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Road traffic noise reducing devices — Non-acoustic performance

Part 3: Reaction to fire — Burning behaviour of noise reducing devices and classification

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National foreword

This British Standard is the UK implementation of EN 1794-3:2016.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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European foreword

This document (EN 1794-3:2016) 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of an identical text or by endorsement, at the latest by January 2017, and conflicting national standards shall be withdrawn at the latest by January 2017.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, *Road traffic noise reducing devices — Non-acoustic performance*, is part of a series composed of the following:

— *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 and classification*.

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Introduction

It is necessary to understand how different materials react to fire and what happens if it burns because this situation could have adverse effects on environment and human life and cause in special situations great consequences in economic or social aspects.

In general, the brushfire test gives enough information for most applications for noise reducing devices. In case where more stringent requirements are necessary, further testing for reaction to fire will be done according to EN 13501-1.

This European Standard also contains indications for smoke hazard; density and toxic fumes, because this could create dangerous situations for the traffic and nearby living people. Test for smoke density and toxic fumes are necessary in all cases.

The European Standard for classification, the EN 13501 series, is clear in its classification. This European Standard defines specific tests to classify products and for Noise Reducing Devices. This European Standard give more information about how to prepare specimen and supporting constructions if they are needed in a way that this product can be tested according to the specific standards mentioned in the EN 13501 series.

1 Scope

This European Standard is to give authorities, designers and specifiers information with respect to reaction to fire, smoke density and toxic fumes of materials used in noise reducing devices.

The combination of brushwood fire test, smoke density test and test for toxic fumes give in general enough safety information. This European Standard gives also information if more stringent requirements are requested for situations with a higher level of safety.

For noise reducing devices, this European Standard gives a method how to handle substantial components of non-homogeneous products (as defined in EN 13501-1 and ISO/DIS 5659-2:2016) and how to handle non-homogeneous products and in which cases the influence of non-substantial components on the total result of the classification may be neglected.

The following effects will be taken into account: ignitability, burning droplets, smoke growth rate, smoke density, toxic fumes.

The European Commission Decision 96/603/EC establish the list of products belonging to Classes A 'No contribution to fire '. The materials, and products made from them, that are listed in the Annex to this Decision, will, on account of their low level of combustibility and subject to the conditions also set out in the Annex, be classified in Classes A1 and Class $A1_{FL}$ as provided for in Tables 1 and 2 of the Annex to Decision 2000/147/EC. For the purpose of this classification, no reaction-to-fire testing of those materials and products made from them is required. The products considered having no contribution to fire are excluded from this standard.

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 1363-1:2012: *Fire resistance tests — Part 1: General Requirements*

EN 13501-1:2007+A1:2009, *Fire classification of construction products and building elements — Part 1: Classification using data from reaction to fire tests*

EN 13823, *Reaction to fire tests for building products —- Building products excluding floorings exposed to the thermal attack by a single burning item*

EN ISO 11925-2, *Reaction to fire tests — Ignitability of products subjected to direct impingement of flame — Part 2: Single-flame source test (ISO 11925-2)*

ISO/DIS 5659-2:2016, *Plastics — Smoke generation — Part 2: Determination of optical density by a single-chamber test*

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 that obstructs the direct transmission of airborne sound emanating from road traffic

3.3
acoustic elements
elements whose primary function is to provide the acoustic performance of the device

3.4
structural elements
elements whose primary function is to support or hold in place acoustic elements

3.5
cladding
noise reducing device that is attached to a wall or other structure to reduce 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
toxic fumes
content of CO, HCN, HCl and NO_x measured value after 10 min in µg/g

3.9
product range of noise reducing devices
range of products with the same composition and properties but that only differ in thickness and/or colours

4 Symbols and abbreviations

$D_{s,max}\,10_i$	maximum smoke density during 10 min of test of material i
$D_{s,max}\,10_{total}$	maximum smoke density during 10 min of test of the cladding or acoustic element
$w_{t,i}$	weight of the material i
$w_{t,total}$	total weight of all material(s) part(s) of the cladding or acoustic element

5 Test methods and classification

5.1 Resistance to brushwood fire

5.1.1 General

A noise reducing device can be exposed to fire are from dry vegetation or other material in close proximity. More severe fires from spilt fuel can arise as the result of traffic accidents.

Where a noise reducing device is in close proximity to property it can also be necessary to consider the need to ensure that fire is not spread from the highway.

Where flammable systems are used, it is recommended that firebreaks of fire-resistant materials or other design are incorporated into the noise reducing device in order to prevent the propagation of fire. This clause is not applicable to such fire resistant material.

This clause describes a test for a representative panel of a vertical noise barrier under normal exposure to brushwood fires at the roadside.

It does not provide information on the results of exposure to more severe conditions e.g. ignition by burning spilt fuel. The test should not be used to provide information on the fire safety of claddings used for tunnels or partial covers over the highway.

5.1.2 Classification

The noise reducing device, after being tested by the method given in 5.1.3, shall be classified as follows:

— class 1: if the panel has been damaged to a greater extent than as defined for classes 2 and 3;

— class 2: if the damaged area above either source is less than 0,06 m^2 and extends to no more than 200 mm above the base of the panel, and the panel has not been burnt through to the other side;

— class 3: if there is no damage other than discoloration.

5.1.3 Fire test

Acoustic elements of at least 2 m long by 1,5 m high shall be tested by exposure to localized sources of fire at its base next to the front and rear faces independently. Panels shall be free of absorbed water before testing. For wood elements, the moisture content shall be reduced to a value below 18 % by an appropriate drying method. Other materials will be stabilized at an atmosphere of 50 % RH and 23 °C according to EN 1363-1:2012, F.1.

The mass and dimensions of the panel to be tested shall be measured and the panel shall be photographed. An identical panel shall be examined to determine its construction; the dimensions of its elements, including wall thickness of hollow sections, shall be measured and noted on a sketch at 1:20 scale.

Testing shall be carried out in an enclosed fireproof and draught-free chamber having a volume of at least 150 m^3.

Fume extraction devices may be installed in or near the ceiling, but shall be prevented from fanning any flames during the test.

The temperature of the chamber, including the floor, before the test begins shall be between 15 °C and 25 °C. The chamber should be fitted with an observation port or window in a suitable position to observe the panel during the test.

5.1.3.1 Two identical sources of fire shall be prepared as follows:

a) a rectilinear wire mesh basket 300 mm by 200 mm by 300 mm high shall be made from welded steel wire mesh, having a square mesh of 3 mm diameter drawn steel wire at 50 mm centres;

b) in addition, three 3 mm diameter wires 300 mm long shall be secured in a vertical position inside the basket, equispaced along the central line of the shorter dimension.

The flammable material shall comprise shavings of spruce, 0,2 mm thick by 2 mm wide, and approximately 50 mm long. The material shall be free from splinters and have a maximum moisture content of 30 %; it shall be acclimatized at 20 °C and 65 % relative humidity until its weight is constant.

600 g of shavings shall be lightly pressed down into each basket so that it is just filled.

5.1.3.2 The test panel shall be supported in a vertical position corresponding to its orientation in use, on a plinth supporting the full length of the panel. The plinth shall be of masonry or concrete and have a vertical step to a level of 250 mm above the floor of the chamber. The base of the test panel shall be completely in contact with the plinth and the face to be tested shall be flush with the edge. The two sources of fire shall be placed on the floor of the chamber with their longer dimension flush against the plinth and the face of the test panel. Both sources shall be lit simultaneously, and the time taken for the test shall start at this point.

5.1.3.3 The performance of the panel shall be observed during the test and the time at which any significant change takes place recorded. After the sources of fire and any part of the panel which may have ignited have burnt out, the panel shall be examined and the extent of any damage photographed and measured. The opposite face of the panel shall not be tested until it and the floor of the chamber have cooled to below 25 °C.

5.2 Reaction to fire, smoke density and toxic fumes

The noise reducing device shall be classified in accordance with EN 13501-1:2007+A1:2009, Clause 8 “Testing of construction products, excluding floorings”

In Annex A, an example is given for the use of the noise reducing device in a certain situation.

5.2.1 Principles of the tests for reaction to fire

5.2.1.1 Introduction

Noise reducing devices shall be classified in accordance with EN 13501-1:2007+A1:2009, Clause 8 “Testing of construction products, excluding floorings” and the there mentioned additional classifications for smoke production and/or flaming droplets and toxic fumes.

5.2.1.2 Smoke and toxic fumes

A flat specimen, representative for the product being used for the noise reducing device, shall be tested in accordance with ISO/DIS 5659-2:2016 at a constant irradiance of 25 kW/m^2.

5.2.2 Suitability of a noise reducing device for testing and preparation

5.2.2.1 Product geometry

5.2.2.1.1 Specimen

The specimen shall be prepared according to the standard as it is installed including coatings, joints, seals, frames and preservation products. Only those parts of the noise reducing device that represents > 1,0 % of its total mass shall be considered.

5.2.2.1.2 Dimensions of the specimen

The dimensions of the specimen are given in the relevant standards. These standards gave information too about eventual frames.

5.2.2.1.3 Number of specimens

The number of specimen to be tested is given in the relevant standards.

5.2.2.2 Mounting of specimen

5.2.2.2.1 Free standing noise reducing devices

Mounting of the specimen shall be as described in the standard EN ISO 11925-2 for testing. For the single burning item test in accordance with EN 13823, the minimal distance from the back surface of the specimen and backing board shall be 80 mm. in order to create the circumstances for a free standing wall.

5.2.2.2.2 Non free standing noise reducing devices (like claddings)

Mounting of the specimen shall be as described in the standard EN ISO 11925-2 for testing. For the single burning item test in accordance with EN 13823, the minimal distance from the back surface of the specimen and backing board shall be 0 mm.

5.2.2.3 Product ranges

5.2.2.3.1 Range in thickness

If the product or material is available in different thicknesses, then the smallest thickness and the largest thickness shall be tested. The worst value shall be declared for the whole family. It is permitted to divide a range of products into more than one family.

5.2.2.3.2 Range of colours

If the product or material is available in different colours, then the lightest, the darkest and one colour in between shall be tested. The worst value shall be declared for the whole family.

Transparent material without colouring is also considered as coloured and shall be tested separately.

NOTE The darkest colour is the black or the nearest to it. The lightest colour is white or the nearest to it. The colour in between is the red or the nearest to it.

When there is one colour that can be delivered in different shades, then only tests on the darkest shade are required.

5.2.2.3.3 Combination of thickness and colour

In the situation where a combination of thickness and colours exists, the colours shall be tested first and the worst result out of these tests shall be used for the testing of the thicknesses.

5.2.2.3.4 Different orientations

If a product has different orientation possibilities, the orientation as installed shall be tested.

5.2.2.3.5 Products with different compositions

If products can have different compositions (for example: different amounts of inorganic fillers), this may influence the test results. In this case the products shall be handled in separate families.

5.2.3 Smoke density and toxic fumes

5.2.3.1 Smoke density

5.2.3.1.1 Parts to be considered in this test

The individual components of the noise reducing device that represents more than 1,0 % of its total mass shall be considered. Coatings and surface treatments shall be considered as an integral part of the component they colour or protect.

All the parts of the noise reducing device considered above shall be measured separately. If any part consists of more than one material, every single material shall be tested.

5.2.3.1.2 Measurement method

Smoke density shall be measured according ISO/DIS 5659-2:2016, 10.9.1 mode 2: irradiance 25 kW/m² with a pilot flame.

5.2.3.1.3 Smoke density value of the cladding or the acoustic element

The smoke density shall be calculated with the following formula:

$$D_{s,\max}10_{total} = \sum_{i=1}^{n} \frac{D_{s,\max}10_i \times w_{t,i}}{w_{t,total}}$$

where

$D_{s,max}\,10_i$ is the maximum smoke density during 10 min of test of material i;

$D_{s,max}\,10_{total}$ is the maximum smoke density during 10 min of test of the cladding or acoustic element;

$w_{t,i}$ is the weight of the material i;

$w_{t,total}$ is the total weight of all material(s) part(s) of the cladding or acoustic element.

5.2.3.2 Toxic fumes

5.2.3.2.1 Parts to be considered in this test

The individual components of the noise reducing device that represents more than 1,0 % of its total mass shall be considered. Coatings and surface treatments shall be considered as an integral part of the component they colour or protect.

All the parts of the noise reducing device considered above shall be measured separately. If any part consists of more than one material, every single material shall be tested.

5.2.3.2.2 Measurement method

Smoke density shall be measured according to ISO/DIS 5659-2:2016, 10.9.1 mode 2: irradiance 25 kW/m² with pilot flame.

5.2.3.2.3 Toxicity values

5.2.3.2.3.1 Measured components

The following gas components shall be measured: CO; HCN; HCL; NO_x. The measurement values shall be indicated in µg/g.

Remark on the significance of the measured values: The Acute Exposure Guidelines, according to Council Directive 96/82/EC, give the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 h without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action: values for CO-content higher than 420 µg/g and HCN-content higher than 95 µg/g should be considered as dangerous for human beings.

5.2.3.2.3.2 Measurement method

At the end of the test done under 5.2.3.2.2, the gas concentrations shall be determined. These measurements shall be done with test tubes filled with a solid reagent. If one of the specific gas components exists, the indicating layer discolours due to chemical reactions. The length of the colour change is a measure of the concentration. The samples for measuring the gas with colourimetric test tubes are taken directly from the smoke test chamber by means of a suction pump. The suction capacity of the pump under load shall comply with the values specified by the manufacturer of the test tubes

The outlet valve at the smoke chamber remains closed during the test carried out in accordance with 5.2.3.2.2. The test tube is then connected between the valve and the suction pump. At the end of the test time, the valve is opened and the suction pump is switched on. The gas flow is then sucked through the test tube at the set volumetric suction flow. The presence of the specified gas results in the instantaneous discoloration of the reagents in the tube.

Following the instructions of the test tubes user manual is essential.

6 Report

6.1 General

The test report(s) shall include a reference to EN 1794-3:2016, together with the following information:

— number and year of this European Standard, EN 1794-3:2016;

— the name and address of the laboratory with the dated signature of the person responsible;

— the name and address of the manufacturer of the product with exact identification of the tested element;

— a full description of the product tested, including such aspects as its name, type, form, essential dimensions, mass or density, colour and coverage rate of any coating and essential parts as frames and seals.

6.2 Resistance to brushwood fire

The test procedure shall be described together with the timing of significant stages, indication of, for example, maximum intensity of flames, the incidence of any observed changes to the test panel and the number of samples tested.

The test report shall record the nature and extent of any flames and smoke produced during the test.

Photographs of the test panel before, during and after the test shall be supplied and shall include an appropriate means of judging scale.

6.3 Reaction to fire, smoke density and toxic fumes

— Result of smoke density test and toxic fume test (reaction to fire test) referring to ISO/DIS 5659-2 and the classification of the product in terms of classification conform to EN 13501-1:2007+A1:2009, Clause 8 "Testing of construction products, excluding floorings".

— Result of the brushfire test and classification according to this test and the description of the test with the timing of significant stages, indication of, for example maximum intensity of flames, the incidence of any observed changes to the test panel and the number of samples tested. The report shall record the nature and extent of any flames and smoke produced during the test. Photographs of the test panel before, during and after the test shall be supplied and shall include an appropriate means of judging scale.

Annex A
(informative)

Classification of reaction to fire for noise reducing devices

The concern of reaction to fire is strongly related to the location of the noise reducing device. The following table provides informative classifications.

Table A.1 — Classification of reaction to fire for noise reducing devices (informative)

Class	Intended use	Test performances
1	Tunnels and total covers	Class B or better according to EN 13501:2007+A1:2009
2	Partial covers, on bridges and near houses	Class E or better according to EN 13501:2007+A1:2009
3	All other situations where fire could be relevant	Test results according to 5.1 (resistance to brushwood fire)

Bibliography

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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 13501 (all parts), *Fire classification of construction products and building elements*

[5] EN 14389-1, *Road traffic noise reducing devices — Procedures for assessing long term performance — Part 1: Acoustical characteristics*

[6] EN ISO 291, *Plastics — Standard atmospheres for conditioning and testing (ISO 291)*

[7] EN ISO 1182, *Reaction to fire tests for products — Non-combustibility test (ISO 1182)*

[8] EN ISO 1716, *Reaction to fire tests for products — Determination of the gross heat of combustion (calorific value) (ISO 1716)*

[9] Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances

[10] Decision 96/603/EC: Commission Decision of 4 October 1996 establishing the list of products belonging to Classes A 'No contribution to fire' provided for in Decision 94/611/EC implementing Article 20 of Council Directive 89/106/EEC on construction products

[11] 2000/147/EC: Commission Decision of 8 February 2000 implementing Council Directive 89/106/EEC as regards the classification of the reaction to fire performance of construction products (notified under document number C(2000) 133)

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