SLOVENSKI STANDARD
oSIST prEN 15273-3:2023

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Železniške naprave - Profili - 3. del: Infrastruktura

Railway applications - Gauges - Part 3: Infrastructure

Bahnanwendungen- Begrenzungslinien - Teil 3: Infrastruktur

Applications ferroviaires - Gabarits - Partie 3 : Infrastructure

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45.060.01	Železniška vozila na splošno	Railway rolling stock in general

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Railway applications - Gauges - Part 3: Infrastructure

Applications ferroviaires - Gabarits - Partie 3 : Infrastructure

Bahnanwendungen- Begrenzungslinien - Teil 3: Infrastruktur

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 256.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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European foreword

This document (prEN 15273-3:2023) has been prepared by Technical Committee CEN/TC 256 “Railway Applications”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 15273-3:2013+A1:2016.

— prEN 15273-1: *General common rules for Rolling stock and Infrastructure* gives the general explanations of gauging and defines the sharing of the space between Rolling Stock and Infrastructure;

— prEN 15273-2: *Rolling stock* gives the rules for dimensioning vehicles;

— prEN 15273-3: *Infrastructure* gives the rules for positioning the infrastructure;

— prEN 15273-4: *Catalogue of defined gauges* includes a non-exhaustive list of reference profiles and parameters to be used by Infrastructure and Rolling Stock;

— prCEN/TR 15273-5: *Background, explanation and worked examples*.

In comparison with the previous edition, the following technical modifications have been made:

— the series was fully restructured, from three parts to five parts,

— Clause 3 and Clause 4 now refer to prEN 15273-1 where all terms and symbols are defined,

— reorganization of Clauses 5 to 17,

— creation of a new Clause 6 for absolute and comparative gauging process,

— all worked examples moved into the new prCEN/TR 15273-5,

— Table B.1 moved into the normative Annex A,

— all reference profiles and basics data from normative Annexes C and D moved into the new prEN 15273-4,

— normative Annex F moved into normative Annex C,

— informative Annex H moved into informative Annex D,

— creation of a new informative Annex F about tilting trains.

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s) / Regulation(s).

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

Introduction

The aim of this document is to define the rules for the calculation and verification of the dimensions of rolling stock and Infrastructure from a gauging perspective.

This document describes gauging processes taking into account the relative movements between rolling stock and infrastructure as well as the necessary margins or clearances.

This part of the series EN 15273 covers requirements for infrastructure and is used in conjunction with the following parts:

— *Part 1: General common rules for Rolling stock and Infrastructure*;

— *Part 2: Rolling stock*;

— *Part 4: Catalogue of defined gauges*;

— *Part 5: Background, explanation and worked examples*.

1 Scope

This document:

— defines the various profiles needed to install, verify and maintain the infrastructures;

— lists the various phenomena to be taken into account to determine the infrastructure gauge;

— defines a methodology that may be used to calculate the various profiles from these phenomena;

— lists the rules to determine the distance between the track centres;

— lists the rules to be complied with when building the platforms;

— lists the rules to determine the pantograph gauge;

— lists the formulae needed to calculate the infrastructure gauge;

and is applicable for various track gauges.

This document is applicable to heavy rail networks using various track gauges. Other networks are outside the scope of this document, but the rules may be applied to them.

This document is not applicable to the gauges “S” and “T” for track gauge 1 520 mm.

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.

EN 13232:2011 (series), *Railway applications — Track — Switches and crossings*

prEN 15273-1:2023, *Railway applications - Gauges - Part 1: General - Common rules for Infrastructure and rolling stock*

prEN 15273-2:2023, *Railway Applications - Gauges - Part 2: Rolling stock*

prEN 15273-4:2023, *Railway Applications - Gauges - Part 4: Catalogue of gauges and associated rules*

prCEN/TR 15273-5:2023, *Railway applications - Gauges - Part 5: Background, explanation and worked examples*

EN 50119:2020, *Railway applications - Fixed installations - Electric traction overhead contact lines*

EN 50367:2020, *Railway applications - Fixed installations and rolling stock - Criteria to achieve technical compatibility between pantographs and overhead contact line*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in prEN 15273-1:2023 apply.

ISO and IEC maintain terminology 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/

4 Symbols and abbreviations

For the purposes of this document, the symbols and abbreviations given in prEN 15273-1:2023 apply.

5 Defined gauging

5.1 General

5.1.1 Introduction

For defined gauging, the infrastructure is defined on the basis of a reference profile and its associated rules (see prEN 15273-1:2023, prEN 15273-4:2023 and 5.2.1) that form an agreement between the Infrastructure Manager and the Railway Undertaking and are therefore inseparable.

This agreement dictates how the various possible displacements of a vehicle on the track are distributed and taken into account.

5.1.2 Gauging methods

There are various calculation methods; more details are given in prEN 15273-1:2023. It is essential to specify the method used:

— the kinematic method;

— the dynamic method;

— the static method.

5.1.3 Infrastructure gauge types

For each reference profile, listed in prEN 15273-4:2023, there are different infrastructure gauge types depending on the required application:

— the infrastructure verification limit gauge only takes into account gauge widening and mandatory allowances that ensure safe operations of traffic after on-site measurements are checked. This type of gauge is only applicable for a short time period and remains the responsibility of the Infrastructure Manager;

— the infrastructure installation limit gauge takes into account the infrastructure verification limit gauge and all the displacements and wear that may occur between two maintenance periods by means of an infrastructure maintenance allowance. Fitting this gauge means that clearance is maintained between the various maintenance and checking operations;

— the infrastructure installation nominal gauge takes into account the infrastructure installation limit gauge and additional infrastructure allowances. This gauge means that clearance is maintained in practically all conditions and allows more possible uses.

5.1.4 Uniform gauge

When the Infrastructure Manager has sufficient space available, he can define a non-variable gauge with a design that permits easier management for the Infrastructure Managers and may allow the passage of exceptional consignments. This gauge, which generally incorporates additional allowances, is a nominal type infrastructure gauge called a uniform gauge.

Uniform gauges are used in Europe by several networks. Their application rules may differ according to the networks.

This approach creates an additional allowance compared to the infrastructure installation nominal gauge used and is only possible if adequate space is available on site.

The Infrastructure Manager shall always check the conditions on which this gauge is based and shall always return to the infrastructure installation nominal gauge when these conditions are not met any longer.

It is necessary, therefore, not to forget the choice of gauge used and the conditions it has been based on.

The passage of exceptional consignments shall be agreed with the Infrastructure Manager.

More detailed information can be found in Annex G.

5.1.5 Choice of gauge

5.1.5.1 Introduction

The gauge choice is up to the Infrastructure Managers. For this, the Infrastructure Manager may need to consider:

— the technical specifications for interoperability in force;

— the bilateral or multilateral agreements;

— international technical specifications in force;

— the space available on the lines concerned;

— the specific restrictions imposed by the infrastructure.

The Infrastructure Manager is responsible for the maintenance of the chosen gauge over time.

The calculation method is strongly linked to the gauge choice.

5.1.5.2 Infrastructure gauge type choice

When constructing new lines, the infrastructure installation nominal gauge should be applied. In exceptional circumstances it is permitted for the Infrastructure Manager to apply the infrastructure installation limit gauge.

For all other new installations on existing lines, renewal, upgrading, etc., it is recommended to apply the infrastructure installation nominal gauge. It is permissible for the Infrastructure Manager to apply the infrastructure installation limit gauge.

NOTE 1 The aim will always be to clear the infrastructure installation nominal gauge.

An infrastructure verification limit gauge may need to be defined when the Infrastructure Manager wants to verify the obstacle free running of vehicles on a track in a degraded condition.

NOTE 2 Once selected a particular type of infrastructure gauge for the line or section of a line, it does not imply necessarily that the same gauge type should also be considered in the calculation of the distance between tracks, platforms and pantograph gauge.

5.2 General information on all the gauge calculation methods

5.2.1 The reference profile and its associated rules

All types of infrastructure gauges are determined by enlarging the reference profile in the lateral and vertical directions, which are often dealt with separately.

This gauge widening corresponds to the displacements of the reference vehicles that are the basis for defining the gauge considered.

NOTE The quasi-static effects and the displacements due to random phenomena (except T_N and T_{voie}) cause a rotation of the vehicle body in different directions, which translate into vertical and lateral displacements.

The calculation of b_{inf} and h_{inf} described in the different methods for the PT (see Figure 3) point is conservative because all the lateral displacements in the same direction as well as all the vertical upward displacements have been taken into account, which is unrealistic in a real world scenario. Therefore, the Infrastructure Manager is allowed to invert the mathematical signs of the quasi-static effects and the displacements due to random phenomena in the related formulae in order to obtain an optimized gauge.

5.2.2 Lateral gauge widening

5.2.2.1 General

Depending on the gauging method and the infrastructure gauge type, some or all of the following parameters need to be taken into account.

5.2.2.2 Lateral infrastructure gauge variations depending on the local situation

5.2.2.2.1 General

The gauge variations depend on the calculation method used and particularly on the gauge used.

5.2.2.2.2 Lateral projection ($S_{i/a}$)

The lateral projection defines the sum of the following phenomena:

— the geometric effect in the curve of the reference vehicles (S_R);

— the effect of the track gauge widening (S_L);

— F value for static calculation method (see prCEN/TR 15273-5:2023).

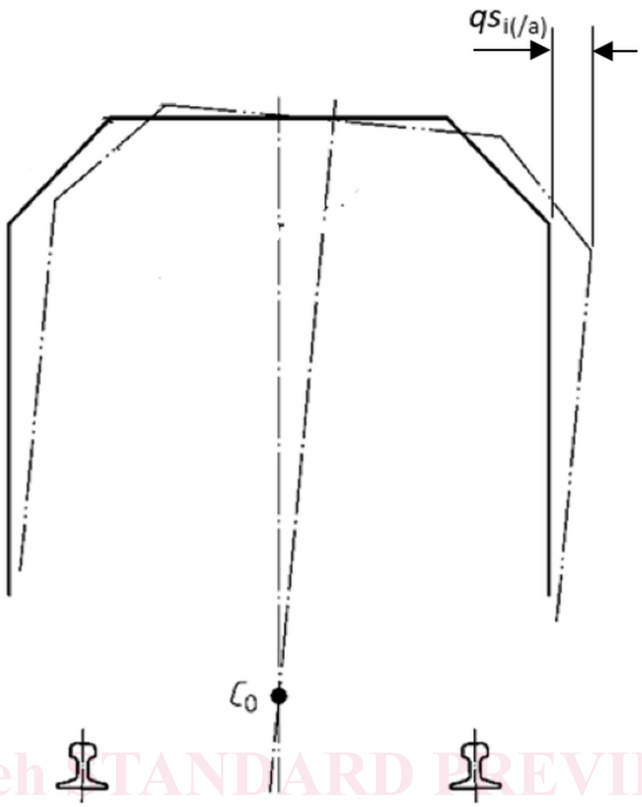
The general formulations are set forth in prEN 15273-1:2023. The specific formulae to be used for calculating each gauge are given in prEN 15273-4:2023.

5.2.2.2.3 Lateral quasi-static effect ($qs_{i/a}$)

The quasi-static effect gives the reference vehicle body roll in a curve for the upper parts:

— outside of the curve, under the cant deficiency effect, which becomes maximum at maximum speed;

— inside of the curve, under the effect of cant, which becomes maximum when the vehicle is stationary



Key

C_0 Reference roll centre of the vehicle

qs Lateral quasi static effect

Figure 1 — Lateral quasi static effect

It should be noted that, for the kinematic calculation method, the rolling stock takes a part of cant deficiency and cant up to values I_0 and D_0 into account and the Infrastructure takes the remaining part (I-I_0) and (D-D_0) along with the values s_0 and h_{c0} into account.

In the static calculation method, the complete D or I needs to be taken into account by the Infrastructure Manager.

NOTE Other methods exist for taking this phenomenon into account. For example, in the case of the dynamic calculation method, this phenomenon is taken into account by the Railway Undertaking.

The general formulations are given in prEN 15273-1:2023. The specific formulae to be applied for the gauge used are given in 5.3.2.1 for the kinematic gauging method.

For the lower parts (see Annex B), this phenomenon is taken into account by the Railway Undertaking.

5.2.2.3 Lateral random phenomena

5.2.2.3.1 General

Random phenomena to be considered depend on the gauge method and infrastructure gauge type used.

The following phenomena are considered as the responsibility of the Infrastructure Manager.

5.2.2.3.2 Vehicle oscillations generated by track irregularities (T_{osc})

Irregularities of the track are one of the causes of vehicle oscillations. The amplitude depends mainly on the track condition and suspension characteristics. These phenomena are taken into account by the infrastructure by the value T_{osc} . Depending on the flexibility of the vehicle, they are located at the base of an inclination around the roll centre and thus the following gauge widening (Formula (1)):

$$\Delta b_1 = \frac{s_0}{L} \cdot T_{osc} \cdot \left(h - h_{c0}\right)_{>0} \quad (1)$$

NOTE Other methods exist for taking this phenomenon into account. For example, in the case of the dynamic calculation method, this phenomenon is taken into account by the Railway Undertaking.

In straight track, the value of $T_{osc,a}$ shall be taken into account.

5.2.2.3.3 Track displacement (T_{voie})

T_{voie} is a lateral margin that takes into account the lateral movement of the track. The track position is likely to change between two track maintenance and/or obstacle verifications owing to the traffic loads and to the track maintenance.

When the track design does not allow any movement in relation to the structure, this allowance may be disregarded.

5.2.2.3.4 Cross level variation (T_D)

T_D is a value for the variation of cross level. The cross level of the track can vary in relation to its nominal value due to the maintenance tolerances and to the traffic. This cross level variation T_D has a double effect:

— the reference profile rotates around the track centreline at an angle corresponding to the maximum variation, $\frac{T_D}{L}$ which causes the following gauge widening (Formula (2)):

$$\Delta b_2 = \frac{T_D}{L} \cdot h \quad (2)$$

— the vehicle will tend to roll around the roll centre, affected by the flexibility of its suspension, which will cause an additional gauge widening of parts located above the roll centre (Formula (3)):

$$\Delta b_3 = \frac{s_0}{L} \cdot T_D \cdot \left(h - h_{c0}\right)_{>0} \quad (3)$$

It shall be noted that the two phenomena are always present simultaneously and are therefore not independent.