BS EN 14389-1:2015

BSI Standards Publication

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

Part 1: Acoustical characteristics

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National foreword

This British Standard is the UK implementation of EN 14389-1:2015. It supersedes BS EN 14389-1:2007 which is withdrawn.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 secretary.

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Lärmschutzvorrichtungen an Straßen - Verfahren zur Bewertung der Langzeitwirksamkeit - Teil 1: Akustische Eigenschaften

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Foreword

This document (EN 14389-1:2015) has been prepared by Technical Committee CEN/TC 226 “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of an identical text or by endorsement, at the latest by November 2015, and conflicting national standards shall be withdrawn at the latest by November 2015.

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 document supersedes EN 14389-1:2007.

The main change compared to the previous edition is a new presentation of the requirements in order to be coherent with the new EN 14389-2. In the new version, the manufacturer has to declare in Table 1 the working life of the acoustic performance as a function of environmental class.

This part is concerned with long-term durability. It should be read in conjunction with:

EN 1793, *Road traffic noise reducing devices – Test method for determining the acoustical performance,*

— *Part 1: Intrinsic characteristics of sound absorption*

— *Part 2: Intrinsic characteristics of airborne sound insulation under diffuse sound field conditions*

— *Part 6: Intrinsic characteristics – In situ values of airborne sound insulation under direct sound field conditions*

CEN/TS 1793-5, *Road traffic noise reducing devices – Test method for determining the acoustical performance,*

— *Part 5: Intrinsic characteristics – In situ values of sound reflection and airborne sound insulation*

EN 1794, *Road traffic noise reducing devices - Non-acoustic performance,*

— *Part 1: Mechanical performance and stability requirements*

— *Part 2: General safety and environmental requirements*

— *Part 3: Reaction to fire. Burning behaviour of noise reducing devices based on assessment of their components*

EN 14389, R*oad traffic noise reducing devices - Procedures for assessing long-term performance,*

— *Part 2: Non-acoustical characteristics*

EN 60721-3-4, *Classification of environmental conditions,*

— *Part 3: Classification of groups of environmental parameters and their severities – Section 4: Stationary use at non-weather protected locations*

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Introduction

Noise Reducing Devices alongside roads should not only fulfil their acoustic function and structural design requirements in accordance with appropriate documents, but also maintain their performance during the required working life. The acoustic elements have to resist the actions of agents within the roadside environment that could significantly degrade their performance.

The acoustic characteristics of a Road Traffic Noise Reducing Device can deteriorate significantly over the duration of its working life if it is not installed or maintained in accordance with the manufacturer's recommendations, or if the materials are not appropriate for the roadside environment.

All elements in the construction of noise reducing devices should be resistant to electrolytic or/and chemical corrosion and embrittlement, be dimensionally stable and have generally a high ageing resistance in many differing conditions.

1 Scope

This European Standard specifies requirements for assessing the working life and provides the relevant exposure conditions.

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)

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

3 Terms and definitions

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

3.1
noise reducing device (NRD)
device that is designed to reduce the propagation of traffic noise away from the road environment

Note 1 to entry: This may be a noise barrier, cladding, a road cover or an added device. These devices may include both acoustic and structural elements.

3.2
noise barrier
noise reducing device, which obstructs the direct transmission of airborne sound emanating from road traffic

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

3.5
cladding
noise reducing device, which is attached to a wall or other structure and reduces the amount of sound reflected

3.6
cover
noise reducing device, which either spans or overhangs the highway

3.7
added device
added component that influences the acoustic performance of the original noise-reducing device (acting primarily on the diffracted energy)

3.8
working life
period of time during which the declared acoustic performance(s) DL_{α} (from EN 1793-1) and/or DL_{R} (from EN 1793-2) and/or DL_{SI} (from EN 1793-6) of the device will be maintained

3.9
roadside exposure
conditions experienced by the noise reducing device installed alongside a road

4 Requirements

Standard environmental categories selected for road traffic noise reducing devices with possible variations are given in Annex A of this document.

The manufacturer shall provide the relevant acoustic performance characteristic (DL_{α} and/or DL_{R} and/or DL_{SI}) at the end of the working lifetime of the product and define the corresponding working life under the exposure classes, listed in the Table 1, adapted to the intended use of the noise reducing device. Where material standards exist, durability shall be assessed using them (see Annex B).

Adverse effects on long-term performance of contact with the ground shall be taken into account.

If retention of water is likely to degrade the working life, the design shall ensure that water is not retained.

The working life of structural and acoustic elements may be different, therefore they have to be assessed under the same exposure conditions when installed on the same site.

If a change in humidity and/or temperature and/or UV affects the dimensional stability of materials used in the construction, then the design shall allow for such changes and ensure that the performance continues to fulfil the performance characteristics.

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

NOTE This European Standard permits specifying authorities to indicate where there is no requirement for assessment under any particular exposure classes.

Table 1 — Declared working life of acoustic performance as a function of exposure classes

Environmental class of exposure	Acoustic performance at end of working life (as appropriate)			Declared working life in years
	DL_{α}	DL_{R}	DL_{SI}	
4B1				
4B2				
4C2				
4C3				
4C4				
4K2				
4K3				
4M3				
4M4				
4S2				
4Z6				
4Z7				

The supplier shall provide for both structural and acoustic elements:

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.

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

A maintenance manual shall specify measures which are necessary, or to be avoided, in order to achieve the declared 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 material 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 his product;

g) the table of declared working lives;

h) installation and maintenance manuals for the achieving of the declared working life.

Annex A
(normative)

Road side exposure – Classification of environmental conditions

A.1 General

Noise reducing devices placed alongside roads 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 properly assessed.

This annex lists typical environmental conditions selected for road traffic noise reducing devices from EN 60721-3-4.

The conditions selected do not take into account the effects of contact with the ground.

The environmental conditions specified in EN 60721-3-4 do not explicitly take into account the effects of contact with the ground. However, for the design of noise reducing devices that could be in contact with the ground, these effects shall be taken into account.

A.2 Environmental classifications* appropriate to road traffic noise reducing devices selected from EN 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	HOT	COLD
Table 1 (K)	Climatic conditions	IV. Dew V. Freeze/thaw VI. Cold VII. Heat VIII UV Radiation XII. Water	4K2	4K2	4K2		4K3 [c]
Table2 (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.

* Detailed classification may be selected according to the local conditions.

Annex B
(informative)

Material standards

B.1 General

This annex includes material standards which can be used to evaluate long-term performance of components of noise reducing devices. It is neither definitive nor complete and in particular makes no provision for interaction between materials which may cause deterioration. Suitable other standards may be used for other materials.

B.2 References

Some parts of the references listed hereafter can conflict with this document. 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 applies.

EN 460, *Durability of wood and wood-based products — Natural durability of solid wood — Guide to the durability requirements for wood to be used in hazard classes*

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 — Performance of preventive wood preservatives as determined by biological tests — Part 1: Specification according to hazard 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 light-weight aggregates).*

EN 13369, *Common rules for precast concrete products.*

EN 10025, *Hot rolled products of non-alloy structural steels — Technical delivery conditions*

EN 10169, *Continuously organic coated (coil coated) steel flat products*

EN 60721-3-4, *Classification of environmental conditions — Part 3: Classification of groups of environmental parameters and their severities — Section 4:* Stationary use *at non-weatherprotected locations (IEC 60271-3-4)*

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 sources (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, *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 (ISO 898-1:2013)*

EN ISO 898-2:2012, *Mechanical properties of fasteners — Part 2: Nuts with specified proof load values — Coarse thread (ISO 898-2:2012)*

EN ISO 898-5:2012 *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 5: Set screws and similar threaded fasteners not under tensile stresses (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 degradation of coatings — Designation 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 paint coatings — Designation of intensity, quantity and size of common types of defect — Part 6: Rating 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 — Test methods for durability (ISO 12543-4)*

EN 1990, *Eurocode — Basis of structural design*

EN 1991-1-1, *Eurocode 1: Actions on structures — Part 1-1: General actions — Densities, self-weight and 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: 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: Common rules and rules for building*

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 and rules for buildings*

EN 1999-1-2, *Eurocode 9: Design of aluminium structures — Part 1-2: General rules — Structural fire design*

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[2] EN 1793-2, *Road traffic noise reducing devices — Test method for determining the acoustic performance — Part 2: Intrinsic characteristics of airborne sound insulation under diffuse sound field conditions*

[3] EN 1793-6, *Road traffic noise reducing devices — Test method for determining the acoustic performance — Part 6: Intrinsic characteristics — In situ values of airborne sound insulation under direct sound field conditions*

[4] EN 14388, *Road traffic noise reducing devices — Specifications*

[5] EN 14389-2, *Road traffic noise reducing devices — Procedures for assessing long term performance — Part 2: Non-acoustical characteristics*

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