Infrastructure TSI as an example of the implementation of the “Interoperability” idea

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From national visions to European interoperability

**YESTERDAY**

- International Agreements (COTIF, AGC, AGTC,...)
- International Rules (UIC, RIV, RIC,...)
- National Rules (With or without mutual recognition)

**TODAY**

- European Specifications
- European Standards
- National Rules
Technical specifications for interoperability (TSI)

- Directive 96/48: Interoperability of the trans-European (TEN) high-speed rail system
- Directive 2001/16: Interoperability of the trans-European (TEN) conventional rail system
- Interoperability Directive 2004/50 modifying 96/48 and 2001/16
- Safety Directive 2004/49/EC
- Regulation 881/2004 (European Railway Agency)
- Directive 2008/57/EC on the interoperability of the rail system within the Community (covering both HS and CR and extending the scope of the TSIs progressively to the whole rail system)

TSIs evolution*

- Decisions 2002 (HS)
- Decisions 2008 (HS)
- Decisions 2011 (CR)
- Decisions 2012 (HS)
- Regulations 2014 (TEN / off TEN)
- Regulation 2019
- New TSI package 2022

* e.g. INF/ENE TSIs
For the purposes of this Directive, the system constituting the Union rail system may be broken down into the subsystems beside.

**Subsystems**

- Infrastructure
- Energy
- Trackside control-command and signalling
- On-board control-command and signalling
- Rolling stock
- Operation and traffic management
- Maintenance
- Telematic applications for passengers and freight services

**Directive EU 2016/797**

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**TSIs chronology (Table 1 Structural TSIs, Table 2 Functional TSIs)**
Implementation of Essential Requirements

Interoperability Directive
6 Essential Requirements

Mandatory Rules
TSIs + NTRs

Standards directly quoted in TSIs

Harmonised EN Standards

Other public standards and documents

Company standards

Level of DETAIL of the description of the essential requirements

1. Safety
2. Reliability and availability
3. Health
4. Environmental protection
5. Technical compatibility
6. Accessibility

Mandatory
- Specified in TSIs / NTRs

Voluntary
- Applicant chooses own specifications
• **TSI infrastructure** is an **Annex** to the 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.

• The Regulation (EU) No 1299/2014 has been amended by Commission Implementing Regulation (EU) 2019/776 of 16 May 2019

• A consolidated version is available in the [link](#)
Structure of TSIs

**The scope of application**
- Geographically, e.g. Union’s network
- Technically, e.g. track
- May exclude some types of subsystem

**Functional and technical specifications**
- To meet essential requirements as in Directive
- To describe interfaces with other subsystems
- May include references to standards

**Interoperability constituents**
- Checked independently from subsystem
- E.g. rail, sleepers,
- If an IC is used, it must comply with TSI

**Procedures to assess conformity**
- Used by NoBos
- Generic assessment modules

**Implementation strategy**
- To minimise the economical impact
- Specific cases for Member States

Both requirements & assessment procedures are mandatory
Chapter 4 - Functional and technical specifications of subsystem

The **Basic Parameters**, characterising the **infrastructure subsystem**, are grouped according to the following aspects:

- **Line Layout**
- **Track Parameters**
- **Switches & Crossing**
- **Track resistance to applied loads**
- **Structure resistance to traffic loads**
- **Immediate action limits on track geometry defects**
- **Platforms**
- **Health, safety and environment**
- **Provision for operation**
- **Fixed installations for servicing trains**
Basic parameters 1/2

**Line layout**
- Structure gauge (4.2.3.1)
- Distance between track centres (4.2.3.2)
- Maximum gradients (4.2.3.3)
- Minimum radius of horizontal curve (4.2.3.4)
- Minimum radius of vertical curve (4.2.3.5)

**Track parameters**
- Nominal track gauge (4.2.4.1)
- Cant (4.2.4.2)
- Cant deficiency (4.2.4.3)
- Abrupt change of cant deficiency (4.2.4.4)
- Equivalent conicity (4.2.4.5)
- Railhead profile for plain line (4.2.4.6)
- Rail inclination (4.2.4.7)

**Switches and crossings**
- Design geometry of switches and crossings (4.2.5.1)
- Use of swing nose crossings (4.2.5.2)
- Lateral track resistance (4.2.6.3)

**Track resistance to applied loads**
- Track resistance to vertical loads (4.2.6.1)
- Lateral track resistance (4.2.6.3)

**Structures resistance to traffic loads**
- Resistance of new bridges to traffic loads (4.2.7.1)
- Equivalent vertical…..earthworks and…..new structures (4.2.7.2)
- Resistance of new structures over or adjacent to tracks (4.2.7.3)
- Resistance of existing bridges and earthworks to traffic loads (4.2.7.4)
Immediate action limits on track geometry defects

- IAL for alignment (4.2.8.1)
- IAL for longitudinal level (4.2.8.2)
- IAL for track twist (4.2.8.3)
- IAL of track gauge as isolated defect (4.2.8.4)
- IAL for cant (4.2.8.5)
- IAL for switches and crossings (4.2.8.6)

Platform

- Usable length of platforms (4.2.9.1)
- Platform height (4.2.9.2)
- Platform offset (4.2.9.3)
- Track layout alongside platforms (4.2.9.4)

Health, safety and environment

- Maximum pressure variation in tunnels (4.2.10.1)
- Effect of crosswinds (4.2.10.2)
- Aerodynamic effect on ballasted track (4.2.10.3)

Provision for operation

- Location markers (4.2.11.1)
- Equivalent conicity in service (4.2.11.2)

Fixed installations for servicing trains

- Toilet discharge (4.2.12.2)
- Train external cleaning facilities (4.2.12.3)
- Water restocking (4.2.12.4)
- Refuelling (4.2.12.5)
- Electric shore supply (4.2.12.6)
Chapter 5 - Interoperability constituents

(7) ‘interoperability constituents’ means any elementary component, group of components, subassembly or complete assembly of equipment incorporated or intended to be incorporated into a subsystem, upon which the interoperability of the rail system depends directly or indirectly, including both tangible objects and intangible objects;
Modules (Decision 2010/713/EU) and particular assessment procedures are identified for:

- **Interoperability Constituents:**

  - Infrastructure subsystems:

  6.2.2. Application of modules

  For the EC verification procedure of the infrastructure subsystem, the applicant may choose either:

  (a) Module SG: EC verification based on unit verification, or

  (b) Module SH: EC verification based on full quality management system plus design examination.
Chapter 7 – Transposition of the infrastructure TSI

- Application of TSI to **new railway lines** vs **existing railway lines**

- National Implementation plan (to be developed by MSs)

- Specific cases:
  - (a) ‘P’ cases: permanent cases;
  - (b) ‘T’ cases: temporary cases, where it is recommended that the target system is reached by 2020
A TSI is a common (harmonized) technical standard specifying the elements of essential requirements* that need to be harmonized to achieve interoperability

- Safety, reliability and availability, health, environmental protection, technical compatibility, accessibility

TSIs relate to
+ structural subsystems (infrastructure, rolling stock, energy, CCS), or
+ functional subsystems (maintenance, traffic operation and management, telematics applications for passengers and freight services)

The TSI framework is supplemented by national rules (NRs)
Making the railway system work better for society.

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