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Železniške naprave - Progovni sistemi z utrjenimi tirnicami - 1. del: Splošne zahteve

Railway applications - Ballastless track systems - Part 1: General requirements

Bahnanwendungen - Feste Fahrbahn-Systeme - Teil 1: Allgemeine Anforderungen

Applications ferroviaires - Systèmes de voie sans ballast - Partie 1: Prescriptions générales

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Railway applications - Ballastless track systems - Part 1: General requirements

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (prEN 16432-1:2012) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

This European Standard is one of the series prEN 16432 "*Railway applications – Ballastless track systems*" as listed below:

— *Part 1: General requirements*

— *Part 2: Subsystems and components*

— *Part 3: Acceptance*

Introduction

This standard is intended to be used by clients, designers and specifiers of ballastless track systems as well as for reference and development by suppliers and construction contractors.

This standard defines a minimum set of requirements for ballastless track systems.

The series of European Standards prEN 16432 “Railway applications – Ballastless track systems” consists or three parts as listed below:

— Part 1: General requirements

— Part 2: Subsystems and components

— Part 3: Acceptance

Contents of part 1: General requirements

Exposure to external interfaces, see 4.

Ballastless track systems are exposed to loads and actions from surrounding systems and structures. Those surrounding systems and structures are:

Environment, see 4.1.

Ballastless track systems are exposed to impacts from the environment like humidity, chemicals and other pollutants, ambient temperatures and temperature changes, rainwater or solar radiation. Those exposures have impact on the track system.

Rolling stock, see 4.2.

Trains are running on rails which are a constituent of ballastless track systems. The train loads are transferred from the train wheel into the rail and further into the total track structure and all its components.

Electrical interfaces, see 4.3.

Ballastless track systems are usually equipped with signalling or power supply systems respectively its components. Ballastless track systems may also influence the functionality of such electrical systems.

Substructure, see 4.4.

Ballastless track systems are always supported by a substructure. The track systems and the substructures consequently need to be harmonized to assure the load transfer and other functions between those two adjacent systems.

System requirements, see 5.

Ballastless track systems shall perform to safely guide the train and distribute the acting loads into the substructure. These and other system requirements on ballastless track systems are defined in clause 5.

Contents of part 2: Subsystems and components

Ballastless track systems consist of or may be divided into various components and/or subsystems. The requirements for those components and subsystems are defined in part 2.

Contents of part 3: Acceptance

Ballastless track systems shall be accepted on site in terms of geometric and performance parameters. The parameters as well as procedures to derive them are defined in part 3.

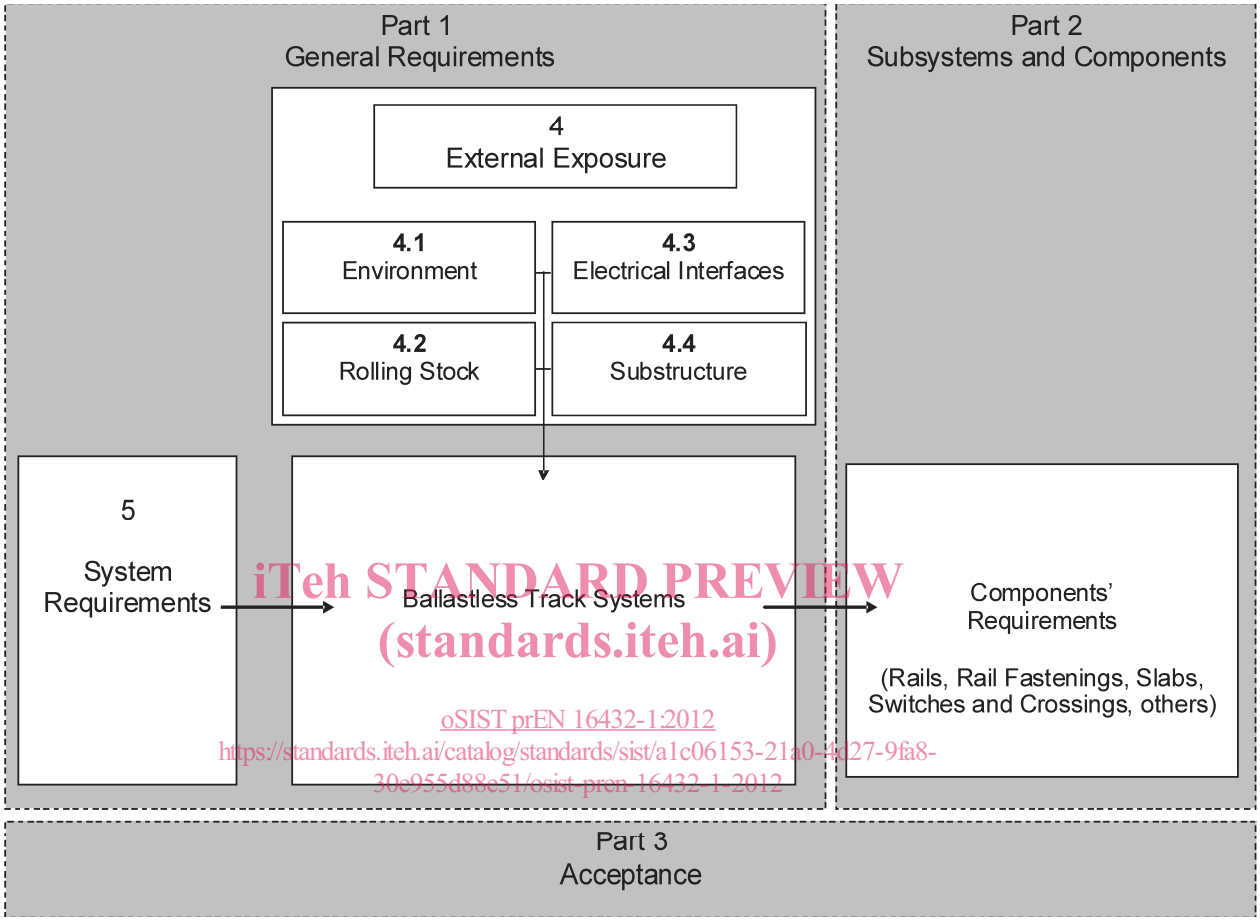

Figure 1 — Structure of prEN 16432-1, -2 and -3

1 Scope

This European Standard defines the general requirements concerning the design and acceptance for ballastless track systems.

It does not include any requirements for inspecting, maintaining, repairing and replacing ballastless track systems during operation.

This standard is applicable for high speed and conventional railway applications up to 250 kN axle load. The application for other tracks (e.g. urban track or industrial lines) is not considered.

This standard applies to track systems using slabs as well as:

— booted systems;

— embedded rail systems; or

— other fastening systems.

The requirements of this standard apply to ballastless track systems:

— for plain track as well as switches and crossings and rail expansion joints;

— at transitions between different supporting structures;

— at transitions between different ballastless track systems;

— at transitions between ballasted and ballastless track systems;

— on various supporting structures like embankments and cuttings, tunnels, bridges or similar, with or without floating slabs.

NOTE Requirements only for the characterisation of the listed supporting structures above are included in this standard. Design of the supporting structures is covered by other standards, e.g. EN 1992-1-1.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1990, *Eurocode – Basis of structural design*

EN 1991-2:2003 + AC:2010, *Eurocode 1: Actions on structures – Part 2: Traffic loads on bridges*

EN 1997-1, *Eurocode 7: Geotechnical design – Part 1: General rules*

EN 1998-1, *Eurocode 8: Design of structures for earthquake resistance – Part 1: General rules, seismic actions and rules for buildings*

EN 13146-5, *Railway applications – Track – Test methods for fastening systems – Part 5: Determination of electrical resistance*

FprEN 13481-5, *Railway applications – Track – Performance requirements for fastening systems – Part 5: Fastening systems for slab track with rail on the surface or rail embedded in a channel*

EN 13848-1+A1:2008, *Railway applications – Track – Track geometry quality – Part 1: Characterisation of track geometry*

EN 50122-1:2011, *Railway applications – Fixed installations – Electrical safety, earthing and the return circuit – Part 1: Protective provisions against electric shock*

EN 50122-2, *Railway applications – Fixed installations – Electrical safety, earthing and the return circuit – Part 2: Provisions against the effects of stray currents caused by d.c. traction systems*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
design life
assumed entire life of the ballastless track systems

3.2
Electromagnetic Compatibility
(EMC)
ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment

3.3
floating slab
mass spring system (MSS) where elasticity is introduced between slab and substructure

EXAMPLE For reducing vibration.

3.4
slab
element made of concrete or asphalt between rail and substructure. It is a component of the superstructure and may include sleepers, beams, plates, etc.

3.5
substructure
earthworks (embankment or cutting) or bridges (or similar civil structures) or/and tunnel floor that lie below the superstructure

3.6
superstructure
ballastless track systems plus associated structures, components or elements, which are not strictly required for the functionality of the track and do not belong to other systems

4 Exposure to external influences

4.1 Environment

4.1.1 General

The principal requirement of ballastless track systems is the correct functioning under relevant and representative environmental conditions. These conditions are divided in physical and chemical loads.

This clause defines the requirements on ballastless track systems arising from the environmental factors acting on the system, which are:

— water including snow and ice;

— temperature;

— wind;

— earthquakes;

— chemical exposure, ultraviolet (UV) exposure and pollution.

4.1.2 Water

Exposure to water shall be considered as an aspect over the design life of ballastless track systems. In the design phase the various aspects of exposure to water shall be considered.

The following items shall be considered:

— exposure to rain water, tunnel leakage water, ground water, (melting) snow, ice and hail, air humidity;

— exposure to pressurized water, either ground water or trapped water;

— exposure to repetitive freezing and thawing;

— exposure to water in the event of fire extinguishing.

For water containing chemical substances dissolved, e.g. salt, metals, oxides, see 4.1.6.

For the influence of water on the electromagnetic compatibility, see 4.3.

Ballastless track systems shall have a drainage system with sufficient capacity, sufficient strength and safety against ground water pressure.

Ballastless track systems shall have sufficient capacity to deal with snow and the equipment to remove snow, e.g. snow ploughs.

Requirements for the design of the drainage system as part of the ballastless track systems shall be in accordance with the substructure drainage system.

If ground water pressure can occur at the interface substructure/superstructure the ballastless track systems shall be designed accordingly.

4.1.3 Temperature

Exposure to temperatures and variations in temperature shall be considered over the design life of the ballastless track systems. In the design phase the various aspects of exposure to temperatures shall be considered.

The following items shall be considered:

— exposure to air temperature and effect of radiation (solar – day time / open sky – night time);

— effects of temperature gradients;

— effects of differential temperatures;

— thermal effects due to rolling stock (e.g. eddy-current braking as operational brake), see 4.2;

— thermal effects due to installation and maintenance works;

— effects of temperature exposure of the substructure and floating slab, see 4.4.

Ballastless track systems shall be able to perform safely and durably within a specified temperature range.

NOTE 1 General points of attention for requirements due to temperature are, e.g. horizontal and vertical movements, interaction with substructures, interaction with other track systems, in particular ballasted track and floating slab.

NOTE 2 During installation, maintenance and operation different requirements due to temperature might apply.