



SLOVENSKI STANDARD
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Željezniške prostore - Upravljanje - Zahtjevi za performanse za sustave za pričvršćivanje - Dio 5:
Sustavi za pričvršćivanje za pločastu tračnicu

Railway applications - Track - Performance requirements for fastening systems - Part 5:
Fastening systems for slab track

Bahnanwendungen - Oberbau - Leistungsanforderungen für
Schienenbefestigungssysteme - Teil 5: Befestigungssysteme für feste Fahrbahnen

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Applications ferroviaires - Voie (Prescriptions de performance pour les systemes de
fixation - Partie 5: Systemes de fixation des voies sur dalle

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English version

Railway applications - Track - Performance requirements for fastening systems - Part 5: Fastening systems for slab track

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This European Standard was approved by CEN on 6 March 2002.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document EN 13481-2:2002 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of an identical text or by endorsement, at the latest by December 2002, and conflicting national standards shall be withdrawn at the latest by December 2002.

This document has been prepared under Mandates (M/024¹, M/275²) given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directives.

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

No existing European Standard is superseded.

This European Standard is one of the series EN 13481 "Railway applications — Track — Performance requirements for fastening systems" which consists of the following parts.

- Part 1: Definitions;
- Part 2: Fastening systems for concrete sleepers;
- Part 3: Fastening systems for wood sleepers;
- Part 4: Fastening systems for steel sleepers;
- Part 5: Fastening systems for slab track;
- Part 6: Special fastening systems for attenuation of vibration;
- Part 7: Special fastening systems for switches and crossings and check rails.

These are supported by the test methods in the series EN 13146 "Railway applications — Track — Test methods for fastening systems".

The annexes A and B are normative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1) Railway Equipment

2) Standardization in the field of Railway Equipment on the Interoperability of the Trans-European High-Speed Rail System

Introduction

A requirement for longitudinal rail restraint is included to control rail creep and pull apart in the event of a broken rail. The relationship between longitudinal rail restraint and the overall design of the track slab requires consideration.

No satisfactory test is available to determine the attenuation of impact loads on slab track. The relative performance can be assessed by the procedure in prEN 13146-3 with the fastening system on a concrete sleeper.

The laboratory test for the effect of repeated loading is the means of assessing potential long-term performance of the fastening in track.

For systems in which the rail is continuously supported, test procedures are modified to take account of the change from discrete support.

1 Scope

This European Standard is applicable to fastening systems for use in attaching rails to the uppermost surface of concrete or asphalt slabs in non-ballasted track construction as follows:

- main lines having radius of curvature greater than 150 m and subject to maximum design axle load of 260 kN;
- light rail systems having a radius of curvature greater than 40 m and subject to a maximum design axle load of 130 kN.

This includes fastening systems for floating slabs but does not include fastening systems for embedded rails.

The requirements apply to the following:

- a) direct fastening systems;
- b) indirect fastening systems;
- c) fastening systems for the rail sections in prEN 13674-1 and prEN 13674-4;
- d) fastening systems which incorporate concrete elements which each have not more than one supporting element per rail.

In the case of (d) the concrete element is considered to be part of the fastening system. If the system includes concrete elements which each have more than one supporting location per rail, those concrete elements are considered to be part of the slab and not part of the fastening system.

This standard is not applicable to special fastening systems used at bolted joints.

This standard is for type approval of a complete fastening assembly only.

2 Normative references

This European Standard incorporates by dated or undated references, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publications referred to applies (including amendments).

prEN 13146-1, *Railway applications — Track — Test methods for fastening systems — Part 1: Determination of longitudinal restraint.*

prEN 13146-4:1998, *Railway applications — Track — Test methods for fastening systems — Part 4: Effect of repeated loading.*

prEN 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 exposure to severe environmental conditions.*

prEN 13146-7, *Railway applications — Track — Test methods for fastening systems — Part 7: Determination of clamping force.*

EN 13481-1, *Railway applications — Track — Performance requirements for fastening systems — Part 1: Definitions.*

EN 13481-2:2002, *Railway applications — Track — Performance requirements for fastening systems — Part 2: Fastening systems for concrete sleepers.*

ENV 13481-6, *Railway applications — Track — Performance requirements for fastening systems — Part 6: Special fastening systems for attenuation of vibration.*

prEN 13674-1, *Railway applications — Track — Rail — Part 1: Flat bottom symmetrical railway rails 46 kg/m and above.*

prEN 13674-4³⁾, *Railway applications — Track — Rail — Part 4: Flat bottom symmetrical railway rails from 27 to 46 kg/m.*

3 Terms and definitions

For the purposes of this European Standard the terms and definitions in EN 13481-1 apply.

4 Symbols

L lateral component of force transmitted by the wheel to the rail head as shown in Figure 1, in kN;

P_L component of load parallel to the running surface of the rails, in kN;

P_V component of load normal to the running surface of the rails, in kN;

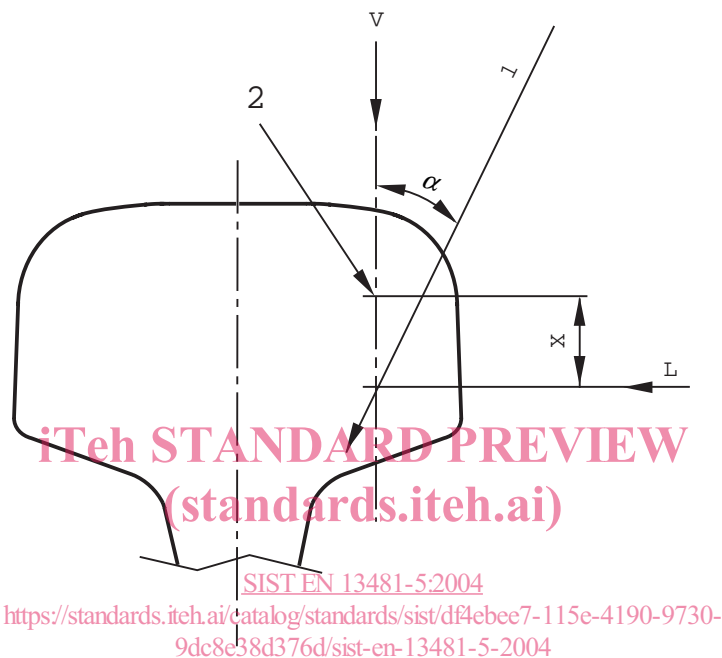
V vertical component of force transmitted by the wheel to the rail head as shown in Figure 1, in kN;

³⁾ In preparation.

X distance between the line of application of L and the centre of the gauge corner radius of the rail head as shown in Figure 1, in mm;

α angle between the load line and a line normal to the running surface of the rails, in degrees.

NOTE $\frac{L}{V} = \frac{P_L}{P_V} = \tan \alpha$



Key

- 1 Line of load application
- 2 Centre of gauge corner radius

Figure 1 — Load application position

5 Requirements

5.1 Longitudinal rail restraint

The longitudinal rail restraint shall be not less than 7 kN when measured by the procedure in prEN 13146-1. For use in high-speed tracks (> 250 km/h) the longitudinal rail restraint shall be not less than 9 kN. When necessitated by the slab track design and subject to agreement between the purchaser and manufacturer, the minimum requirement for longitudinal restraint can be reduced.

For fastening systems with continuous support of the rail, the test shall be performed using a length of pad equal in length to the design spacing of the fastening along the rail. The piece of rail used for the test shall be at least as long as the piece of pad. For fastening systems which have dynamic stiffness < 50 MN/m, when tested in accordance with annex A, the test shall be carried out over two rail seats to provide greater rail stability.

5.2 Effect of repeated loading

This shall be determined by the procedure in prEN 13146-4 except that the fastening system shall be mounted in the centre of the top surface of a reinforced concrete block. The length of the block, normal to the rail, shall be ≥ 500 mm and the width ≥ 300 mm. If, for stability, it is necessary to test two rail seats in accordance with prEN 13146-4:1998, clause 6, the width of the block shall be ≥ 2 x the design fastening spacing in track. The depth of the block shall be the depth of the slab or (200 ± 10) mm, whichever is the smaller. For fastening systems with continuous support of the rail, the test shall be performed using a length of pad equal in length to the design spacing of the fastening along the rail. The piece of rail used for the test shall be at least as long as the piece of pad and the size of the concrete block shall be sufficient to provide support to the full length of the piece of pad.

Test loads for the track types specified in Table 1 shall be in accordance with Table 2. The value of $P_v/\cos\alpha$ shall be obtained from Table 2 for the assembly design under test. The values in Table 2 have been derived for the track classes shown in Table 1. Pad stiffness is the vertical dynamic stiffness measured at (3 - 5) Hz in accordance with annex A. For fastening systems which incorporate a second resilient layer additional to the rail pad, the assembly stiffness shall be used in Table 2. The assembly stiffness shall be determined in accordance with annex B.

Table 1 — Reference values for testing the effect of repeated loading

Type of track	Main line	Light rail
Rail section	60 E1	40 E1
Axle load ¹⁾ in kN	225	100
Curve radius in m	> 400 (soft pads) ²⁾ > 150 ≤ 400 (med/hard pads)	> 40 (any pad)
Support spacing in m	0,6 SIST EN 13481-5:2004	0,8
<p>¹⁾ The axle loads in this table are reference values only.</p> <p>²⁾ The dynamic stiffness of pads and the support spacings are stated for test purposes only. It should not be taken as a recommendation for the dynamic stiffness of pads or the support spacings to be used in track.</p>		

Pads and assemblies are classified as follows when the dynamic stiffness is measured in accordance with annex A for pads and annex B for assemblies.

- Soft - dynamic stiffness < 100 MN/m;
- Medium - dynamic stiffness ≥ 100 MN/m < 200 MN/m;
- Hard - dynamic stiffness ≥ 200 MN/m.

The following measurements shall be performed before and after repeated loading. The change in performance shall not exceed the values shown.

- Longitudinal rail restraint (prEN 13146-1) change ≤ 20 %;
- Vertical stiffness (prEN 13146-4) change ≤ 25 %;
- Clamping force (prEN 13146-7) change ≤ 20 %.

Fastening systems with an assembly stiffness < 50 MN/m shall be assessed in accordance with ENV 13481-6.