

SVENSK STANDARD

SS-ISO 12856-1:2019



Fastställt/Approved: 2019-01-15
Utgåva/Edition: 1
Språk/Language: engelska/English
ICS: 14.540;45.080;83.140.99

Järnvägar – Järnvägssliprar i plast (ISO 12856-1:2014, IDT)

Plastic railway sleepers (railroad ties) (ISO 12856-1:2014, IDT)

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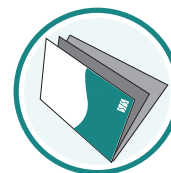
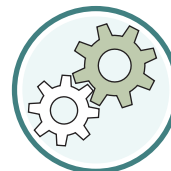
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The International Standard ISO 12856-1:2014 has the status of a Swedish Standard. This document contains the official version of ISO 12856-1:2014.

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Denna standard är framtagen av kommittén för Järnvägar, SIS/TK 254.

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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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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 61, *Plastics*, Subcommittee SC 11, *Products*.

ISO 12856 consists of the following parts, under the general title *Plastics — Plastic railway sleepers for railway applications (railroad ties)*:

— *Part 1: Material characteristics*

The following parts are planned:

— *Part 2: Products*

Introduction

Railway sleepers are manufactured mainly of pre-stressed concrete, wood, or steel. However, based on the development of plastic materials, some plastic sleepers have been installed in recent years.

In view of the facts that the types of plastics and manufacturing processes can have various effects on the in-service performance, this part of ISO 12856 covers the general characteristics of materials which plastic/composite sleepers are made from, in order to specify their performance.

This part of ISO 12856 will be used in conjunction with ISO 12856-2 to be developed in the foreseeable future.

This part of ISO 12856 applies to sleepers made from plastic materials, including reinforced plastic materials.

Plastics — Plastic railway sleepers for railway applications (railroad ties) —

Part 1: Material characteristics

1 Scope

This part of ISO 12856 specifies the characteristics of plastic and reinforced plastic materials to be used in the manufacturing of railway sleepers.

It is applicable to the sleepers and parts of sleepers to be installed in tracks with or without ballast. Examples of different types of plastic and reinforced sleepers are given in [Annex B](#).

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.

ISO 62, *Plastics — Determination of water absorption*

ISO 75 (all parts), *Plastics — Determination of temperature of deflection under load*

ISO 178, *Plastics — Determination of flexural properties*

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

ISO 306, *Plastics — Thermoplastic materials — Determination of Vicat softening temperature (VST)*

ISO 527-2, *Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics*

ISO 527-4, *Plastics — Determination of tensile properties — Part 4: Test conditions for isotropic and orthotropic fibre-reinforced plastic composites*

ISO 604, *Plastics — Determination of compressive properties*

ISO 877-1:2009, *Plastics — Methods of exposure to solar radiation — Part 1: General guidance*

ISO 877-2:2009, *Plastics — Methods of exposure to solar radiation — Part 2: Direct weathering and exposure behind window glass*

ISO 1183-1, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pycnometer method and titration method*

ISO 2578, *Plastics — Determination of time-temperature limits after prolonged exposure to heat*

ISO 3611, *Geometrical product specifications (GPS) — Dimensional measuring equipment: Micrometers for external measurements — Design and metrological characteristics*

ISO 4892-2, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps*

ISO 4892-4, *Plastics — Methods of exposure to laboratory light sources — Part 4: Open-flame carbon-arc lamps*

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ISO 8256, *Plastics — Determination of tensile-impact strength*

ISO 10640, *Plastics — Methodology for assessing polymer photoageing by FTIR and UV/visible spectroscopy*

ISO 11357-2, *Plastics — Differential scanning calorimetry (DSC) — Part 2: Determination of glass transition temperature and glass transition step height*

ISO 11357-6, *Plastics — Differential scanning calorimetry (DSC) — Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT)*

ISO 11359-2, *Plastics — Thermomechanical analysis (TMA) — Part 2: Determination of coefficient of linear thermal expansion and glass transition temperature*

ISO 13385-1, *Geometrical product specifications (GPS) — Dimensional measuring equipment — Part 1: Callipers; Design and metrological characteristics*

ISO 13385-2, *Geometrical product specifications (GPS) — Dimensional measuring equipment — Part 2: Calliper depth gauges; Design and metrological characteristics*

ISO 14125, *Fibre-reinforced plastic composites — Determination of flexural properties*

ISO/TR 19032, *Plastics — Use of polyethylene reference specimens (PERS) for monitoring laboratory and outdoor weathering conditions*

IEC 60695-11-20:2003, *Fire hazard testing — Part 11-20: Test flames — 500 W flame test methods*

3 Characteristics

3.1 Material identification

The manufacturer shall declare the following information:

- a) type of polymer(s), e.g. thermoplastic or thermosetting, including the main additives and the materials constituting composite matrix, if any;
- b) type, form, structure, and content of reinforcing materials;
- c) type, form, and content of filler or increasing-mass materials, if any;
- d) description of the manufacturing process.

3.2 Chemical resistance

The material shall not be adversely affected by exposure to chemicals typically found in the railway environment, such as diesel and grease. Chemical compatibility can be demonstrated either by test results or it can be documented.

3.3 Physical, mechanical, and electrical characteristics

The physical, mechanical, and electrical characteristics of materials are listed in [Tables 1](#) and [2](#). The relevance of assessment on characteristics shall be agreed on between the interested parties. Some of the tests might not be applicable for anisotropic sleepers or sleepers with specific reinforced material.

Examples of typical plastic sleeper properties are given in [Annex B](#).

Table 1 — Physical, mechanical, and electrical characteristics

Characteristic		Unit	Test method
Material strength	Bending strength	MPa	4.2
	Flexural modulus	MPa	
	Longitudinal compression strength	N/mm ²	4.3
	Lateral compression strength	N/mm ²	4.4
	Shear strength	N/mm ²	4.5
	Adhesive shear strength	N/mm ²	4.6
Electrical characteristic	Alternating-current breakdown voltage	kV	4.7
	Direct-current insulation resistance	Ω	4.8
Water absorption		% ^a	4.9
Mass density		g/cm ³	4.10
Linear expansion coefficient		K ⁻¹	4.11
^a Percentage expressed in mass fraction.			

Table 2 — Temperature-dependent mechanical properties

Characteristic		Unit	Test conditions	Test method
Material strength	Bending strength	% ^a	In air for 24 h Test temperatures ^b : -30 °C and 60 °C	4.2
	Flexural modulus	% ^a		
	Longitudinal compression strength	% ^a		4.3
	Shear strength	% ^a		4.5
^a Percentages indicate the strength retention in comparison with the values determined at an ambient temperature.				
^b Test temperatures can vary in the conditions where sleepers are used (tunnels, extreme weather conditions, excessively exposed locations).				

3.4 Weathering resistance

The sleeper shall be designed to guarantee that at the end of its service life, the load-bearing capacities are sufficient for service even in case of the losses of strength due to weathering.

The requirements for the weathering resistance of the materials shall be agreed on between the interested parties.

The weathering resistance shall be demonstrated either by a documented and substantially proven experience or by assessing the properties in accordance with [4.13.1](#) or [4.13.2](#), as applicable.

4 Test methods

4.1 General

4.1.1 Preparation of test specimens

There shall be no damage or faults on the surface of the test specimens in order to prevent notch effects. If there are burrs, they shall be carefully removed without damaging the surface. If necessary, the edges of the surfaces of the test specimens shall be finished using sandpaper.