SLOVENSKI STANDARD
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Železniške naprave - Zgornji ustroj proge - Betonski pragi in nosilci s podpragovnimi podlogami

Railway applications - Track - Concrete sleepers and bearers with under sleeper pads

Bahnanwendungen - Oberbau - Gleis- und Weichenschwellen aus Beton mit Schwellensohlen

Applications ferroviaires - Voie - Traverses et supports en béton avec semelles sous traverse

Ta slovenski standard je istoveten z: **prEN 16730**

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45.080	Tračnice in železniški deli	Rails and railway components
91.100.30	Beton in betonski izdelki	Concrete and concrete products
93.100	Gradnja železnic	Construction of railways

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EUROPEAN STANDARD

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ICS 93.100

Will supersede EN 16730:2016

English Version

Railway applications - Track - Concrete sleepers and bearers with under sleeper pads

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Bahnanwendungen - Oberbau - Gleis- und Weichenschwellen aus Beton mit Schwellensohlen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 256.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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European foreword

This document (prEN 16730:2025) 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 will supersede EN 16730:2016.

In comparison with the previous edition, the following technical modifications have been made:

— to improve parts of the procedure that involve concrete blocks to make it easier to implement and increase its relevance;

— to review some requirements for USP surface planarity/flatness to make it more practical and improve the procedure for making concrete blocks;

— to review some requirements for USP to help to contribute to innovative products;

— to capitalize on the experience from the field gained by industry manufacturers and infrastructure managers since the previous publication.

Introduction

This document relates to the EN 13230 series when the sleepers or bearers are manufactured with Under Sleeper Pad (USP). The USP is an elastic layer fixed to the bottom surface of the sleepers or bearers. This document applies to the system constituted of the concrete sleepers or bearers and the Under Sleeper Pad.

For more information, the following document “IRS 70713-1”: “Railway Application - Track & Structure - “Under Sleeper Pads (USP) - Recommendations for Use” proposes different recommendations:

- for USP classification and their fields of applications;
- for cases of use of USP;
- for the design approval tests and routine tests.

1 Scope

This document is applicable to concrete sleepers or bearers with Under Sleeper Pads (USP) physically bonded to concrete used in ballast track and define the test procedures and their evaluation criteria. This document provides particular information in the following areas:

— test methods, test arrangements and evaluation criteria of Under Sleeper Pads;

— test methods, test arrangements and evaluation criteria of concrete sleepers and bearers with Under Sleeper Pads;

— data supplied by the purchaser and by the supplier;

— definition of general process of design approval tests;

— definition of routine tests.

This document defines the specific test procedures for design approval tests, routine tests and tests concerning the determination of relevant properties of Under Sleeper Pad with or without concrete sleepers and bearers:

— fatigue tests;

— tests of capability for stacking of concrete sleepers or bearers fitted with USP;

— pull-out test;

— temperature variation test.

This document also sets out procedures for testing fitness for purpose and provides information on quality monitoring as part of quality assurance procedures. This document does not, however, contain requirements pertaining to the properties of Under Sleeper Pads. It is the responsibility of the purchaser to define these requirements

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 206,[1] *Concrete - Specification, performance, production and conformity*

EN 1542, *Products and systems for the protection and repair of concrete structures - Test methods - Measurement of bond strength by pull-off*

EN 10027 (all parts), *Designation systems for steels*

EN 13230-1:2016, *Railway applications - Track - Concrete sleepers and bearers - Part 1: General requirements*

EN 13230-2:2016, *Railway applications - Track - Concrete sleepers and bearers - Part 2: Prestressed monoblock sleepers*

[1] Impacted by EN 206:2013+A1:2021

EN 13230-3:2016, *Railway applications - Track - Concrete sleepers and bearers - Part 3: Twin-block reinforced sleepers*

EN 13230-4:2016+A1:2020, *Railway applications - Track - Concrete sleepers and bearers - Part 4: Prestressed bearers for switches and crossings*

EN 13230-5, *Railway applications - Track - Concrete sleepers and bearers - Part 5: Special elements*

EN 13230-6, *Railway applications - Track - Concrete sleepers and bearers - Part 6: Design*

EN 13450, *Aggregates for railway ballast*

EN 17343, *Railway applications - General terms and definitions*

EN ISO 527 (all parts), *Plastics — Determination of tensile properties (ISO 527, all parts)*

EN ISO 7500-1, *Metallic materials - Calibration and verification of static uniaxial testing machines - Part 1: Tension/compression testing machines - Calibration and verification of the force-measuring system (ISO 7500-1)*

EN ISO 9513:2012,[2] *Metallic materials - Calibration of extensometer systems used in uniaxial testing (ISO 9513:2012+AC:2013)*

EN 22768-1, *General tolerances - Part 1: Tolerances for linear and angular dimensions without individual tolerance indications (ISO 2768-1)*

ISO 37, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

ISO 291:2008, *Plastics — Standard atmospheres for conditioning and testing*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 17343 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1
track category TC1
track using concrete sleepers or bearers with under sleeper pads designed for urban light rail and some industrial track with a typical axle load between 100 kN and 130 kN, a typical maximum speed of 100 km/h, a typical rail section of 49E1 and a typical sleeper or support spacing of 650 mm (maximum 750 mm)

3.2
track category TC2
track using concrete sleepers or bearers with under sleeper pads designed for urban light rail and some industrial track with a typical axle load of 160 kN, a typical maximum speed of 140 km/h, a typical rail section of 54E1 and a typical sleeper or support spacing of 650 mm

[2] Impacted by EN ISO 9513:2012+AC:2013.

3.3
track category TC3
track using concrete sleepers or bearers with under sleeper pads designed for either:

— conventional main line railways with a typical axle load of 225 kN, a typical maximum speed of 200 km/h, a typical rail section of 60E1 and a typical sleeper or support spacing of 600 mm; or

— track using concrete sleepers or bearers with under sleeper pads designed for lines with large radius curves, often used for high speed trains and having a typical axle load of 200 kN, a typical maximum speed of 320 km/h, a typical rail section of 60E1, a typical sleeper or support spacing of 600 mm; or

— freight line railways with a typical axle load of 250 kN, a typical maximum speed of 120 km/h, a typical rail section of 60E1 and a typical sleeper or support spacing of 600 mm

3.4
track category TC4
track using concrete sleepers or bearers with under sleeper pads designed for mixed traffic line carrying heavy freight trains with a typical axle load of 300 kN, a typical maximum speed of 200 km/h, a typical rail section of 60E1 and a typical sleeper or support spacing of 600 mm

3.5
ballasted track
track in which the sleepers or bearers are embedded in the ballast

3.6
sleeper
transverse components of the track which control the gauge and transmit loads from the rail to the ballast or other sleeper support

3.7
bearer
transverse components of switches and crossings which control the relative geometry of two or more stretches of running rails and different pieces of special track work, and transmit loads from the rails to the ballast or other sleeper support

3.8
Under Sleeper Pad
USP
elastic layer fixed to the bottom surface of the sleepers or bearers including technologies of bonding between sleepers or bearers and under sleeper pad

3.9
stiffness
force per unit deflection measured under a uniaxial force

3.10
bedding modulus
pressure (force per surface) per unit deflection and measured under a uniaxial load

3.11
stiffness or bedding modulus
stiffness or bedding modulus in vertical direction measured normal to the base of the sleeper where the support is a slab, between two specified applied loads

3.12
static stiffness or bedding modulus
force or pressure per unit deflection measured under a uniaxial static load

3.13
dynamic stiffness or bedding modulus
force or pressure per unit deflection measured under a cyclic uniaxial load

Note 1 to entry: Low frequency dynamic stiffness or bedding modulus: stiffness or bedding modulus measured within the frequency range (2 to 30) Hz (without preloading between defined pressures, see Figure 1).

Note 2 to entry: Higher frequency dynamic stiffness or bedding modulus: stiffness or bedding modulus measured within the frequency range (20 to 450) Hz (under preloading conditions see Table H.1, see Figure 1).

3.14
vibration mitigation
reduction in emission of mechanical vibration and/or structure-borne noise into the surroundings

3.15
geometric ballast plate
GBP
rigid steel plate with a geometrically structured surface simulating ballast contact

Note 1 to entry: See *Annex A*.

3.16
design approval test
homologation procedure with description of the product properties and test results

3.17
routine test
quality control test in terms of regular manufacturing

3.18
purchaser
operator or user of the equipment, or the customer of the material on the user's behalf

3.19
supplier
body responsible for the use of the EN in response to the purchaser's requirement and also for requirements which apply to the producer or manufacturer

Note 1 to entry: Generally the supplier is the manufacturer of the concrete sleepers and has a sub-contractor for the USPs.

3.20
USP on concrete block
USP bonded on concrete block

Note 1 to entry: See *Annex B*.

4 Symbols

Table 1 lists the parameters and physical quantities used.

Table 1 — Symbols

Symbols	Characterization	Units
A	area	mm^2
a	acceleration in measurement of higher frequency bedding modulus	m/s^2
C	bedding modulus	N/mm^3
d	displacement	mm
Δ	variation	-
F	force	N
f	frequency in measurement	Hz
k	stiffness	N/mm
L_H	vibration level related to reference value of 5×10^{-8} m/s	dB
m	mass	kg
N	number of cycles	-
η	loss factor	-
p	pressure	N/mm^2
κ	stiffening coefficient between low frequency dynamic bedding modulus and static bedding modulus	-
σ	stress (pressure or tensile)	N/mm^2
ω	angular frequency = $2\pi \cdot f$ (for higher frequency bedding modulus)	s^{-1}

Table 2 lists the indices used with the parameters and physical quantities.

Table 2 — Indice of the symbols

Indices	Characterization
0	for frequency, definition of natural frequency
5 Hz, 10 Hz, 20 Hz, 30 Hz	value of frequency in measurement
af	after
av	average
be	before
dyn	low frequency dynamic
H	higher frequency
max	maximum
min	minimum