

Railway applications - Track - Noise barriers and related devices acting on airborne sound propagation - Test method for determining the acoustic performance - Part 4: Intrinsic characteristics - In situ values of sound diffraction under direct sound field

EESTI STANDARDI EESSÕNA

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English Version

Railway applications - Track - Noise barriers and related devices acting on airborne sound propagation - Test method for determining the acoustic performance - Part 4: Intrinsic characteristics - In situ values of sound diffraction under direct sound field

Applications ferroviaires - Voie - Dispositifs de réduction du bruit - Méthode d'essai pour la détermination des performances acoustiques - Partie 4: Caractéristiques intrinsèques - Valeurs in situ de la diffraction acoustique dans des conditions de champ acoustique direct

Bahnanwendungen - Oberbau - Lärmschutzwände und verwandte Vorrichtungen zur Beeinflussung der Luftschallausbreitung - Prüfverfahren zur Bestimmung der akustischen Eigenschaften - Teil 4: Produktspezifische Merkmale - In-situ-Werte zur Schallbeugung in gerichteten Schallfeldern

This European Standard was approved by CEN on 25 March 2016.

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European foreword

This document (EN 16272-4:2016) 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of an identical text or by endorsement, at the latest by March 2017, and conflicting national standards shall be withdrawn at the latest by March 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This European Standard is one of the series EN 16272 "Railway applications – Track – Noise barriers and related devices acting on airborne sound propagation – Test method for determining the acoustic performance" as listed below:

- *Part 1: Intrinsic characteristics – Sound absorption in the laboratory under diffuse sound field conditions*
- *Part 2: Intrinsic characteristics – Airborne sound insulation in the laboratory under diffuse sound field conditions*
- *Part 3-1: Normalized railway noise spectrum and single number ratings for diffuse field applications*
- *Part 3-2: Normalized railway noise spectrum and single number ratings for direct field applications*
- *Part 4: Intrinsic characteristics – In situ values of sound diffraction under direct sound field conditions*
- *Part 5: Intrinsic characteristics – In situ values of sound reflection under direct sound field conditions*
- *Part 6: Intrinsic characteristics – In situ values of airborne sound insulation under direct sound field conditions*
- *Part 7: Extrinsic characteristics – In situ values of insertion loss*

This document should be read in conjunction with:

- EN 16272-3-2, *Railway applications – Track – Noise barriers and related devices acting on airborne sound propagation – Test method for determining the acoustic performance – Part 3-2: Normalized railway noise spectrum and single number ratings for direct field applications*
- EN 16272-6, *Railway applications – Track – Noise barriers and related devices acting on airborne sound propagation – Test method for determining the acoustic performance – Part 6: Intrinsic characteristics – In situ values of airborne sound insulation under direct sound field conditions*

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Introduction

Part of the market for railway noise barriers and related devices acting on airborne sound propagation includes products to be added to the top of noise barriers and intended to contribute to sound attenuation acting primarily on the diffracted sound field. These products are called here “added devices”. This standard has been developed to specify a test method for determining the acoustic performance of added devices.

The test method can be applied *in situ*, i.e. where the railway noise barriers and the added devices are installed. The method can be applied without damaging the railway noise barriers or the added devices.

The method can be used to qualify products before the installation along railways as well as to verify the compliance of installed added devices to design specifications. Repeated application of the method can be used to verify the long term performance of added devices.

This method could be used to qualify added devices for other applications, e.g. to be installed along roads or nearby industrial sites. In this case, special care has to be taken in considering the location of the noise sources and the single-number ratings should be calculated using an appropriate spectrum.

No other national or international standard exists about the subject of this standard.

1 Scope

This European Standard describes a test method for determining the intrinsic characteristics of sound diffraction of added devices installed on the top of railway noise barriers. The test method prescribes measurements of the sound pressure level at several reference points near the top edge of a noise barrier with and without the added device installed on its top. The intrinsic effectiveness of the added device is calculated as the difference between the measured values with and without the added devices, correcting for any change in height. In other words, the method described here gives the acoustic benefit of changing the shape and materials of the top edge over a simple barrier of the same height. This is an intrinsic characteristic of the added device, provided that the source and receiver positions are standardized. In practice, when the added device is placed over an existing barrier, it raises the height and this provides additional screening, depending on the source and receiver positions; this additional screening is not considered in this European Standard.

The test method is intended for the following applications:

- preliminary qualification, outdoors or indoors, of added devices to be installed on noise barriers;
- determination of the sound diffraction index difference of added devices in actual use;
- comparison of design specifications of an added device with actual performance data after the completion of the construction work;
- verification of the long term performance of added devices (with a repeated application of the method);
- interactive design process of new products, including the formulation of installation manuals.

The test method can be applied both in situ and on samples purposely built to be tested using the method described here.

Results are expressed as a function of frequency, in one-third octave bands between 100 Hz and 5 kHz. If it is not possible to get valid measurements results over the whole frequency range indicated, the results shall be given in the restricted frequency range and the reasons for the restriction(s) shall be clearly reported. A single-number rating is calculated from frequency data.

For indoor measurements, see Annex A.

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 16272-3-2, *Railway applications — Track — Noise barriers and related devices acting on airborne sound propagation — Test method for determining the acoustic performance — Part 3-2: Normalized railway noise spectrum and single number ratings for direct field applications*

EN 16272-6, *Railway applications — Track — Noise barriers and related devices acting on airborne sound propagation — Test method for determining the acoustic performance — Part 6: Intrinsic characteristics — In situ values of airborne sound insulation under direct sound field conditions*

EN ISO 354, *Acoustics — Measurement of sound absorption in a reverberation room (ISO 354)*

EN 61672-1, *Electroacoustics — Sound level meters — Part 1: Specifications (IEC 61672-1)*

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

3 Terms and definitions

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

3.1

noise barrier

noise reducing device, which obstructs the direct transmission of airborne sound emanating from railways; it will typically span between posts and also may overhang the railway

Note 1 to entry: Noise barriers are generally made of acoustic and structural elements (3.3 and 3.4).

3.2

cladding

noise reducing device, which is attached to a wall or other structure and reduces the amount of sound reflected

Note 1 to entry: Claddings are generally made of acoustic and structural elements (3.3 and 3.4).

3.3

acoustic element

element whose primary function is to provide the acoustic performance of the device

3.4

structural element

element whose primary function is to support or hold in place acoustic elements

Note 1 to entry: In some noise barriers, the acoustic function and the structural function cannot be clearly separated and attributed to different components.

3.5

added device

added component that influences the acoustic performance of the original noise-reducing device (acting primarily on the diffracted energy)

3.6

rail side exposure

use of the product as a noise reducing device installed alongside railways

3.7

sound diffraction index, DI

result of a sound diffraction test whose components are described by the formula in 5.6

Note 1 to entry: $DI_{x,refl}$ refers to measurements on a reflective reference wall. $DI_{x,abs}$ refers to measurements on an absorptive reference wall. $DI_{x,situ}$ refers to in situ measurements; where x is "0" when the added device is not on the top of the test construction and "ad" when the added device is on the top of the test construction

3.8

sound diffraction index difference, ΔDI

difference between the results of sound diffraction tests on the same reference wall with and without an added device on the top, described by the formulae in 5.10