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Railway applications — Polymeric composite sleepers bearers and transoms —

Part 1: Material characteristics

*Applications ferroviaires — Traverses et supports en composite polymère —
Partie 1: Caractéristiques des matériaux*

ICS: 45.080; 83.140.99

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CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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This document was prepared by Technical Committee [or Project Committee] ISO/TC [or ISO/PC] ###, [name of committee], Subcommittee SC ##, [name of subcommittee].

This second/third/... edition cancels and replaces the first/second/... edition (ISO #####:#####), which has been technically revised.

The main changes compared to the previous edition are as follows:

— xxx xxxxxxxx xxx xxxxx

A list of all parts in the ISO ##### 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.

Introduction

This Standard is one of the series ISO 12856 "*Railway applications -Polymeric composite sleepers bearers and transoms*", which consists of the following parts:

- Part 1: Material Characteristics;
- Part 2: Product Testing;
- Part 3: General requirements.

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

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Railway applications — Polymeric composite sleepers bearers and transoms —

Part 1: Material characteristics

1 Scope

This part of ISO 12856 specifies the characteristics of polymeric composite and reinforced polymeric composite materials in the manufacture of polymeric composite railway sleepers. It is applicable to the sleepers, bearers and transoms to be installed in all tracks (both heavy and urban rail) with or without ballast.

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 179-1, *Plastics — Determination of Charpy impact properties — Part 1: Non-instrumented impact test*

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 4582, *Plastics — Determination of changes in colour and variations in properties after exposure to glass-filtered solar radiation, natural weathering or laboratory radiation sources*

ISO 4892-2:2013, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps*

ISO 9001, *Quality management systems — Requirements*

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

ISO 14126, *Fibre-reinforced plastic composites — Determination of compressive properties in the in-plane direction*

3 Terms and definitions

For the purposes of this document, 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 <https://www.electropedia.org>

In this document, the term “sleeper” clusters “sleeper, bearer and transom”.

4 Material characteristics

4.1 Resistance

4.1.1 Chemical compatibility

The material of the polymeric composite sleepers shall basically be resistant against all those chemicals that can regularly contaminate the sleepers in conventional railway traffic.

These are e.g.: oils / grease / hydrocarbons (media dripping from railway vehicles), possibly de-icing salts and herbicides / fungicides from weed control on the railway track.

The manufacturer shall prove the resistance to chemical media in suitable form, if necessary through studies and demonstration of transferable knowledge from other application cases.

If the purchaser asks for a high resistance to specific chemicals (e.g. for use in loading and unloading areas of chemical factories, oil and chemical transshipment ports etc.), the purchaser shall define these requirements and the sleeper manufacturer shall prove this if necessary.

The purchaser may specify tests if the manufacturer's proofs are not satisfactory according to the generally recognized state of scientific and technical knowledge, or are not plausible.

4.1.2 Environmental resistance (standards.iteh.ai)

4.1.2.1 Weathering resistance

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The load bearing capacities of the sleeper until the end of its service life shall remain sufficient for service regardless of weathering effect. 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 changes of properties according to ISO 4582 after an exposure to xenon-arc lamps in accordance with ISO 4892-2:2013, Method A, Cycle 1.

4.1.2.2 Resistance to water

The sleepers shall be highly resistant to water absorption, precipitation of water (rain, snow, dew, fog etc.). The purchaser may limit the possible water absorption when reasonably necessary.

The manufacturer may prove the basic non-water absorbing capacity of his material in suitable form if necessary through studies and demonstration of transferable knowledge from other application cases.

The purchaser may specify tests if the manufacturer's proofs are not satisfactory according to the generally recognized state of scientific and technical knowledge, or are not plausible.

4.1.2.3 Frost in connection with water

The state of the sleepers is to be designed so that any penetrating and freezing water produces no frost damage to the sleepers.

The manufacturer may prove the basic non-water absorbing capacity of his material in suitable form if necessary through studies and demonstration of transferable knowledge from other application cases.

The purchaser may specify tests if the manufacturer's proofs are not satisfactory according to the generally recognized state of scientific and technical knowledge, or are not plausible.

4.1.2.4 Temperature resistance

4.1.2.4.1 Deformation

The plastic material of the sleepers is to be selected so that sleepers subject to normally occurring long term temperature cycles do not deform to any extent (bend, rotate, twist), or do not soften too much or do not solidify so that the specific values required by the infrastructure operator in [Clause 4](#) of Part 2 are not maintained.

These limit values are specified e.g.: thermal-mechanical guiding characteristic values, to be measured on standard test specimens, such as for thermal deformability (e.g.: Vicat softening temperature), modulus of elasticity (tensile testing / bending), and tested according to the relevant standards.

4.1.2.4.2 Embrittlement

The manufacturer shall ensure that, for the plastic material used, the influence of temperature (see above) during the minimum shelf-life duration specified by the manufacturer does not lead to such embrittlement of the sleeper material that the specific values according to [Clause 4](#) of Part 2 are not maintained.

The purchasers shall specify the percentage of the absolute values of the specific values (for the sum of all influences [4.1.](#)) according to [Clause 4](#) of Part 2 shall still be present until the end of the minimum shelf-life specified by the manufacturer.

4.1.2.5 Resistance to biological media

The sleeper material shall be sufficiently inert against any microbiological and macrobiological attack that the product specific values according to [Clause 4](#) of Part 2 are not reduced during the service life by more than a rate to be defined by the purchaser.

Microbiological attacks are here e.g.: attacks by fungi, algae, rotting and fermenting microbes.

Macrobiological attacks are here e.g.: through the roots of plants, animal gnawing damage (e.g.: beetles, ants /termites, rodents).

The manufacturer shall prove the resistance to biological media in suitable form, if necessary through studies and demonstration of transferable knowledge from other application cases.

The purchaser may specify tests if the manufacturer's proofs are not satisfactory according to the generally recognized state of scientific and technical knowledge, or are not plausible.

4.2 Environmental compatibility

The plastic material should not contain any chemical, biological or physical environmental contaminants. No negative environmental impact should emanate from it. The limit values for chemical and biological contaminants are to be defined by the purchaser.

Should raw materials be processed that, from their history, were in contact with chemical or biological substances harmful to the environment, the manufacturer shall prove the freedom from hazardous substances or the observance of limit values applied to their intended location. Waste legislation in accordance to the intended location is valid for the admissibility of using recycled raw materials for polymeric composite sleepers.

If sorting, washing or other cleaning processes are used in the raw material production, the manufacturer shall prove absence of hazardous substances or the observance of limit values in accordance with Health & Safety regulations applicable to the production location.