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Railway applications - Acoustics - Measurement of source terms for environmental noise calculations

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

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English Version

Railway applications - Acoustics - Measurement of source terms for environmental noise calculations

Applications ferroviaires - Acoustique - Mesurage des termes sources pour le calcul du bruit en environnement

Bahnanwendungen - Akustik - Messung der Quellterme für Umgebungslärberechnungen

This European Standard was approved by CEN on 2 September 2024.

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EN 17936:2024 (E)

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EN 17936:2024 (E)**European foreword**

This document (EN 17936:2024) 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of an identical text or by endorsement, at the latest by April 2025, and conflicting national standards shall be withdrawn at the latest by April 2025.

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

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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Introduction

In Europe, various prediction methods for environmental noise exist. For noise mapping and planning of railway lines, the prediction methods are enshrined in national or European legislation such as Directive (EU) 2015/996 (CNOSSOS). An integral aspect to ensure realistic results is to use valid input data.

Environmental noise prediction models consist of noise source terms and a propagation model.

The calculation of railway traffic sources is based on traffic data such as train types, speeds and flow, and on the vehicle/track noise source terms.

In this document, measurement methods are specified for the acoustic input parameters for the vehicle/track noise source terms. The collection of traffic flow data are outside the scope of this document. The method can be used to collect data from different railway noise source types, within the practical constraints of widely available measurement equipment and railways in normal service.

The document covers the measurement of separate physical source types which are listed in the scope.

Each source type is characterized in terms of its frequency spectrum (up to one-third octave band details), source height and directivity.

The description of rolling noise goes one step further: it combines wheel and rail acoustics roughness (its generating mechanism) with vehicle and track transfer functions.

The derivation of these transfer functions is addressed in the standard. The complete process of an environmental prediction noise scheme showing different types of inputs is illustrated in Figure 1. It shows the different types of inputs: traffic data, acoustic parameters and geographical data.

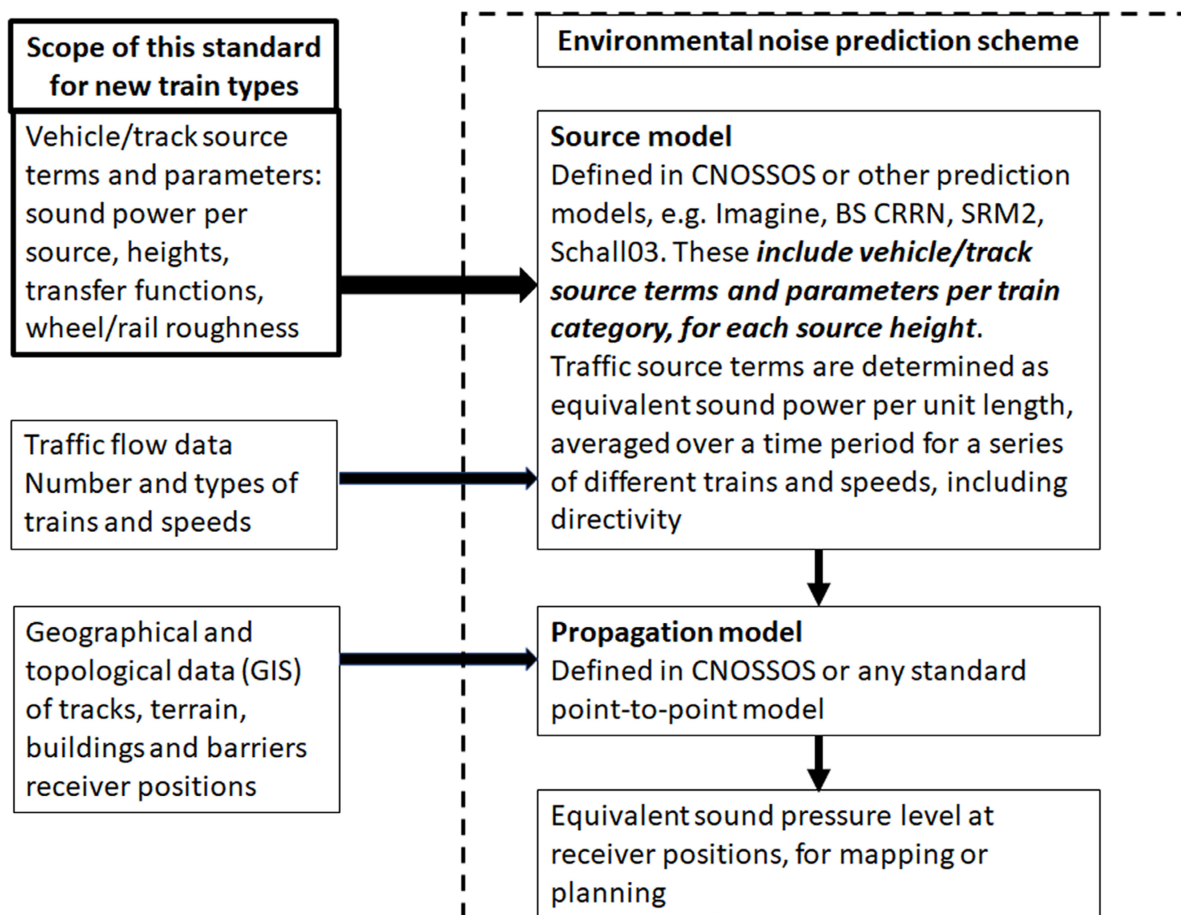


Figure 1 — Elements of an environmental noise prediction scheme

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1 Scope

This document addresses the measurement of source terms for environmental noise calculation for rail traffic (including light rail, such as trams, metros, etc.). It is applicable to the measurement of in-service trains on operational tracks.

It is not applicable to type acceptance testing of rolling-stock or tracks, or to derive source terms for time domain models.

The following rail traffic noise source types are in the scope:

- rolling noise;
- traction and equipment noise;
- aerodynamic noise;
- impact noise (e.g. rail joints, switch and crossings, wheel flats);
- braking noise;
- bridge noise;
- squeal noise.

Noise from rail vehicles at standstill, such as stationary engine idling and auxiliary equipment at yards and stations, is covered by EN ISO 3095:2013 for measurement procedures and operating conditions, and by EN ISO 3740:2019 and EN ISO 3744 for the determination of sound power. It is therefore not in the scope of this document.

The calculation of the propagation of sound is part of generally standardized propagation models which are not addressed in this document.

Noise from fixed installations (e.g. stations, depots, electricity sub-stations) is not in the scope of this document.

Source terms are specific to a vehicle and track type. The scope includes measurement procedures and conditions and sampling requirements.

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 15610:2019, *Railway applications — Acoustics — Rail and wheel roughness measurement related to noise generation*

EN 17343, *Railway applications — General terms and definitions*

CEN/TR 16891:2016, *Railway applications — Acoustics — Measurement method for combined roughness, track decay rates and transfer functions*

EN IEC 60942:2018, *Electroacoustics — Sound calibrators (IEC 60942:2017)*

EN 61094-4:1995, *Measurement microphones — Part 4: Specifications for working standard microphones (IEC 61094-4:1995)*

EN 61260-1:2014, *Electroacoustics — Octave-band and fractional-octave-band filters — Part 1: Specifications (IEC 61260-1:2014)*

EN 61672-1:2013, *Electroacoustics — Sound level meters — Part 1: Specifications (IEC 61672-1:2013)*

EN 61672 (all parts), *Electroacoustics — Sound level meters*

EN ISO 3095:2013, *Acoustics — Railway applications — Measurement of noise emitted by railbound vehicles (ISO 3095:2013)*

EN ISO 3744, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane (ISO 3744)*

ISO 5725-2:2019, *Accuracy (trueness and precision) of measurement methods and results — Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*

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