of product safety in track.

The production control management system procedures, and ISO9001 certificate shall be submitted.

## 8. **DESIGN APPROVAL**

- 8.1. A statement that The Standard Mechanical Rail Joint and The Transitional Mechanical Rail Joint comply with the requirements of these technical specifications and prEN16843, shall be submitted.
- 8.2. The design calculation of the Fishplate Set as part of the Rail Joint, which ensure the Clearance Capacity ( $J_c$ ), in accordance with prEN16843 section 5.1.3, and Maximum Rail Length for Jointed track ( $L_{jt,max}$ ), in accordance with prEN16843 section 5.1.4 shall be submitted.
- 8.3. All necessary installation and maintenance recommendations, including the table of Instantaneous joint clearance ( $J_t$ ), depending on rail temperature, in accordance with prEN16843 shall be submitted.

## 9. **INSPECTION BY A REPRESENTATIVE OF ISR**

- 9.1. The ISR technical team and/or an inspection body appointed by the ISR ("**The Inspector**") shall the privilege to inspect the manufacture processes and/or the Fishplate Sets, during or after production .
- 9.2. It is the manufacturer's responsibility to guarantee dimensional accuracy and to ensure that the inspection is carried out with the appropriate measuring instruments.
- 9.3. The Manufacturer shall be responsible to coordinate inspection process time table with The Inspector in accordance to the delivery date defined in the purchase order.
- 9.4. The Manufacturer shall extend, to The Inspector, all necessary assistance and cooperation, and shall give access to all test records, calibrations and calculations that contribute to the final results.



- 9.5. All the gauge/measuring instruments for manufacture verification and inspection of The Rails shall be made available by The Manufacturer to The Inspector on request.
- 9.6. The Manufacturer shall provide, for every purchase order, all Tests results to The Inspector on request.
- 9.7. The Calibration Certificates of the gauge/measuring instruments signed shall be made available to The Inspector on request.
10. **FISHPLATE SET COMPONENTS - MARKING**
- 10.1. Each Fishplate Set and component shall be inscribed with at least the following marks:
- The product identification type;
  - The supplier mark or name;
  - The month and year of last two figures of the year of manufacture.

## **11. PACKING AND DELIVERY**

11.1. The transition fishplate sets components shall be packed as follows:

- 25 coupled fishplate joints with 4 holes (left and right tightened) for 60E2/54E1 or 54E1/50E6 Rail Profiles in each wooden box.
- 100 sets of square head bolts and nuts and spring washers in each wooden box.

11.2. The fishplate Sets shall be packed as follows:

- 70 fishplate joints with 4 holes (35 couples) for 54E1 rails in each wooden box.
- 60 fishplates joints with 4 holes (30 couples) for 60E1 or 60E2 rails in each wooden box.
- 50 fishplates joints with 6 holes (25 couples) for 54E1 rails in each wooden box.
- 40 fishplates joints with 6 holes (20 couples) for 60E1 or 60E2 rails in each wooden box.
- 500 sets of bolts and nuts and spring washers in each wooden box.

11.3. Each fishplate joints component shall be packed separately in wooden boxes tied by metal bands.

11.4. The wooden boxes shall be tightened by metal bands, and shall be fastened to one another with plastic nylon. They shall be tied to wooden platform by plastic bands.

11.5. סעיף 9.4 – להרחיב את הסעיף: במידה וטובין כגון: ברגים, מטלות חיבור וכו' אשר על הספק לרוקן את המכולות באתר שלו ובאמצעי FCL מגיעים במכולות מלאות

ולספק את הטובין על גבי משאיות לאתר רכבת.

באחריות הספק להחזיר את המכולות כשהם נקיים לאתר הדיפון.

11.6. The dimensions of the wooden boxes shall enable maximum effective storage capacity in containers.

It shall be possible to put at least 3 wooden boxes one on the other.  
Each package gross weight shall not exceed 1 tone.

Each package shall be labeled with the following details:

- Component name and type;
- Production batch number;
- Date of manufacture;
- Component barcode;
- Component quantity in box;
- Gross and net weight;
- Manufacturer recognition number or name;
- ISR recognition number;
- ISR order number;
- Ordinal number on the packing list.

The labeling shall be with black letters and shall be on 3 spots on the package (one on top of the package and the two others on the sides).

Each component shall be marked in accordance with the manufacturer drawing

11.7. חייב להיות במשטח חזק ורציני (המשטחים נשברים תחת העומס והמשקל) ומאוגד בבנד ממתכת כולל מדבקה או אמצעי זיהוי שעליו רשומה הכמות הכוללת במשטח

11.8. Each Wedge Lock washer shall be glued together in pairs, but The packed Wedge Lock Washers must not adhere to one another.

11.9. While overseas shipping transportation shall be carried out the fishplate joints component shall be packed in special means to protect against corrosion.

12. **LIST OF DOCUMENTS TO BE SUBMITTED WITH BIDDER'S PROPOSAL**

12.1. The technical drawing and technical description of Steel Fishplates for each type described in section 5.1.1 aforementioned, including dimensions, material main characteristics, coating description, heat



- treatment, marking, etc., complying with the prEN16843 (section 5.1.3).
- 12.2. The technical drawings and technical descriptions of Bolt and of Nut, including dimensions, material main characteristics, coating description, heat treatment, marking, etc., complying with ISO6305-4; ISO898-1, ISO898-2, ISO965-1, ISO965-4, ISO4759-1, ISO10684, ISO 6157-1, ISO 6157-2 (section 5.2.3).
- 12.3. The Wedge Lock Washers shall comply with Junker testing demonstrate that at least 80% of the tightening force is maintained for 2000 load cycles in conform with DIN25201-4, test report (section 5.3.2).
- 12.4. The technical drawing and technical description of Wedge Lock Washer, including dimensions, material main characteristics, coating description, heat treatment, marking, etc., and the relevant standard number (section 5.3.3).
- 12.5. A complete set of technical drawings of Fishplate Sets assembled in Rail Joints for each Fishplate Set type, in additional Technical drawings of each component of the Fishplate Set (sections 6.1)
- 12.6. The Fishplate Sets production control management system procedures, and ISO9001 certificate (section 7.1).
- 12.7. A statement that The Standard Mechanical Rail Joint and The Transitional Mechanical Rail Joint comply with the requirements of these technical specifications and prEN16843 (section 8.1).
- 12.8. The design calculation of the Fishplate Set as part of the Rail Joint, which ensure the Clearance Capacity ( $J_c$ ), in accordance with prEN16843 section 5.1.3, and Maximum Rail Length for Jointed track ( $L_{jt,max}$ ), in accordance with prEN16843 section 5.1.4. (section 8.2).
- 12.9. All necessary installation and maintenance recommendations, including the table of Instantaneous joint clearance ( $J_t$ ), depending on rail temperature, in accordance with prEN16843 (section 8.3).
13. **LIST OF DOCUMENTS TO BE DELIVERED WITH EACH DELIVERY**
- 13.1. The Steel Fishplates visual inspection, surface finish, geometry, mechanical properties and chemical composition tests results shall conform with the requirements of these technical specification, and prEN16843, Annex B, EN10025-2, table 7, and in additional EN

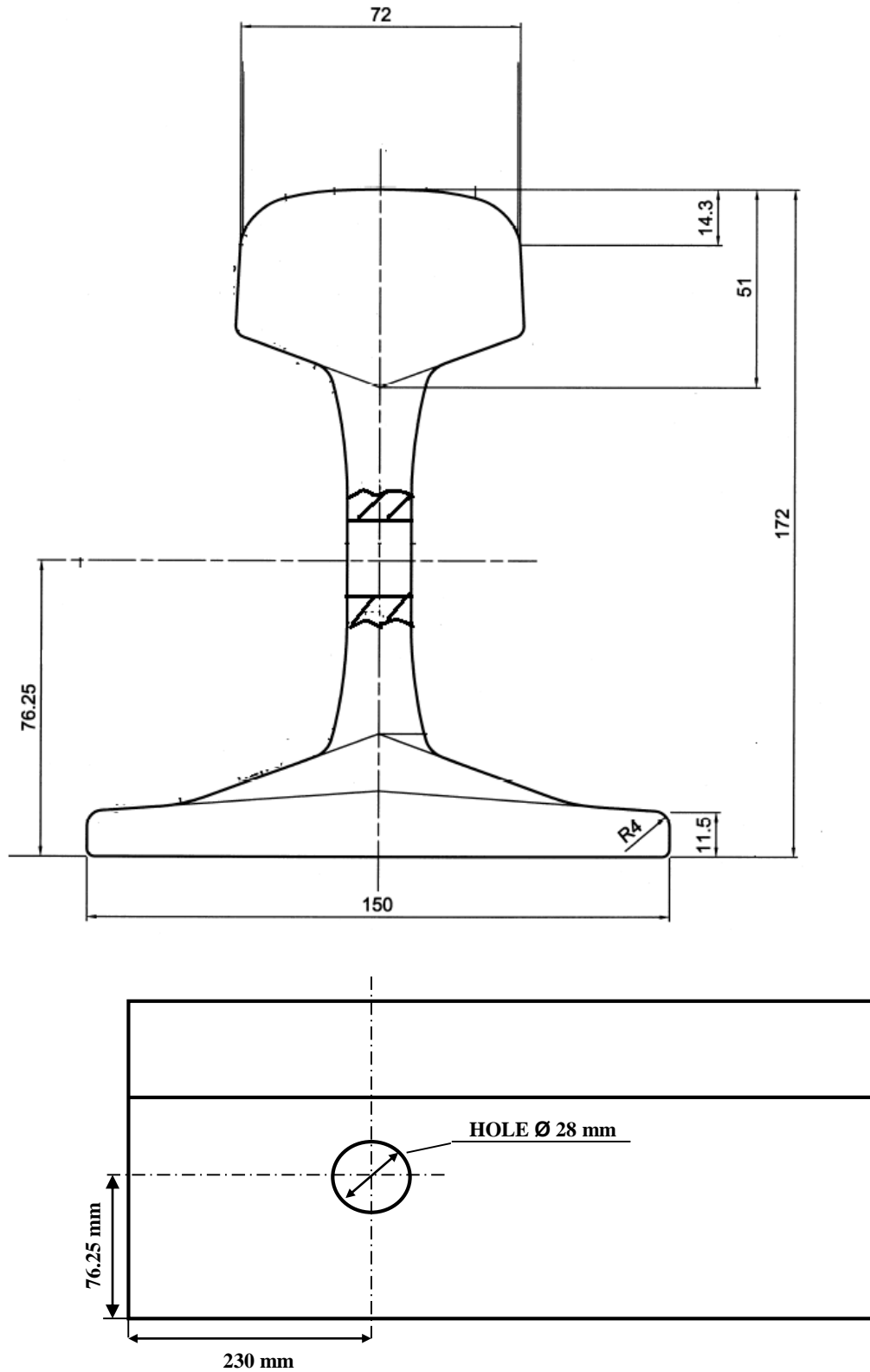


- 
- 10204, Type 3.1; or Type 3.2. (section 5.1.4).
- 13.2. The Bolts and Nuts visual inspection, surface finish, geometry, mechanical properties and chemical composition tests results shall conform with the requirements of these technical specification and ISO6305-4; ISO898-1, ISO898-2, ISO965-1, ISO965-4, ISO4759-1, ISO10684, ISO 6157-1, ISO 6157-2, and in additional EN 10204, Type 3.1; or Type 3.2 (section 5.2.4).
- 13.3. The Bolts and Nuts certificates of galvanization shall be submitted (section 5.2.4).
- 13.4. The Wedge Lock Washer visual inspection, surface finish, geometry, mechanical properties and chemical composition tests results shall conform with the requirements of these technical specification and the relevant standards, and in additional EN 10204, Type 3.1; or Type 3.2 (section 5.3.4)
- 13.5. The Wedge Lock Washers certificates of corrosion protection process (section 5.3.4).



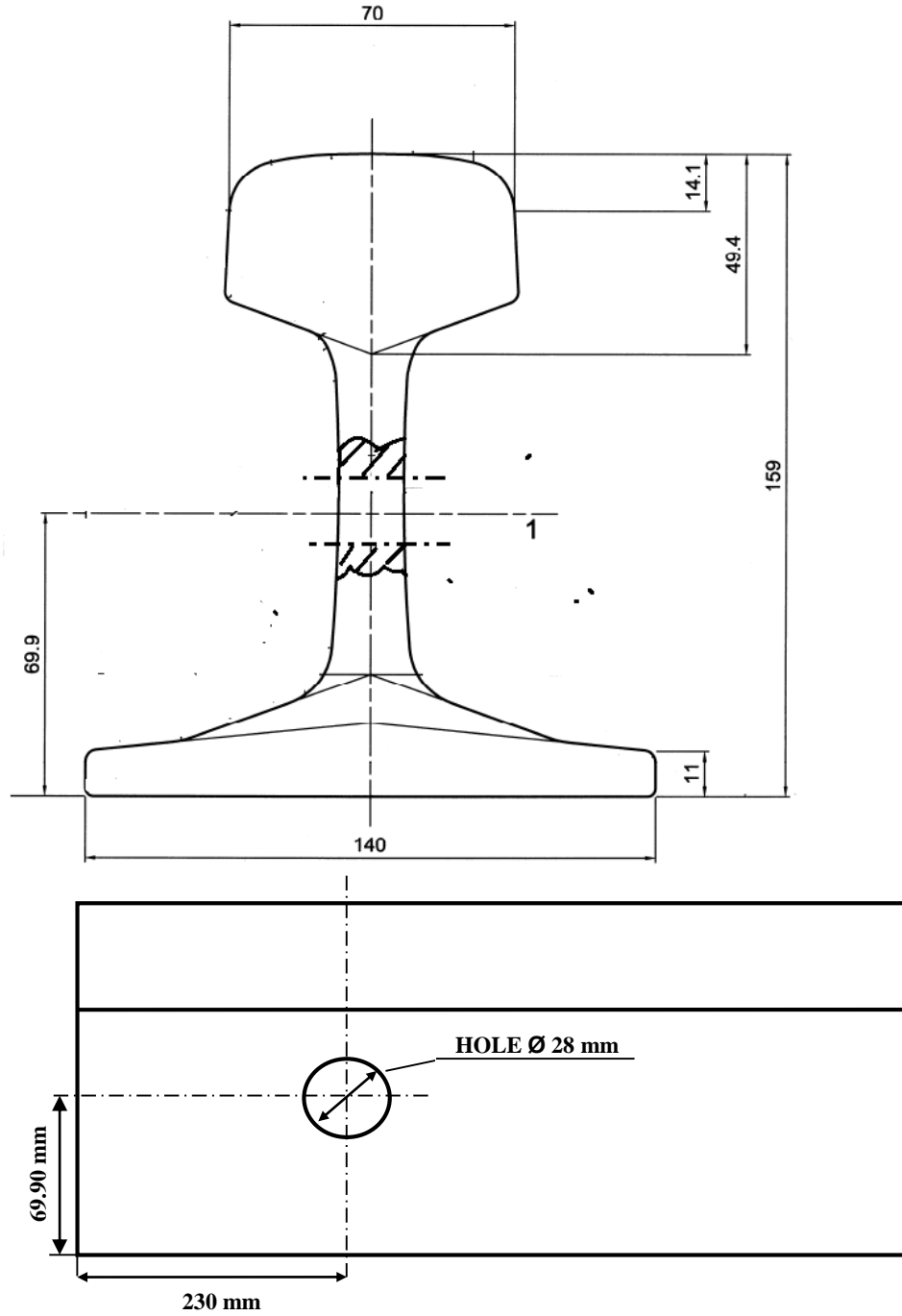
**TECHNICAL APPENDIX A – FISHPLATE BOLT HOLE POSITION –  
IN THE RAIL WEB**

**A.1 -- Rail Profile 60E2**



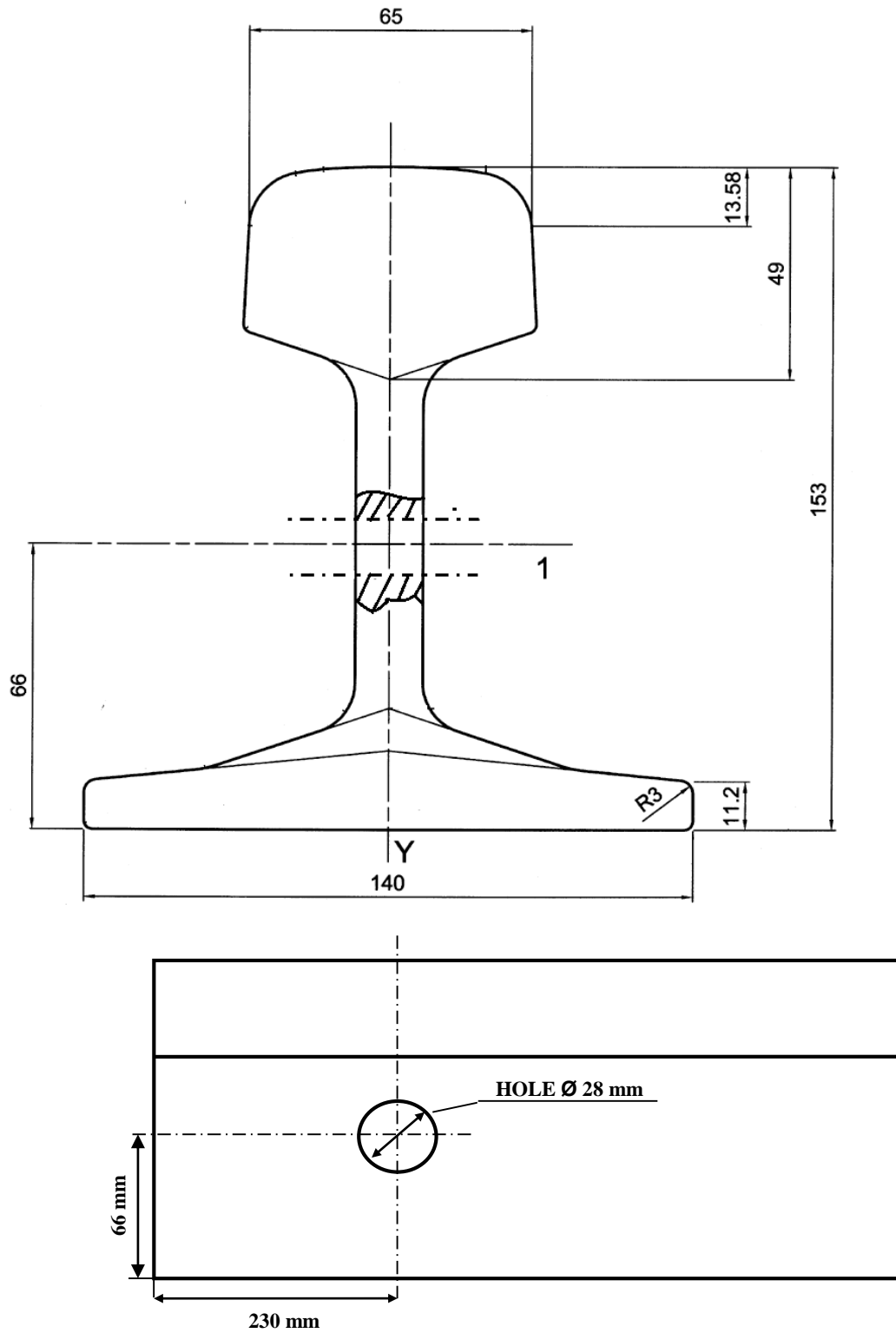


**A.2 – Rail Profile 54E1**





**A.3 – Rail Profile 50E6**





## TECHNICAL APPENDIX B - ISRAEL CLIMATE AND ENVIRONMENTAL CONDITIONS

### B.1 Climate and Environmental Conditions

Max. ambient temperature	50 °C (shade)
Min. ambient temperature	-5 °C
Relative humidity	10 to 90 %
Altitude	-400 to +800 [meter]
Sunny	3300 [hours/year]
UV Radiation	360 to 600 [MJ/(m <sup>2</sup> *year)]
Rainfall	400 to 800 [mm/year]

### B.2 Dust Conditions in the atmosphere

	Maximum Half Hour Value*	Maximum Daily Value*	Average
NO <sub>x</sub>	1064	560	71
SO <sub>2</sub>	780	260	21
O <sub>3</sub>	312	143	84
Suspended Dust	-	350	100

\*([Microgram/m<sup>3</sup> atmosphere])

### B.3 Suspended Particulate Matter (SPM)

Particle size to 0.5-1 [micron]

### B.4 Sea Salt Concentrations in the Atmosphere

Salt Element	Na*		Cl*		SO <sub>4</sub> *	
	Dry	Wet	Dry	Wet	Dry	Wet
Sea Air at Coast Line	7.3	16.0	12.0	22.0	5.3	7.0
600 m from Shore	3.1	4.8	4.2	7.9	1.9	2.0
6000 m from Shore	1.1	1.4	1.5	1.7	1.3	1.4

\* ([Micrograms/m<sup>3</sup> atmosphere])