



SLOVENSKI STANDARD

SIST EN 16431:2014

01-oktober-2014

Železniške naprave - Zgornji ustroj proge - Votli pragovi in nosilci

Railway applications - Track - Hollow sleepers and bearers

Bahnanwendungen - Oberbau - Hohlwand-Gleis- und Weichenschwellen

Applications ferroviaires - Voie - Traverses et supports en creux

Ta slovenski standard je istoveten z: **EN 16431:2014**

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ICS:

45.080	Tračnice in železniški deli	Rails and railway components
93.100	Gradnja železnic	Construction of railways

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EUROPEAN STANDARD

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Railway applications - Track - Hollow sleepers and bearers

Applications ferroviaires - Voie - Traverses et supports
creuxBahnanwendungen - Oberbau - Hohlschwellen für Gleise
und Weichen

This European Standard was approved by CEN on 30 April 2014.

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COMITÉ EUROPÉEN DE NORMALISATION
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EN 16431:2014 (E)**Foreword**

This document (EN 16431:2014) has been prepared by Technical Committee CEN/TC 256 "Railway applications", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2015 and conflicting national standards shall be withdrawn at the latest by January 2015.

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1 Scope

This European Standard defines technical criteria and control procedures which are satisfied by hollow sleepers and bearers used in ballasted track with Vignole rails. The hollow sleepers and bearers designed for ballasted track can also be used in ballastless track. In this case, the requirements are defined by the customer.

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.

EN 13481 (all parts), *Railway applications - Track - Performance requirements for fastening systems*

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

EN 13146-5, *Railway applications - Track - Test methods for fastening systems - Part 5: Determination of electrical resistance*

EN 13146-6, *Railway applications - Track - Test methods for fastening systems - Part 6: Effect of severe environmental conditions*

EN 13146-9, *Railway applications - Track - Test methods for fastening systems - Part 9: Determination of stiffness*

EN 50125-3, *Railway applications - Environmental conditions for equipment - Part 3: Equipment for signalling and telecommunications*

EN ISO 7500-1, *Metallic materials - Verification of static uniaxial testing machines - Part 1: Tension/compression testing machines - Verification and calibration of the force-measuring system (ISO 7500-1)*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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

3.1.1

hollow sleepers

sleepers and bearers with hollow structure, with support for Vignole rails on ballasted or ballastless track, including the fastenings systems and all components, with a minimum of 50 % of the cross sectional-area hollow throughout its length

3.1.2

body

hollow structure which is in contact with the ballast/slab and supports the fastening system and other components

EN 16431:2014 (E)**3.1.3****interface**

any device used to fix the fastening system or any equipment to the hollow sleeper or bearer body

3.1.4**top width**

maximum width of the hollow sleepers at the top (including the body and the fastening system)

3.1.5**bottom width**

maximum width of the hollow sleepers at the bottom level of the body (in the tamping area)

3.1.6**tamping area**

distance on each side to the rail centre where the ballast has to be tamped

3.1.7**bending moment**

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

3.1.8**positive bending moment**

moment which produces tension or reduces compression at the bottom of the hollow sleeper or bearer

3.1.9**negative bending moment**

moment which produces tension or reduces compression at the top of the hollow sleeper or bearer

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3.2 Abbreviations

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For the purposes of this document, the following abbreviations apply.

MGT	Mass Gross Tons
USP	Under Sleeper Pad
FEM	Finite Element Method
f_{yk}	Characteristic value of yield strength

4 Requirements**4.1 General**

The main requirement of hollow sleepers and bearers is the transmission of vertical, lateral and longitudinal loads of the wheel from the rail to the ballast. In addition, a minimum of 50 % of the cross-sectional area is hollow to permit containment of the following devices and/or systems for example:

- switch and crossing actuation, detection and locking (in the case of bearers);
- wheel detection;
- rods, bars, cables, pipes, etc.

A sufficient space for maintenance of these devices and/or systems shall be considered.

In this standard electrical, mechanical, chemical and corrosion tests for approval are defined which provide assurance of the capability of hollow sleepers and bearers to resist repetitive loading and provide sufficient durability.

Additional controls during the manufacturing process are not part of this standard and shall follow the corresponding material test standards.

4.2 General requirements

The body of the hollow sleepers and bearers shall be designed in order to support the bending moments due to the traffic load.

NOTE Test load, given in Table 1 and Table 2, correspond to the category C of EN 13481 and category E limited to a maximum axle load of 300 kN.

4.3 Functional requirements

All types of hollow sleepers and bearers shall meet the following requirements:

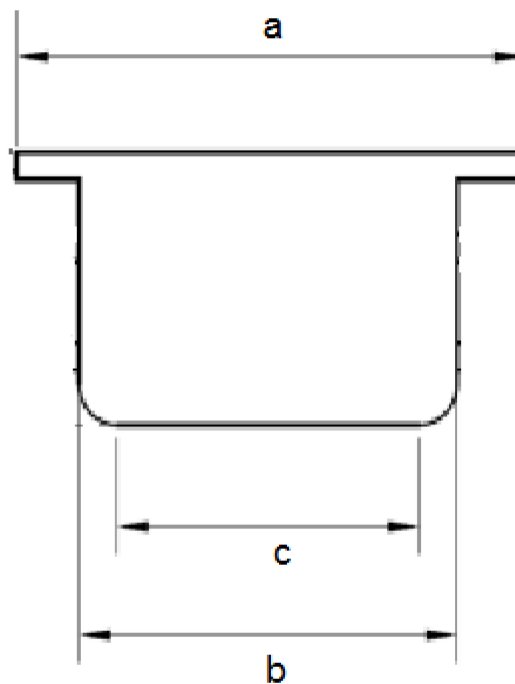
- the height between the top of the rail and the bottom of the hollow sleeper or bearer shall be defined by the customer. This height is usually the same as the neighbouring sleepers or bearers. The bottom of the hollow sleeper or bearer should be aligned at the same level as the bottom of the adjacent sleepers and bearers in order to guarantee stability (mounting on same ballast level);
- the tamping area shall be defined by the customer;
- the weight of the hollow sleeper (including rail fastening, cover plates) shall be ≥ 100 kg/m;
- the maximum bottom width shall be 350 mm, and flat part of the bottom shall represent minimum 80 % of the bottom width (see Figure 1);
- the fastening system and the mechanical resistance of the body shall be checked according to Clauses 5 and 6 of this standard, the fastening system shall only use components from homologated fastening systems according to EN 13481 series.
- the electrical resistance shall be checked according to 5.4, 6.3 and 7.2 of this standard.

Hollow bearers shall fulfil the following additional requirements:

- the maximum top width in the tamping area shall be 425 mm (see Figure 1);
- the length of the hollow bearers shall be defined by the customer (regarding, transportation and installation limits or regulations);
- the position of the tamping area and the dimensions of the hollow bearer body shall be agreed between supplier and customer.

Hollow sleepers in track shall fulfil the following additional requirements:

- the maximum top width shall not exceed 350 mm (see Figure 1);
- the length of the hollow sleeper shall be the same as neighbouring sleepers.

**Key**

- a Maximum top width
- b maximum bottom width
- c flat part of the bottom

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Figure 1 – Dimensions of hollow sleeper or bearer

4.4 Design requirements

Cover plates on both end faces and on the top of the hollow sleepers and bearers shall be installed to prevent ballast penetration. Cover plates shall also be designed to withstand aerodynamic effects.

If there are two (or more) consecutive hollow sleepers or bearers, the lateral track resistance shall be considered.

If an USP is used, the USP shall be fixed on flat part of bottom area. The connection between USP and the bottom of the hollow sleeper or bearer shall be verified on the principle of the relevant USP standard (pull off test).

Sufficient drainage shall be incorporated in to the design.

Hollow bearers shall be designed to ensure that the normal operation of actuation, locking and detection equipment is not adversely affected by temperature, ice formation, snow or water penetration.

4.5 Materials

Metallic body materials shall be specified by the supplier with their relevant standards and agreed by the customer.

If using other body materials, the supplier shall specify their relevant standards or their mechanical and environmental characteristics in case of the non-existence of a standard.

The materials used for the others components shall be agreed between customer and supplier.

4.6 Environmental requirements

4.6.1 Environmental test standards

Hollow bearers (including fastening system) shall fulfil environmental tests only as part of the integrated system with actuating, locking and detection devices according to EN 50125-3. The customer shall define the tests amongst the list of tests of this standard and the corresponding criteria.

4.6.2 Hot and cold temperature

The equipment shall operate in ambient air temperatures within the range of -25 °C to $+40\text{ °C}$ for indefinite periods. For materials other than steel, the supplier shall verify (by calculation or testing) in this temperature range that the gauge modification shall not exceed 2 mm.

4.6.3 Flammability

The equipment in a hollow sleeper or bearer shall be, where practicable, manufactured from non-combustible materials. Where this cannot be achieved, the supplier shall give a data sheet of the toxic gases and smoke emissions of the material. The used materials shall be agreed by the customer;

4.6.4 Effect of exposure to severe environmental conditions (optional)

If requested by the customer, following exposure to the salt spray test in accordance with EN 13146-6, the fastening assembly shall be capable of being dismantled, without failure of any component and re-assembled using manual tools provided for this purpose.

4.7 Requirements for interfaces with mechanical equipments in case of integrated system (optional)

If requested by the customer, interfaces to mechanical equipment shall be tested according to EN 50125-3 (only the clauses of this document concerning vibration).

5 Test methods

5.1 General

The following tests are part of the homologation process.

5.2 Tests for fastening system and interface

5.2.1 Effect of repeated loading

This test is used for assessing the long term performance of the fastening system and interface. A load is applied with repeated cycles representative of the repeated loads caused by traffic on railway track.

Test shall be performed according to Annex A. Test loads and positions are specified in Table 1:

Table 1 – Test loads and positions for fastening system and interface test

Item		Up to 260 kN axle load	Between 260 kN and 300 kN axle load
		Values	
X	position of the line of application of P_L below the centre of curvature of the gauge corner of the rail head, in mm	15	75
α	angle between the load line and a line normal to the running surface of the rails, in degrees	33	40
$2Pv$	component of load normal to the running surface of the rails, in kN	140	166
Frequency, in Hz		4 ± 1	
Number of cycles		3 million	

NOTE Compared to EN 13481-2:2012, Table 3, the load $2Pv$ has been reduced as a maximum axle load of 300 kN in this standard.

5.2.2 Fixation of the fastening system on body

A vertical load test shall be performed on the fixation elements using the procedure described in EN 13481-2:2012, Annex A.

The verification shall be given by a structural analysis. The calculation shall be based on an existing design standard.

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5.2.3 Attenuation of impact loads (Optional test)

If requested by the customer, attenuation of dynamic loads shall be measured. Test procedure is defined by the customer (on the basis of EN 13146-3).

5.2.4 Pad and assembly stiffness (Optional test)

If requested by the customer, the assembly and pads static stiffness and assembly and pads low frequency dynamic stiffness shall be measured. Test procedure is defined by the customer (on the basis of EN 13146-9).

5.3 Bending test for the body

This test is used for assessing the long term performance of the body only. A load is applied with repeated displacement cycles representative of the displacements caused by traffic on railway track.

Test shall be performed according to Annex B. Test loads and positions are specified in Table 2.