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Road traffic noise reducing devices — Procedures for assessing long term performance

National foreword

This British Standard is the UK implementation of EN 14389:2023. It supersedes BS EN 14389-1:2015 and BS EN 14389-2:2015, which are withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/509/6, Fences for the attenuation of noise.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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EUROPEAN STANDARD

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NORME EUROPÉENNE

EUROPÄISCHE NORM

September 2023

ICS 93.080.30

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English Version

Road traffic noise reducing devices - Procedures for assessing long term performance

Dispositifs de réduction du bruit du trafic routier -
Méthodes d'évaluation des performances à long terme

Lärmschutzvorrichtungen an Straßen - Verfahren zur
Bewertung der Langzeitwirksamkeit

This European Standard was approved by CEN on 28 May 2023.

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European foreword

This document (EN 14389:2023) has been prepared by Technical Committee CEN/TC 426 "Road equipment", the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by March 2024, and conflicting national standards shall be withdrawn at the latest by March 2024.

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.

This document supersedes EN 14389-1:2015 and EN 14389-2:2015.

The main change compared to the previous edition is the inclusion of the method for assessing long term performance regarding "non-acoustic" characteristics.

This document is intended to be read in conjunction with:

- EN 14388, *Road traffic noise reducing devices — Characteristics*;
- EN 1793, *Road traffic noise reducing devices — Test method for determining the acoustic performance*:
 - *Part 1: Intrinsic characteristics — Sound absorption under diffuse sound field conditions*;
 - *Part 2: Intrinsic characteristics — Airborne sound insulation under diffuse sound field conditions*;
 - *Part 5: Intrinsic characteristics — Sound absorption under direct sound field conditions*;
 - *Part 6: Intrinsic characteristics — Airborne sound insulation under direct sound field conditions*;
- EN 1794, *Road traffic noise reducing devices — Non-acoustic performance*:
 - *Part 1: Methods of determination of the mechanical and stability characteristics*;
 - *Part 2: Methods of determination of the general safety and environmental characteristics*;
- prEN 17383, *Road traffic noise reducing devices — Sustainability: Key Performance Indicators (KPIs) Declaration*.

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

Road traffic noise reducing devices alongside roads are expected to maintain their characteristics during the declared working life.

Resistance to electrolytic or/and chemical corrosion and embrittlement, dimensional stability and ageing resistance are considered by the manufacturer for different environmental conditions.

A change of acoustic characteristics can be foreseen depending on the material used and the environmental exposure conditions. Significant deterioration of the acoustic characteristics is avoided when appropriate materials for the roadside environment are used and manufacturer's recommendations for installation and maintenance are respected.

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1 Scope

This document specifies a method for evaluating the working life of noise reducing devices used alongside roads according to the relevant exposure conditions.

It also specifies a method for determining the acoustic characteristic at the end of the working life.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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/>

3.1

road traffic noise reducing device

RTNRD

device that is designed to reduce the propagation of traffic noise away from the road environment

Note 1 to entry: The RTNRD can comprise acoustic elements (3.2) only, or both structural (3.3) and acoustic elements.

Note 2 to entry: Applications of RTNRDs include noise barriers (3.4), claddings (3.5), covers (3.6) and added devices (3.7).

3.2

acoustic element

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

3.3

structural element

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

3.4

noise barrier

RTNRD which obstructs the direct transmission of airborne sound emanating from road traffic

3.5

cladding

RTNRD which is attached to a wall or other structure and reduces the amount of sound reflected off the structure

3.6

cover

RTNRD which either spans or overhangs the road

3.7
added device

added component that influences the acoustic characteristic of the original noise reducing device

Note 1 to entry: The added device is acting primarily on the diffracted sound energy.

3.8
working life

period of time during which the declared performance(s) of the product will be maintained

3.9
roadside exposure

conditions experienced by the RTNRD

4 Determination of the characteristics

The determination of the working life of RTNRDs shall be based on the behaviour of the materials they are made of with reference to different environmental categories with possible variations as given in Table A.1 in Annex A of this document.

Standards of construction and any material tests conducted should provide evidence of resistance to specified conditions selected from the following:

- | | | |
|-------|-----------------------|----------------------------|
| I. | Chemical agents | Location dependent |
| II. | De-icing salt | Location/climate dependent |
| III. | Dirty water/dust | Location/climate dependent |
| IV. | Dew | Climate dependent |
| V. | Freeze/thaw | Climate dependent |
| VI. | Cold | Climate dependent |
| VII. | Heat | Climate dependent |
| VIII. | UV radiation | Climate dependent |
| IX. | Traffic vibration | Location dependent |
| X. | Biological process | Climate dependent |
| XI. | Ozone | Location dependent |
| XII. | Water | Climate dependent |
| XIII. | Water spray (wet/dry) | Location dependent |

NOTE Special care is taken for combinations of different materials, whether inside a single device or in combination with other devices (for example: a combination of different acoustic elements or another combination of acoustic and structural elements).

Adverse effects on long-term performance of contact with the ground shall be considered.

If water retention may degrade the working life, evaluation shall be made of the extent to which the RTNRD is retaining water.

If a change in humidity and/or temperature and/or UV affects the dimensional stability of materials used in the construction, then evaluation shall be made of how RTNRDs shall allow for such changes and ensure characteristics remain fulfilled along the whole working life.

Where different materials are used in the construction, evaluation shall be made of the appropriate measures taken to avoid electrolytic and chemical corrosion or interaction that could adversely affect working life.

The working life of structural and acoustic elements can be different; therefore, it shall be assessed under the same exposure conditions.

Evaluation shall be made of what the relevant acoustic characteristics ($DL_{\alpha,NRD}$ and/or DL_{RI} and/or $DL_{SI,E}$ and/or $DL_{SI,P}$) will be at the end of the working lifetime of the RTNRD.

The evaluation for the characteristic DL_R is omitted, as the measurement method according to the corresponding technical standard cannot be applied to check the performance of the product at the end of the working life.

The corresponding working life in years shall be defined under the exposure classes, listed in Table 1, together with the value expressed in decibels of the acoustic performances at the end of the working life.

Where relevant standards exist, long term performance shall be assessed using them (see Annex B).

The evaluation can be omitted for any exposure classes not covered by the intended use of the RTNRD.

Table 1 — Example of working life and acoustic performance at the end of the working life as a function of exposure classes

Environmental class of exposure	Working life expressed in years		Acoustic performance at the end of the working life expressed in dB			
	Acoustic element	Structural element	$DL_{\alpha,NRD}$	DL_{RI}	$DL_{SI,E}$	$DL_{SI,P}$
4B1						
4B2						
4C2						
4C3						
4C4						
4K2						
4K3						
4M3						
4M4						
4S2						
4Z6						
4Z7						

Evaluation shall be made for both structural and acoustic elements. The evaluation shall include:

- a) the list of measures taken to limit the effects of ageing on the product;
- b) the working life corresponding to the specific environmental exposure classes;
- c) evidence of evaluation of working life;

d) evidence of the acoustic performances at the end of the working life.

Installation instructions shall describe how the product (acoustic element, full noise barrier, etc.) shall be installed to achieve the working life.

A maintenance manual shall specify measures which are necessary, or to be avoided, to achieve the working life.

5 Report

The report shall include a full description of the geometry of the product evaluated, including details of procedures required by all appropriate documents.

It shall also include:

- a) reference to this document.
- b) name and address of the approved independent evaluating body with a dated signature of the person responsible;
- c) exact identification of evaluated product, name and address of the manufacturer.
- d) full description of the materials, their thickness, and densities of sound absorptive elements.
- e) drawing showing the cross-section of the evaluated element with permitted manufacturing tolerances.
- f) the list of measures taken to limit the effects of ageing on the product with reference to the installation manual.
- g) the list of measures taken to limit the effects of ageing on the product with reference to the maintenance manual.
- h) the working life of the acoustic element expressed with reference to the exposure classes according to Table 1.
- i) the working life of the structural element expressed with reference to the exposure classes according to Table 1.
- j) the list of acoustic indicators expressed with reference to the working life and exposure classes according to Table 1.
- k) installation and maintenance manuals giving all necessary information for the working life to be achieved.

Annex A
(normative)

Roadside exposure – Classification of environmental conditions

RTNRDs are exposed to agents as well as climatic changes which can limit working life. It is essential that the environmental classifications are identified so that the long-term performance life can be accurately assessed.

This annex lists typical environmental conditions selected for RTNRDs from EN IEC 60721-3-4.

Effects of the contact with the ground are not considered in the selected conditions and shall be considered separately.

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Table A.1 — Environmental classifications appropriate to RTNRDs selected from EN IEC 60721-3-4

	Classifications	Identified Exposures List 1.	Location variation (Distance from carriageway)			Additional possible Climatic variations	
			< 5 m	5 m to 10 m	> 10 m	WET	COLD
Table 1 (K)	Climatic conditions	IV. Dew V. Freeze/thaw VI. Cold VII. Heat VIII. Radiation XI. Water	4K2	4K2	4K2		4K3 ^c
Table 2 (Z)	Special climatic conditions	XIII. Water spray	4Z7	4Z7	4Z6		
Table 3 (B)	Biological conditions		4B1	4B1	4B1	4B2 ^d	
Table 4 (C)	Chemically active substances	I. Chemical agents II. De-Icing salts ^a XI. Ozone ^b	4C2 4C3 ^a 4C4 ^b	4C2 4C3 ^a 4C4 ^b	4C2 4C2 4C4 ^b		
Table 5 (S)	Mechanically active substances	III. Dirty water/Dust	4S2	4S2	4S2		
Table 6 (M)	Mechanical conditions	IX. Traffic vibration	4M4	4M4	4M3		
Selection of more severe categories: a Applicable only if de-icing salts used. b Applicable only if in marine/coastal environment. c Extreme cold climate. d Hot humid conditions.							

Annex B (informative)

Material standards

B.1 General

This annex lists material standards which can be used to evaluate long-term performance of components of RTNRDs. There is no claim to completeness and it makes no provision for interaction between materials which may cause deterioration of performance. Other suitable standards may be used for other materials.

B.2 References for material standards

Some parts of the references listed hereafter can conflict with this document (EN 14389). If that occurs, the explicit requirements of this document classifying exposure near to roads should prevail.

For these undated references, the latest edition of the publication (including any amendments) applies.

EN 460, *Durability of wood and wood-based products — Guidance on performance*

EN 350-2, *Durability of wood and wood-based products — Natural durability of solid wood — Part 2: Guide to natural durability and treatability of selected wood species of importance in Europe*

EN 351-1, *Durability of wood and wood-based products — Preservative-treated solid wood — Part 1: Classification of preservative penetration and retention*

EN 335, *Durability of wood and wood-based products — Use classes: definitions, application to solid wood and wood-based products*

EN 599-1, *Durability of wood and wood-based products — Efficacy of preventive wood preservatives as determined by biological tests — Part 1: Specification according to use class*

EN 771-1, *Specification for masonry units — Part 1: Clay masonry units*

EN 771-3, *Specification for masonry units — Part 3: Aggregate concrete masonry units (Dense and lightweight aggregates)*

EN 13369, *Common rules for precast concrete products*

EN 10025 (all parts), *Hot rolled products of structural steels*

EN 10169, *Continuously organic coated (coil coated) steel flat products — Technical delivery conditions*

EN IEC 60721-3-4, *Classification of environmental conditions — Part 3-4: Classification of groups of environmental parameters and their severities — Stationary use at non-weatherprotected locations (IEC 60721-3-4)*

EN ISO 4892-1, *Plastics — Methods of exposure to laboratory light sources — Part 1: General guidance (ISO 4892-1)*

EN ISO 4892-2, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps (ISO 4892-2)*

EN ISO 11403-3, *Plastics — Acquisition and presentation of comparable multipoint data — Part 3: Environmental influences on properties (ISO 11403-3)*

EN ISO 527 (all parts), *Plastics — Determination of tensile properties (ISO 527)*

EN ISO 8256, *Plastics — Determination of tensile-impact strength (ISO 8256)*

EN ISO 898-1:2013, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs with specified property classes — Coarse thread and fine pitch thread (ISO 898-1:2013)*

EN ISO 898-2:2022, *Fasteners — Mechanical properties of fasteners made of carbon steel and alloy steel — Part 2: Nuts with specified property classes (ISO 898-2:2022)*

EN ISO 898-5:2012, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 5: Set screws and similar threaded fasteners with specified hardness classes — Coarse thread and fine pitch thread (ISO 898-5:2012)*

EN 20898-7:1995, *Mechanical properties of fasteners — Part 7: Torsional test and minimum torques for bolts and screws with nominal diameters 1 mm to 10 mm (ISO 898-7:1992)*

EN ISO 4628-1, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 1: General introduction and designation system (ISO 4628-1)*

EN ISO 4628-2, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 2: Assessment of degree of blistering (ISO 4628-2)*

EN ISO 4628-3, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 3: Assessment of degree of rusting (ISO 4628-3)*

EN ISO 4628-4, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 4: Assessment of degree of cracking (ISO 4628-4)*

EN ISO 4628-5, *Paints and varnishes — Evaluation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 5: Assessment of degree of flaking (ISO 4628-5)*

EN ISO 4628-6, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 6: Assessment of degree of chalking by tape method (ISO 4628-6)*

EN ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests (ISO 9227)*

EN ISO 14713 (all parts), *Zinc coatings — Guidelines and recommendations for the protection against corrosion of iron and steel in structures (ISO 14713)*

EN ISO 12543-4, *Glass in building — Laminated glass and laminated safety glass — Part 4: Test methods for durability (ISO 12543-4)*

EN 1990, *Eurocode — Basis of structural and geotechnical design*

EN 1991-1-1, *Eurocode 1: Actions on structures — Part 1-1: General actions — Densities, self-weight, imposed loads for buildings*

EN 1991-1-2, *Eurocode 1: Actions on structures — Part 1-2: General actions — Actions on structures exposed to fire*

EN 1991-1-3, *Eurocode 1 — Actions on structures — Part 1-3: General actions — Snow loads*

EN 1991-1-4, *Eurocode 1: Actions on structures — Part 1-4: General actions — Wind actions*

EN 1991-1-5, *Eurocode 1: Actions on structures — Part 1-5: General actions — Thermal actions*

EN 1991-1-6, *Eurocode 1 — Actions on structures Part 1-6: General actions — Actions during execution*

- EN 1991-1-7, *Eurocode 1 — Actions on structures — Part 1-7: General actions — Accidental actions*
- EN 1992-1-1, *Eurocode 2: Design of concrete structures — Part 1-1: General rules and rules for buildings*
- EN 1992-1-2, *Eurocode 2: Design of concrete structures — Part 1-2: General rules — Structural fire design*
- EN 1993-1-1, *Eurocode 3 — Design of steel structures — Part 1-1: General rules and rules for buildings*
- EN 1993-1-2, *Eurocode 3: Design of steel structures — Part 1-2: General rules — Structural fire design*
- EN 1993-1-3, *Eurocode 3 — Design of steel structures — Part 1-3: General rules — Supplementary rules for cold-formed members and sheeting*
- EN 1993-1-4, *Eurocode 3 — Design of steel structures — Part 1-4: General rules — Supplementary rules for stainless steels*
- EN 1994-1-1, *Eurocode 4: Design of composite steel and concrete structures — Part 1-1: General rules and rules for buildings*
- EN 1994-1-2, *Eurocode 4 — Design of composite steel and concrete structures — Part 1-2: General rules — Structural fire design*
- EN 1995-1-1, *Eurocode 5: Design of timber structures — Part 1-1: General — Common rules and rules for buildings*
- EN 1995-1-2, *Eurocode 5: Design of timber structures — Part 1-2: General — Structural fire design*
- EN 1996-1-1, *Eurocode 6 — Design of masonry structures — Part 1-1: General rules for reinforced and unreinforced masonry structures*
- EN 1996-1-2, *Eurocode 6 — Design of masonry structures — Part 1-2: General rules — Structural fire design*
- EN 1999-1-1, *Eurocode 9 — Design of aluminium structures — Part 1-1: General rules*
- EN 1999-1-2, *Eurocode 9 — Design of aluminium structures — Part 1-2: Structural fire design*

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- EN 1317-2:2010, *Road restraint systems — Part 2: Performance classes, impact test acceptance criteria and test methods for safety barriers including vehicle parapets*
- EN 1793-1:—¹, *Road traffic noise reducing devices — Test method for determining the acoustic performance — Part 1: Intrinsic characteristics — Sound absorption under diffuse sound field conditions*
- EN 1793-2:—², *Road traffic noise reducing devices — Test method for determining the acoustic performance — Part 2: Intrinsic characteristics — Airborne sound insulation under diffuse sound field conditions*
- EN 1793-4:—³, *Road traffic noise reducing devices — Test method for determining the acoustic performance — Part 4: Intrinsic characteristics — Intrinsic sound diffraction*
- EN 1793-5:—⁴, *Road traffic noise reducing devices — Test method for determining the acoustic performance — Part 5: Intrinsic characteristics — Sound absorption under direct sound field conditions*
- EN 1793-6:—⁵, *Road traffic noise reducing devices — Test method for determining the acoustic performance — Part 6: Intrinsic characteristics — Airborne sound insulation under direct sound field conditions*
- EN 1794-1:—⁶, *Road traffic noise reducing devices — Non-acoustic performance — Part 1: Methods of determination of the mechanical and stability characteristics*
- EN 1794-2:—⁷, *Road traffic noise reducing devices — Non-acoustic performance — Part 2: Methods of determination of the general safety and environmental characteristics*
- EN 13501-1:2018, *Fire classification of construction products and building elements — Part 1: Classification using data from reaction to fire tests*
- EN IEC 60721-3-4, *Classification of environmental conditions — Part 3-4: Classification of groups of environmental parameters and their severities — Stationary use at non-weatherprotected locations (IEC 60721-3-4)*

¹ Under preparation. Stage at the time of publication: prEN 1793-1:2023.

² Under preparation. Stage at the time of publication: prEN 1793-2:2023.

³ Under preparation. Stage at the time of publication: prEN 1793-4:2023.

⁴ Under preparation. Stage at the time of publication: prEN 1793-5:2023.

⁵ Under preparation. Stage at the time of publication: prEN 1793-6:2023.

⁶ Under preparation. Stage at the time of publication: FprEN 1794-1:2023.

⁷ Under preparation. Stage at the time of publication: FprEN 1794-2:2023.

CEN/TS 15447:2006, *Mounting and fixing in reaction to fire tests under the Construction Products Directive*

CEN/TS 16637-2:2014, *Construction products — Assessment of release of dangerous substances — Part 2: Horizontal dynamic surface leaching test*

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