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Železniške naprave - Infrastruktura - Plastični pragi in kretniški plastični pragi - 1.
del: Splošne zahteve

Railway applications - Infrastructure - Plastic sleepers and bearers - Part 1: General requirements

Bahnanwendungen - Infrastruktur - Gleis- und Weichenschwellen aus Kunststoff - Teil 1: Allgemeine Anforderungen

Applications ferroviaires - Infrastructure - Traverses et supports en plastique - Partie 1 : Exigences générales

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45.080	Tračnice in železniški deli	Rails and railway components
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Railway applications - Infrastructure - Plastic sleepers and bearers - Part 1: General requirements

Applications ferroviaires - Infrastructure - Traverses et supports en plastique - Partie 1 : Exigences générales

Bahnanwendungen - Infrastruktur - Gleis- und Weichenschwellen aus Kunststoff - Teil 1: Allgemeine Anforderungen

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European foreword

This document (prEN 17318-1:2018) 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.

This European Standard is one of the series EN 17318 “*Railway applications – Infrastructure – Plastic sleepers and bearers*”, which consist of the following parts:

- *Part 1: General requirements;*
- *Part 2: Product testing;*
- *Part 3: Material characteristics.*

This European Standard is used as the technical basis for transaction between corresponding parties (purchaser – supplier).

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).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

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prEN 17318-1:2018 (E)**Introduction**

This part of the standard defines the general characteristics for plastic sleepers and bearers and is used in conjunction with the following parts:

- Part 2: Product testing;
- Part 3: Material Characteristics.

Plastic sleepers and bearers are safety critical components for railway applications. They are not covered by any other standards.

As safety critical components, an agreement is needed between purchaser and supplier to operate a factory Quality System.

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1 Scope

This document defines the technical criteria and control procedures which need to be satisfied by the constituent materials and the finished plastic sleepers and bearers.

The main requirement of plastic sleepers and bearers is transmission of vertical, lateral and longitudinal loads from the rails to the ballast or other support. In use they are also exposed to environmental and chemical impacts, which could influence sleeper performance.

The tests defined in this standard provide assurance of the capability of sleepers or bearers to resist repetitive loading and provide sufficient durability. In addition, controls are placed on manufacturing processes and tests to ensure that the plastic will not suffer unacceptable degradation in service.

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 13146-3, *Railway applications - Track - Test methods for fastening systems - Part 3: Determination of attenuation of impact loads*

3 Terms, definitions and symbols

3.1 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>

3.1.1

purchaser

body responsible for purchasing the product on the user's behalf

3.1.2

supplier

body responsible for the use of the European Standard in response to the purchaser's requirement. The supplier is also responsible for requirements which apply to the producer or manufacturer

3.1.3

sleeper

transverse component of the track which controls the gauge and transmits loads from the rail to the ballast or other sleeper support

3.1.4

bearer for switches and crossings

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

prEN 17318-1:2018 (E)**3.1.5****bending moment**

moment applied on the plastic sleeper or bearer which produces tension and compression in the element

3.1.6**positive bending moment**

moment which produces tension at the bottom of the plastic sleeper or bearer

3.1.7**negative bending moment**

moment which produces tension at the top of the plastic sleeper or bearer

3.1.8**rail seat**

area on which a running rail rests

3.1.9**rail seat area**

rail seat and the immediate area around the fastening system

3.1.10**rail seat bending moment**

moment under the centre line of the rail

3.1.11**centre bending moment**

moment at the centre part of a monoblock sleeper

3.1.12**monoblock sleeper**

Sleeper consisting of one block of material

3.1.13**twin-block sleeper**

sleeper in which two blocks are connected by a connecting bar

3.1.14**block**

short plastic element which transmits loads from one rail to the ballast or other support

3.1.15**test load**

load applied during testing

3.1.16**dynamic rail seat load**

P_k

characteristic load on a rail seat of the sleeper for normal service dynamic loading

3.1.17**characteristic bending moment**

M_k

bending moment from dynamic rail seat load P_k

3.1.18**characteristic positive bending moment for rail seat section** $M_{k,r,pos}$ positive bending moment at rail seat from dynamic rail seat load P_k **3.1.19****characteristic negative bending moment for rail seat section** $M_{k,r,neg}$ negative bending moment at rail seat from dynamic rail seat load P_k **3.1.20****characteristic negative bending moment for centre section** $M_{k,c,neg}$ negative bending moment at centre section from dynamic rail seat load P_k **3.1.21****characteristic positive bending moment for centre section** $M_{k,c,pos}$ positive bending moment at centre section from dynamic rail seat load P_k **3.1.22****thermal deformability**

deformation of geometric properties as a result of thermal influences

3.1.23**bedding modulus**

pressure (force per surface area) per unit deflection and measured under a uniaxial load

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high fixity track constrained by means other than ballast

3.1.25**fastening system**

any device used to secure running rails into chairs or baseplates or directly to sleepers, bearers or other rail supports

3.1.26**gauge**

lateral distance between the running edges of rails in track

3.1.27**lateral track resistance**

ability of a sleeper to resist movement, perpendicular to rail, under lateral loading

3.1.28**conductor rail**

rigid metallic section or rail mounted on insulators as a means of distributing electrical energy to trains

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prEN 17318-1:2018 (E)**3.1.29****geometric ballast plate****GBP**

rigid steel plate with geometrically structured surface simulating ballast contact

Note 1 to entry: see Annex A of EN 16730.

3.1.30**flat plate****FP**

rigid steel plate with flat surface with dimension 300 mm by 300 mm

3.2 Symbols

For the purpose of this document, the symbols listed in Table 1 apply.

Table 1 — Symbols

Symbol	Description	Unit
C_{stat}	static bedding modulus with GBP between 0,01 and 0,1 N.mm ⁻²	N/mm ³
C_{tend}	static bedding modulus with GBP between 0,01 and 0,2 N · mm ⁻²	N/mm ³
C_{dyn}	low frequency dynamic bedding modulus with GBP at 5Hz between 0,01 and 0,1 N · mm ⁻²	N/mm ³
d_{0s}	Deformation of the sleeper in the strength test under F_{r0}	mm
d_{1s}	Deformation of the sleeper in the strength test under $k_{1s} \times F_{r0}$	mm
d_{2s}	Deformation of the sleeper in the strength test under $k_{2s} \times F_{r0}$	mm
$d_{1s,lim}$	Upper limit for the sleeper deformation in the strength test at exceptional load level	mm
$d_{2s,lim}$	Upper limit for the sleeper deformation in the strength test at accidental load level	mm
F_c	Positive test load at the centre section of the sleeper	kN
F_{c0}	Positive reference test load at the centre section of the sleeper	kN
F_{c0n}	Negative reference test load at the centre section of the sleeper	kN
$F_{cfat,n}$	Negative fatigue test load at the centre section of the sleeper	kN
F_{cn}	Negative test load at the centre section of the sleeper	kN
$F_{cperm,n}$	Negative permanent deformation test load at the centre section of the sleeper	kN
F_r	Positive test load for the rail seat section	kN
F_{r0}	Positive reference test load for the rail seat section	kN
F_{rB}	Maximum positive test load at the rail seat section which cannot be increased	kN
F_{rfat}	Positive fatigue test load for the rail seat section	kN
k_{1s}	Coefficient used for calculation of static test load for the exceptional load level. This factor is applied to initial reference test load.	

Symbol	Description	Unit
k_{2s}	Coefficient used for calculation of static test load for the accidental load level. This factor is applied to initial reference test load.	
k_3	Coefficient to be used for calculation of Fr_B at the end of the fatigue test.	
$k_{cn,dyn1}$	Dynamic low frequency stiffness at the centre section in between the loads $(0,1 \cdot F_{c0})$ and $(0,5 \cdot F_{c0})$	MN/m
$k_{cn,dyn2}$	Dynamic low frequency stiffness at the centre section in between the loads $(0,1 \cdot F_{c0})$ and F_{c0}	MN/m
$k_{cn,stat1}$	Static stiffness at the centre section in between the loads $(0,1 \cdot F_{c0})$ and $(0,5 \cdot F_{c0})$	MN/m
$k_{cn,stat2}$	Static stiffness at the centre section in between the loads $(0,1 \cdot F_{c0})$ and F_{c0}	MN/m
$k_{r,dyn1}$	Dynamic low frequency stiffness at the rail seat section in between the loads $(0,1 \cdot Fr_0)$ and $(0,5 \cdot Fr_0)$	MN/m
$k_{r,dyn2}$	Dynamic low frequency stiffness at the rail seat section in between the loads $(0,1 \cdot Fr_0)$ and Fr_0	MN/m
$k_{r,stat1}$	Static stiffness at the rail seat section in between the loads $(0,1 \cdot Fr_0)$ and $(0,5 \cdot Fr_0)$	MN/m
$k_{r,stat2}$	Static stiffness at the rail seat section in between the loads $(0,1 \cdot Fr_0)$ and Fr_0	MN/m
k_t	Coefficient used for the degradation during service life of the sleeper.	
k_{stat}	static stiffness with GBP between 0,01 and 0,1 N · mm ⁻²	MN/m
k_{tend}	static stiffness with GBP between 0,01 and 0,2 N · mm ⁻²	MN/m
k_{dyn}	low frequency dynamic stiffness with GBP at 5Hz between 0,01 and 0,1 N · mm ⁻²	MN/m
L	Length of the sleeper	m
L_C	Design distance between centre lines of the rail seat	m
L_p	Design distance between the centre line of the rail seat to the edge of the sleeper at the bottom	m
L_r	Design distance between the articulated supports centre lines for the test arrangement at the rail seat section	m
M_k	Bending moment from dynamic rail seat load P_k	kNm
$M_{k,c,neg}$	Negative characteristic bending moment at centre section, (see Annex B)	kNm
$M_{k,c,pos}$	Positive characteristic bending moment at centre section, (see Annex B)	kNm
$M_{k,r,neg}$	Negative characteristic bending moment at rail seat, (see Annex B)	kNm
$M_{k,r,pos}$	Positive characteristic bending moment at rail seat, (see Annex B)	kNm
Δe	Deformation for permanent deformation test of screw/insert in function of temperature	mm