INTERNATIONAL STANDARD

ISO 12856-2

First edition
2020-11

Railway applications — Polymeric composite sleepers, bearers and transoms —

Part 2: **Product testing**

Applications ferroviaires — Traverses et supports en matériaux composites à matrice polymère —

Partie 2: Essais de produit

Reference number
ISO 12856-2:2020(E)

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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 269, *Railway applications*, Subcommittee SC 1, *Infrastructure*.

A list of all parts in the ISO 12856 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

This document is used as the technical basis for transactions between corresponding parties (purchaser – supplier).

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Railway applications — Polymeric composite sleepers, bearers and transoms —

Part 2: Product testing

1 Scope

This document specifies various test methods to ensure the performance of polymeric composite and reinforced polymeric composite sleepers, bearers and transoms for use in tracks. It is applicable to the sleepers, bearers and transoms to be installed in tracks with or without a ballast.

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.

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 12856-3:—[1)], *Railway applications — Polymeric composite sleepers, bearers and transoms — Part 3: General requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12856-3 apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Symbols and abbreviated terms

For the purposes of this document, the symbols and abbreviated terms listed in Table 1 apply.

Table 1 — Symbols

Symbol/ Abbreviated term	Description	Unit
C_{dyn}	low frequency dynamic bedding modulus of polymeric composite sleeper or bearer measured with GBP	N/mm^3
C_{max}	static bedding modulus of polymeric composite sleeper or bearer measured with geometric ballast plate (GBP)	N/mm^3
$d_{fat,lim}$	acceptable displacement of fatigue test as a maintenance policy	mm
d_{0c}	deformation of the sleeper in the compression test under F_{r0}	mm

1) Under preparation. Stage at the time of publication: ISO/DIS 12856-3:2020.

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Table 1 *(continued)*

Symbol/ Abbreviated term	Description	Unit
d_{1c}	deformation of the sleeper in the compression test under $k_{1s} \times F_{r0}$	mm
$d_{1s,lim}$	upper limit deformation related to the exceptional test load	mm
d_{2c}	deformation of the sleeper in the compression test under $k_{2s} \times F_{r0}$	mm
$d_{2s,lim}$	upper limit deformation related to the accidental test load	mm
Δk_c	variation of static and dynamic stiffness before and after the fatigue test at the centre section for positive bending moments	MN/m
$\Delta k_{c,n}$	variation of static and dynamic stiffness before and after the fatigue test at the centre section for negative bending moments	MN/m
Δk_r	the variation of static and dynamic stiffness before and after the fatigue test at the rail seat	MN/m
e	design distance between the centre line of the rail seat to the longitudinal girders of bridge	m
E_S	thickness of ballast bed in a ballast box	mm
F_c	positive test load at the centre section of the sleeper	kN
F_{c0}	positive initial test load at the centre section of the sleeper	kN
$F_{c,n}$	negative test load at the centre section of the sleeper	kN
$F_{c,fat}$	positive fatigue test load at the centre section of the sleeper	kN
$F_{c,fat,n}$	negative fatigue test load at the centre section of the sleeper	kN
$F_{c,perm,n}$	constant load applied for permanent deformation test at the centre section for negative bending moments	kN
FP	flat plate	n/a
F_r	positive test load for the rail seat section	kN
F_{rB}	maximum positive test load at the rail seat section which cannot be increased	kN
$F_{r,fat}$	positive fatigue test load for the rail seat section	kN
F_{r0}	positive initial reference test load for the rail seat section	kN
GBP	geometric ballast plate	n/a
$k_{c,dyn1}$	low frequency dynamic stiffness on 10 cycles under applying a cyclic force of $F_{c,min}$ (= $0{,}1 \cdot F_{c0}$) to $F_{c,test1}$ (= $0{,}5 \cdot F_{c0}$) at (5 ±1) Hz for 1 000 cycles	MN/m
$k_{c,dyn2}$	Low frequency dynamic stiffness on 10 cycles under applying a cyclic force of $F_{c,min}$ (= $0{,}1 \cdot F_{c0}$) to $F_{c,test2}$ (= F_{c0}) at (5 ±1) Hz for 1 000 cycles	MN/m
$k_{c,n,stat1}$	static stiffness of the fifth loading at the centre section for negative bending loads between ($0.1 \cdot F_{c0,n}$) and ($0.5 \cdot F_{c0,n}$)	MN/m
$k_{c,n,stat2}$	static stiffness of the fifth loading at the centre section for negative bending loads between ($0.1 \cdot F_{c0,n}$) and $F_{c0,n}$	MN/m
k_{dyn}	low frequency dynamic stiffness of polymeric composite sleeper or bearer measured with GBP	MN/m
k_{max}	static stiffness of polymeric composite sleeper or bearer measured with GBP	MN/m
$k_{r,dyn1}$	low frequency dynamic stiffness on 10 cycles under applying a cyclic force of $F_{r,min}$ (= $0{,}1 \cdot F_{r0}$) to $F_{r,test1}$ (= $0{,}5 \cdot F_{r0}$) at (5 ±1) Hz for 1 000 cycles	MN/m
$k_{r,dyn2}$	low frequency dynamic stiffness on 10 cycles under applying a cyclic force of $F_{r,min}$ (= $0{,}1 \cdot F_{r0}$) to $F_{r,test2}$ (= F_{r0}) at (5 ±1) Hz for 1 000 cycles	MN/m
k_{1s}	load factor of exceptional test load level	n/a
k_{2s}	load factor of accidental test load level	n/a
k_3	static coefficient to be used for calculation of F_{rB} at the end of fatigue test and provided by the purchaser	n/a
L_B	shoulder length of ballast bed in a ballast box	mm

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