SLOVENSKI STANDARD
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Železniške naprave - Infrastruktura - Pod balastnimi preprogami

Railway applications - Infrastructure - Under ballast mats

Bahnanwendungen - Infrastruktur - Unterschottermatten

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Bahnanwendungen - Infrastruktur - Unterschottermatten

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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 17282:2018) 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.

Introduction

In a track for railway vehicles, the under ballast mat (UBM) is a product which is placed between the substructure and the ballast layer. This document applies to the performance-related properties of this mat.

1 Scope

This document is applicable to under ballast mats used in ballasted track and defines 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 ballast mat;

— 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 under ballast mat:

— stiffness tests;

— fatigue tests;

— number of tests for severe environmental condition.

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 functions of under ballast mats. It is the responsibility of the purchaser to define these requirements and to choose the optional tests.

2 Normative references

The following referenced documents are indispensable for the application 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 10027 (all parts), *Designation systems for steels*

EN 13450, *Aggregates for railway ballast*

EN 13674-1, *Railway applications – Track – Rail – Part 1: Vignole railway rails 46 kg/m and above*

EN ISO 1856, *Flexible cellular polymeric materials - Determination of compression set (ISO 1856)*

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, *Metallic materials - Calibration of extensometer systems used in uniaxial testing (ISO 9513:2012)*

EN ISO 22768 (all parts), *General tolerances (ISO 2768, all parts)*

3 Terms and definitions

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

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

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

3.1
ballasted track
track in which the sleepers or bearers are supported by ballast

3.2
under ballast mat (UBM)
product of resilient material installed in track between substructure and ballast layer including all integral parts of the product

Note 1 to entry: The main objectives of the application of under ballast mats are to increase resilience in the track in order to improve the load distribution and/or to reduce vibrations transmitted to the surroundings, and by doing so providing vibration insulation.

3.3
stiffness
force per unit deflection, measured under a uniaxial force

3.4
bedding modulus
compressive stress (force per unit area) per unit deflection, measured under a uniaxial force

3.5
static stiffness or bedding modulus
force or stress per unit deflection measured under a uniaxial static load

3.6
low frequency dynamic stiffness or bedding modulus
force or stress per unit deflection measured under a uniaxial force which acts periodically at a frequency of (5 – 20) Hz between specific force or stress levels

Note 1 to entry: This value is determined mainly for calculation of dynamic deformation of tracks.

3.7
higher frequency dynamic stiffness or bedding modulus
force or stress per unit deflection measured under a uniaxial force or displacement, which acts periodically at a frequency of (10 – 160) Hz at a specific stress level

Note 1 to entry: This value will be determined as an input characteristic for vibration calculations. In contrast to the determination of low frequency dynamic stiffness or bedding modulus, this test will be determined under static preloading.

3.8
noise mitigation
reduction of emission of structure borne noise into the surroundings

Note 1 to entry: UBM has no direct influence on noise-mitigation only in some indirect cases e.g. mitigate the reradiated sound from bridge-structures.

3.9
vibration mitigation
reduction of emission of mechanical vibration and/or structure-borne noise into the surroundings

3.10
geometric ballast plate (GBP)
rigid steel plate with a geometrically structured surface simulating ballast contact

Note 1 to entry: See Annex A.

3.11
design approval test
test performed to demonstrate the compliance of the product properties to the requirements, set by the purchaser

3.12
routine test
test performed to demonstrate the compliance of the product properties to the quality plan, set by the supplier

3.13
purchaser
operator or user of the equipment, or the customer of the material on the user's behalf

3.14
supplier
company /body responsible for the execution of purchaser's requirements

Note 1 to entry: This can be the manufacturer or his designated representative, stockist, distributer, or agent. The supplier is responsible for the use of the EN in response to the purchaser's requirements and will ensure all local conditions of purchase requirements are satisfied.

3.15
manufacturer
organization responsible for blending and processing material constituents, integrating them in the manufacturing process and subsequently cutting, stamping or moulding to final dimensions

4 Symbols and abbreviations

Table 2 — Symbols

Symbols	Characterization	Units
A	area	mm²
a	acceleration in measurement of higher frequency stiffness	m/s²
C	bedding modulus	N/mm³
d	displacement	mm
Δ	variation	-
F	force	kN
f	frequency in measurement	Hz
k	stiffness	N/mm
L	point stiffness level for higher frequency stiffness	dB re 1 N/m
m	mass	kg
η	loss factor	-
N	number of cycles	-
p	pressure	N/mm²
κ	stiffening ratio between dynamic bedding modulus and static bedding modulus	-
σ	stress (compressive or tensile)	N/mm²
ω	angular frequency = 2π · f (for higher frequency stiffness)	s^{-1}

Table 3 — Indices of the symbols

Indices	Characterization
0	for frequency, definition of natural frequency
i Hz	value of frequency in measurement
af	after
av	average
be	before
dyn	low frequency dynamic
H	higher frequency
h	horizontal
max	maximum
min	minimum
'number' or i	sequential number in order to differentiate types of measurements
pre	preload
stat	static
tend	tendency
test	test load
v	vertical

5 Track categories

For track categories, see Table 1.

Table 1 — Definition of Track Categories (TC) for tracks using under ballast mats according their typical specifications and use cases

	Axle load [kN]	**Speed** [km/h]	**Rail profile** as defined in EN 13674-1	**Distance of sleeper supports or rail fastenings** [mm]	**Typical application**
TC1	≥ 100 ≤ 130	≤ 100	49E1	650 (maximum 750)	Urban light rail or industrial tracks
TC2	≤ 160	≤ 140	54E1	650	Urban light rail or industrial tracks
TC3	≤ 225	≤ 200	60E1	600	Conventional main traffic lines
	≤ 200	≤ 320	60E1	600	High-speed lines and tracks with large radius
	≤ 250	≤ 120	60E1	600	Freight lines
TC4	≤ 300	≤ 120	60E1	600	Mixed traffic including freight with heavy axle loads

6 Design approval tests and routine tests

6.1 General

This clause defines the objectives of tests and of demanded information about the UBM.

The purchaser should define the accepted laboratories.

The purchaser decides the way to choose the test sample units.

In order to be able to identify UBM at a later date, the following values shall be indicated:

— the specific mass of the product and all its components, see 6.3.1;

— the results of a suitable material analysis as selected by the manufacturer and approved by the purchaser.

The supplier shall provide sufficient data to satisfy the objectives of the tests and/or the provision of requested information in respect of UBM including:

— the data sheet as described in Annex B;

— any transportation, storage and installation recommendations and procedures to preserve the material characteristics and original performance.

Compliance with Category TC4 implies compliance with Categories TC1 – TC4 except for bedding modulus measurements.