

Design guidelines

Technical Specification - Rails

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1. Scope

This specification covers the manufacture and supply of running and guard rails for use on the Rail Baltica Project.

This specification concerns the track:

- Running rails of the new high-speed line itself, including passing loops, and service track necessary for its proper functioning;
- Guard rails.

This specification does not concern:

- The track of the ancillary facilities needed to carry out maintenance;
- The temporary track which might be created during construction works;
- Specific rails;

2. Reference Documents

The document hierarchy of precedence in descending order shall be:

- This Specification;
- Design Guidelines;
- TSI specification;
- European Standards;
- UIC leaflets recommendations.

The following standards and specifications are referred to in this specification (when revised or amended, subsequent revisions or amendments to these specifications shall apply).

2.1. Design Guidelines

The following Design Guidelines shall be applied and/or refer to:

Standard	Title
RBDG-MAN-012	Design Guidelines – General Requirements
RBDG-MAN-014	Design Guidelines – Railway Superstructure – Track
RBDG-MAN-032	Design Guidelines – RAMS targets
RBDG-MAN-033	Design Guidelines – BIM Manual

2.2. TSI

Railways used are to be based largely on national regulations and requirements. The purpose of the new European regulations is to standardise subsystems or components in order to reduce the cost of railways and to increase competitiveness, as well as to make it possible for trains to run between different member states without technical obstacles.

The following Technical Specifications for Interoperability (TSI) is based on best available expert knowledge and is related to the infrastructure subsystem of the rail in the European Union:

TSI	Title
Commission Regulation (EU) N° 1299/2014 of 18 November 2014 – Infrastructure TSI	Commission Regulation (EU) No 1299/2014 of 18 November 2014 on the technical specifications for interoperability relating to the 'infrastructure' subsystem of the rail system in the European Union (hereinafter – TSI INF). Amended by: Commission Implementing Regulation (EU) 2019/776 of 16 May 2019 amending Commission Regulations (EU) No 321/2013, (EU) No 1299/2014, (EU) No 1301/2014, (EU) No 1302/2014, (EU) No 1303/2014 and (EU) 2016/919 and Commission Implementing Decision 2011/665/EU as regards the alignment with Directive (EU) 2016/797 of the European Parliament and of the Council and the implementation of specific objectives set out in Commission Delegated Decision (EU) 2017/1474.

2.3. European Standards

The relevant European standards used for high speed lines and conventional lines are listed below:

Standard	Title
EN 13674-1	Railway application – Track – Rail – Part 1: Vignole railway rails 46kg/m and above
EN ISO 6506-1	Metallic materials – Brinell hardness test – Part 1: Test method
EN ISO 9001	Quality management systems - Requirements
EN 50126-1	Railway Applications – The Specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS) Part 1: Generic RAMS process
EN 13450	Aggregates for railway ballast
EN 13674-1	Railway applications - track - rail - part 1: Vignole railway rails 46 kg/m and above
EN 13674-2	Railway applications - track - rail - part 2: switch and crossing rails used in conjunction with Vignole railway rails 46 kg/m and above
EN 13674-3	Railway applications - track - rail - part 3: check rails
EN 13231-2	Railway applications - track - acceptance of works - part 2: acceptance of reprofiling rails in plain line, switches, crossings and expansion devices
EN 14587-1	Railway applications - track - flash butt welding of rails - part 1: new r220, r260, r260mn and r350ht grade rails in a fixed plant

Standard	Title
EN 14587-2	Railway applications - track - flash butt welding of rails - part 2: new r220, r260, r260mn and r350ht grade rails by mobile welding machines at sites other than a fixed plant
EN 14587-3	Railway applications - track- flash butt welding of rails - part 3: welding in association with crossing construction
EN 14730-1	Railway applications - track - aluminothermic welding of rails - part 1: approval of welding processes
EN 14730-2	Railway applications - track - aluminothermic welding of rails - part 2: qualification of aluminothermic welders, approval of contractors and acceptance of welds

2.4. UIC Recommendations

The following UIC recommendation should be taken into consideration:

UIC leaflet	Title
UIC 721	Recommendations for the use of hard quality and extra hard quality rails

3. Terms and definitions

Acceptance test	test carried out as part of the process and product control system, normally on a heat, sequence or tonnage basis;
Heat treated rail (HT)	rail that has undergone accelerated cooling from austenitizing temperature during the metallurgical transformation period;
Qualifying test	special test and criteria which are relevant to some aspects of the service performance of rails. Acceptance tests also form part of the qualifying tests;
Rail running surface	curved surface of the rail head. Area between both gauge corners (transition points of the head inclination and the first head radius).
Building information modelling (BIM)	a process supported by various tools, technologies and contracts involving the generation and management of digital representations of physical and functional characteristics of places.
Notified Body (NoBo)	EU authorized body to carry out EC verification process of interoperability of railway subsystems and constituents
Acceptance test or Routine test	test carried out as part of the process and product control system, normally on a heat, sequence, or tonnage basis;
Factory Acceptance Test	Tests that will be done to verify that supplier is complying with requirements stated in TS. Includes proving conformity to TSI, qualifying tests and acceptance tests, but not limited to.
Project Quality plan or Manufacturing Quality Plan	plan which describes all measures to be done ensuring necessary rail quality control and assurance level within the project.

4. General requirements

Only components with service proven records for application on track with at least the same or higher speed and axle load, and a minimum of 5 years period service on such conditions, will be considered;

The steel running rails are continuously welded with the following characteristics:

- Axle loads of 25tons for train speed up to 120 km/h;
- Axle loads of 22,5tons for train speed from 120 km/h up to 220 km/h;
- Axle loads of 18tons for train speed from 220 km/h up to 300 km/h;
- Maximum annual tonnage on the busiest section is 25 million tons/annum;
- Daily maximum tonnage on the busiest sections is 67 000 tons;
- Maximum gradients and minimum horizontal radius of curvature are all given in the Design Guidelines;

All infrastructure components, including rail, shall comply with a design life of 50 years;

5. Component interface requirements

5.1. General

The Track system (mainly rails / sleepers and fastenings / ballast / turnouts) shall be fully compatible with all systems and equipment provided as part of the overall Rail Baltica Project;

The Track system shall support the transfer of physical loads between the vehicle and the infrastructure.

5.2. Interface with Power Supply

Rail shall be able to support traction return current, even on line sections with 2 x 25 kV feeders.

5.3. Interface with Rolling Stock

The specifications of this document are done for Rolling Stock which conforms with TSI (for rail/wheel interfaces issues, chapter 4.2.4.5 of the Infrastructure TSI shall be respected).

Inclination of rail shall be set with 1/40 inclination.

Rail resistance to vertical loads shall be in accordance with chapter 4.2.6.1 of the Infrastructure TSI.

Rails shall be designed to withstand longitudinal forces equivalent to the force arising from braking of 2,5m/s² (according to chapter 4.2.6.2.1 of the Infrastructure TSI).

Rails shall be designed to be compatible with the use of magnetic braking system for emergency braking.

6. Design requirements, mechanical properties and manufacturing

6.1. General

Running rails shall be manufactured, tested and supplied according to EN 13674-1.

Running rail profile shall be EN 60E2, according to EN 13674-1, inclined at 1:40 to match the wheel/rail profile interface (rail inclination shall be provided by the sleeper surface).

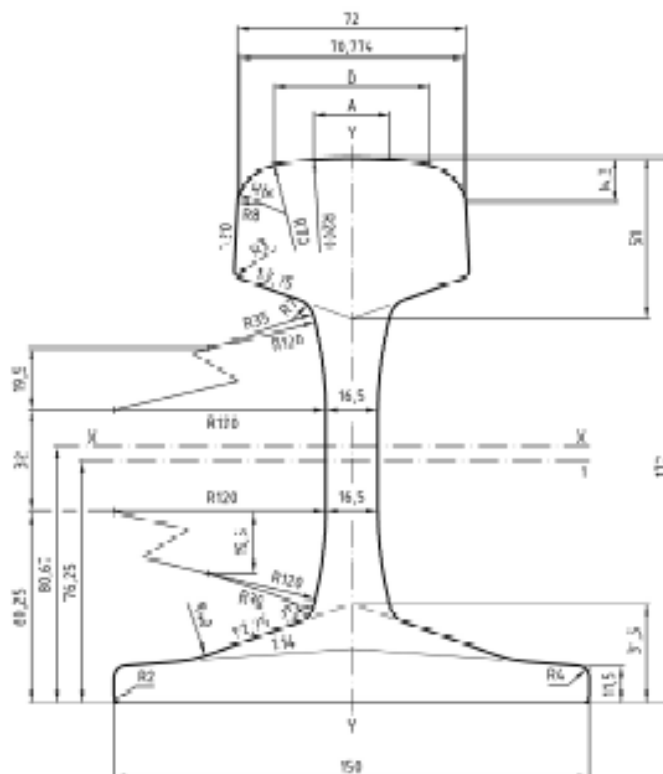
Running rail ends must not be drilled. Rails will be welded, making continuously welded rail (rail welding not in the scope of rail supply).

Guard rails shall meet all the requirements stipulated for running rails 60E2 except they must be of steel grade R260 independently of the alignment and traffic.

6.2. Rail profile

Rails shall have the minimum following specifications:

- Rail profiles shall be EN 60E2, in accordance with the one described in Appendix A of EN 13674-1



Key

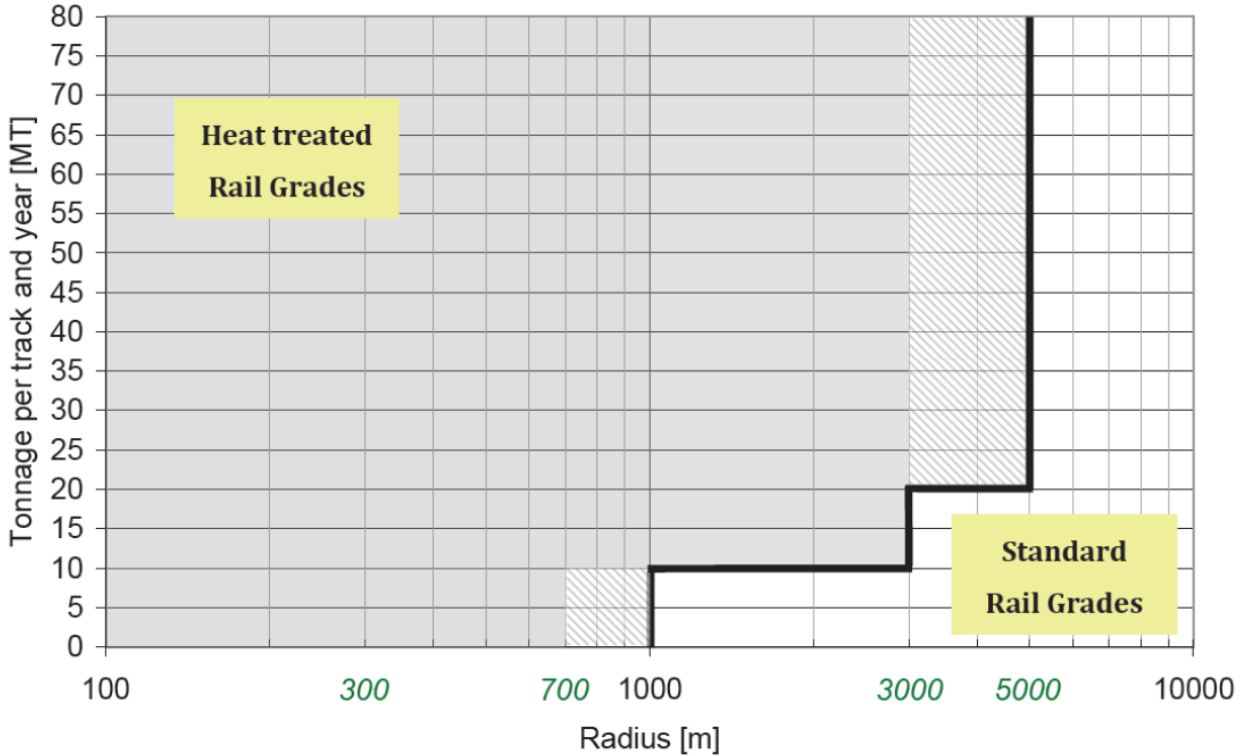
1	centre line of branding		
	cross-sectional area	: 76,48	cm ²
	mass per metre	: 60,03	kg/m
	moment of inertia x-x axis	: 3 021,5	cm ⁴
	section modulus - Head	: 330,8	cm ³
	section modulus - Base	: 374,5	cm ³
	moment of inertia y-y axis	: 510,5	cm ⁴
	section modulus y-y axis	: 68,10	cm ³
	indicative dimensions:	A = 23,778 mm	
		B = 48,913 mm	

1. RAIL PROFILE 60 E2

6.3. Steel grade

Rail shall be produced and supplied with a hardness and tensile strength in agreement with grade R350 HT minimum in the recommended regions with radii below 5000m for heavily loaded tracks, for moderately loaded tracks with

radii up to 3000m and for lightly loaded tracks with radii <1000m (based on the Figure 6). In other areas steel grade R260 shall be delivered.



2. RAIL GRADE SELECTION

Final steel grades volumes will be provided by the Client based on designer calculations.

6.4. Dimension tolerances

Rails shall be produced and supplied in accordance with profile tolerances of class X (cf. Table 7 of Section 9.2.1 of EN 13674-1).

Rails shall be produced and supplied in accordance of crown profile straightness and surface flatness of class A, as per Section 9.2.2 of EN 13674-1. Twist tolerances shall also respect the requirements found in the same section 9.2.2 of EN 13674-1.

6.5. Nominal length

Rails shall be supplied, at rolling mill exit, at a nominal length not less than 50 meters (details in project specific contract documentation may overrule the length given here, length will depend on procurement strategy and shipping capacities), to a length tolerance of ± 1 mm per meter of rail (as per Table 9 of EN 13674-1).

6.6. Manufacture

Bloom casting and rail identification shall be in accordance with Section 7 of EN 13674-1.

No additional requirement regarding cold stamping and paint code.

7. Qualifying tests

Unless otherwise specified below, qualifying tests, for each steel grade stipulated in §6.3 of this specification, shall be carried out in accordance with the requirements and the frequencies of Section 8 of EN13674-1;

All test must be conducted without undue delay and test results must be promptly tabulated and The Client must be advised of any failures or trends.

8. Quality system and inspection

8.1. General

The supplier must be certified under ISO 9001, or institute a Quality Assurance system complying with ISO 9001 and approved by the Client, and must ensure that its subcontractors (if any) have similar systems, or work under the supplier's system;

A Project Quality Plan must be prepared and be submitted to the Client for approval as a controlled document within 1 month of the date of award of the contract;

Unless otherwise specified below, control of non-conforming products and quality records shall be in accordance with the requirements of Section 8.7 of ISO 9001 or Section 9.3 (Annex I Clause I7) of EN13450.

8.2. Design Conformance, acceptance tests and certification

Unless otherwise specified below, acceptance tests shall be carried out, for each steel grade stipulated in §6.3 of this specification, in accordance with the requirements and the frequencies of Section 9 of EN13674-1;

Brinell hardness tests shall be carried out in accordance with EN ISO 6506-1;

Supplier's EC Declaration of conformity and NoBo EC certificate shall be submitted to The Client for each type of rail indicated in the European Commission Regulation No 1299/2014 (Technical Specifications of Interoperability – TSI INF);

The supplier must within 10 days of the month end prepare and issue a Certificate of Conformance to The client in an agreed format, certifying the month's production, itemizing any failures and actions, and attaching a tabulation of inspection and test results.

At the end of the successfully completed acceptance process including all testing and documentation the Product Acceptance certificate will be granted by the Client.

8.3. Quality records

The supplier must retain all primary quality records in accordance with the statutory requirements, contract conditions and company policy and make these available to The Client at all reasonable times. These must include all the requirements of the approved Project Quality Plan;

If not otherwise required, records must be kept for at least 6 (six) years after the date of issue of the final certificate.

8.4. Inspections and audits

The Client will arrange inspections or audits to ensure that the supplier is complying with the Quality Management system;

The Client reserves the right to perform inspections, at all times while the work on the contract of the Supplier is being performed, of all parts of the Supplier's works which concern the manufacture of rails ordered. The supplier must,

upon being given reasonable notice, make or arrange to make available all facilities, documentation records, and personnel details, including those of any subcontractors, that are reasonably required for the audit or surveillance to be undertaken.

The Supplier shall ensure the inspector, free of charge, all reasonable facilities and necessary assistance to satisfy him that rails are being manufactured in accordance with this Technical Specification. Inspections will be conducted so as not to interfere unnecessarily with the operation of the works or disturb normal rolling mill production.

9. Additional information requested

In addition to the mandatory requirements outlined in this specification, the Client reserves the right to request from the Supplier information pertaining to the performance of their product under similar service conditions, with particular emphasis on rail management aspects which may influence rail life-cycle costs, i.e.: rail wear rates, rolling contact fatigue behavior, rail head wear limits.