

CE marking for Noise Barriers to be installed alongside Road Infrastructures

ENBF – Guidelines & Recommendations

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Foreword

Noise barriers for road infrastructure are construction products falling under CPR (Construction Product Regulation).

CPR covers construction products in two different ways: for some products, stated requirements are compulsory, for others, they are voluntary. Applying CPR is compulsory for products included in the scope of a harmonised European Standard (hEN).

Among categories belonging to road equipment, noise barriers are regulated by the harmonized standard hEN 14388 published in the Official Journal of the European Union (OJEU). A full set of supporting standards has also been approved.

Application of CPR for noise barriers is compulsory for all European Union Member States and for external countries, having mutual implemented EU regulations.

The above technical standards reflect Europe's deepest knowledge and experience in noise barrier field. The mission for ENBF is both the full respect of existing regulations and to ensure the application of above technical standard in different markets around the world.

This document gives general guidelines and information about the CE marking procedure according to CPR, with specific reference to noise barriers for road infrastructures. According to its content it be considered as a 'live document', which will be updated periodically when additional information becomes available. This guideline will also take into consideration the changes in CPR coming from previous CPD.

General remarks

According to CPR, CE marking is a harmonized way to declare the performance of construction products so that they can circulate within the common market.

Performance has to be declared for the essential characteristics listed in Annex ZA of the harmonized standard.

Annex ZA is the part of the harmonized standard which identifies essential characteristics and provides the Assessment and Verification of Constancy of Performance (AVCP) to which the products needs to be submitted before the manufacturer is entitled to draw up a Declaration of Performance (DoP) and to affix the CE marking.

AVCP also defines the degree of involvement of third parties in assessing the conformity of the product according to the relevant technical standards.

With reference to noise barriers, AVCP system 3 applies in which responsibility for assessment is largely left to the company. In detail, in case of products assessed under system 3:

- factory production control is carried out by the manufacturer;
- determination of the product-type on the basis of type testing (based on sampling carried out by the manufacturer), type calculation, tabulated values or descriptive documentation of the product, are carried out by the notified testing laboratory.

DoP finally has to be made by the company (contractor, manufacturer, installer...) that is in charge of the final installation of the noise barrier.

For all above reasons, ENBF, as a representative of the industrial sector, is one of the main stakeholders involved in CE marking process for noise barriers.

This document has been established by ENBF to help their members to make the process of CE marking more transparent.

As the final goal, the use of this document should help to establish a common approach to CE marking for noise reducing devices.

It can be useful to third parties who may be involved and/or to support them to clarify relevant topics. Some common issues about CE marking for noise barriers are addressed within the next paragraphs

Recommendations are also provided for further improvements of the standards within future revisions undertaken by the Standard Committees and working Groups.

CE marking: addressed issues

Main stakeholders involved in noise barriers market sector often raise issues and questions regarding procedures for Declaration of Performance and CE marking. Some of the reasons why this happens may be covered by the following considerations.

- CEN Technical Committee has been appointed for standard developing at the early stage of CPD when many uncertainties were existing within the application of the basic principles of the Directive. In fact hEN 14388 and related supporting standards have been developed in a time frame covering the full period of existence of CPD and transition to CPR.
- AVCP system 3 which was adopted for noise barriers leaves major responsibility to the companies both in Initial Type Testing and Factory Production Control (FPC). Notified laboratories are only required to provide testing and calculations. Most of the companies involved with the Noise Barrier market are SMEs, which may lack personnel experienced in procedures and standards. The role of National and European Association (as ENBF) is then essential to provide the necessary support for their members.
- The term Noise barriers covers a huge variety of products and solutions. Consequently technical reference is made to different Eurocodes and Product Standards. Uncertainties are also raised

by the title of the hEN 14388: the term “noise reducing devices” seems to address various products able to minimize road traffic noise in a variety of ways. In fact the scope is restricted to “noise barriers”, “cladding”, “coverings” and their structural and acoustic elements which act solely on noise propagation.

The following questions are addressed within this document.

1. *What is the object of CE marking* ?
2. *Who is in charge of signing CE marking* ?
3. *Which is the role of parties involved* ?
4. *When CE marking has to be presented* ?

A framework is also provided to support next revision of the harmonized standard and related supporting standards where required. ENBF is actively working to this end.

1 - What

CE marking is often associated to single industrial products whose performance has to be declared before their introduction on the market.

Attention is focused on a single component (i.e. cassette panel) whose performance is declared and maintenance procedure is assessed. No consideration is given to the full noise barrier system whose performance should be expected to meet requirements stated for the road infrastructure.

A correction is required for this distortion: CE marking of a noise barrier shouldn't be a mere collection of test certificates and reports on single components.

The harmonized standard hEN 14388 states that CE marking applies for following NRDs (noise reducing devices):

1. noise barriers (noise reducing devices, which obstruct the direct transmission of airborne sound emanating from road traffic);
2. claddings (noise reducing devices, which are attached to a wall or other structure and reduce the amount of sound reflected);
3. road covers (noise reducing devices, which either span or overhang the road);

Above NRDs are equipment to be incorporated in road infrastructures to reduce noise levels caused by vehicle traffic in surrounding areas. Within this document, they are referred as “noise reducing systems”.

It has also been stated that the above devices may include distinct acoustic and structural elements, where:

4. an acoustic element is an element whose primary function is to provide a noise reducing device with sound insulation, diffraction and/or sound absorption; it is a component of noise reducing device to be used alongside roads,
5. a structural element is an element whose primary function is to support or hold in place acoustic elements; it is a part of noise reducing device to be used alongside roads. Depending upon the

- design of the noise reducing device, structural elements may potentially be tested separately from acoustic elements
6. added devices (added components that influence the acoustic performance of the original noise-reducing device - acting primarily on the diffracted energy).

The above NRDs need to be integrated in a noise reducing system in order to act on acoustic propagation from road infrastructures. Within this document, they are referred as “noise reducing components”.

Performance of Noise Reducing Systems has to meet basic work requirements of the whole construction (road infrastructure) as stated by CPR :

1. Mechanical performance and stability
2. Safety in case of fire
3. Hygiene Health and Environmental protection
4. Safety in use
5. Noise protection
6. Energy saving and heat insulation
7. Sustainable use of natural resources

With reference to Basic Work Requirements (BWRs), Essential Characteristics for the product are regulated by the harmonized standard.

It comes clear that in order to fulfil BWRs, performance needs to be evaluated on noise barriers, cladding or coverings (Noise Reducing System).

Evaluation of performance of acoustic elements and structural elements (Noise Reducing Components) can be made if their intended use is for their final integration in a Noise Reducing System.

DoP of a noise reducing component is then to be considered throughout a cascading process as an intermediate step towards the full system DoP.

Clarification of the above concepts within further revisions of the harmonized standard hEN 14388 is strongly recommended.

2. Who

In the road construction sector, contracts concerning noise barrier supply and installation are currently of two distinct types:

- a) Noise barrier installed as part of the road construction work. This is the case where a main contractor is currently in charge of road construction, enlargement or refurbishment. Noise barrier is then the equipment required to reduce noise impact of the new or refurbished infrastructure.
- b) Noise barrier installed on existing road infrastructures to reduce noise impact. In this case, a specialized contractor is currently in charge of installing the noise barrier system.

Contract types are dependent on different national legislations and are matter of choice of road managers. They are out of the scope of present document. Nevertheless, in both situations the performance is to be declared and guaranteed for the noise barrier (or noise reducing system in the more general case). Responsibilities for each party involved within the supply chain need now to be addressed.

In both cases, responsibility for noise barrier CE marking belongs to the party in charge of introducing into the market the Noise Reducing System for the final incorporation in road construction.

The role of the specialist contractor remains untouched also in contract type “A” where main contractors are often procure different Noise Reducing Components independently. If this is the case, the main contractor has to cover all roles in other cases covered by specialist contractors.

They should be requested to perform acoustic, mechanical and impact tests on the full noise barrier to ensure that performance declared is really covering the Noise Reducing System and not merely being a collection of single certificates.

3. Which

Authorities and main contractors often object to CE marking documents signed by the authorized representant of the company in charge of noise barrier supply and installation. A signature from a third party is commonly expected.

However, answers can be found in the AVCP system applying to noise barriers. Clarification is herein given for the role of parties currently interested at CE marking process:

- the Notified Laboratories.
- the suppliers of Noise Reducing Components,
- the contractor responsible for the Noise Reducing System,
- the final client.

Notified laboratories are in charge of performing tests on initial types of noise barrier components and noise barrier systems. When a calculation report is required, Notified laboratories are in charge of the validation of the calculation report. Notified laboratories are also required to assess the conformity of products under test with drawings and technical datasheet to be incorporated into test reports.

Suppliers of Noise Reducing Components are responsible for providing Declaration of Performance and Factory Production Control for their products. Those documents do not entirely correspond to the noise barrier CE marking.

The contractor in charge of supplying the noise barrier system has to provide the CE marking of the system on the basis of DoP and FPC (Factory Production Control) of single components provided by suppliers. He may need to integrate DoP with additional tests and/or calculation on the noise barrier system. He also needs to provide Installation and Maintenance Manuals for the barrier system.

Finally the Client needs to be guaranteed about the performance declared for the noise barrier he has purchased. He cannot be assured by partial declarations for single components. To guarantee the performance declared, it is recommended that all test reports and certificates prepared by the Notified Laboratory are attached to the declaration provided to the Client.

4. When

It is generally stated that CE marking has to be presented when the product is introduced on the market. Clarification is required for when occurs in the case of Noise Reducing Systems and Components.

The key moment is the offer stage of the Noise Reducing System when the supplier has to state that product performance fulfils contract specifications set by the Client.

Declaration of Performance with reference to single certificates or documents provided by the Notified Laboratory and Factory Production Control provided by the manufacturer need be attached to contract documents when signed.

This corresponds to the actual placing of the product on the market.

If required, test certificates need also to be attached to D.o.P together with Factory Production Control, Installation and Maintenance manuals. This choice is to assure the Client that declared values will meet tender specifications.

When the noise barrier is part of the road construction work, quotations by specialists are given to the main contractor involved in the tender procedure. In this case, CE marking document can be postponed to the actual date of contract signature between the main contractor and the specialist subcontractor in charge of supplying the Noise Reducing System.

Contract signature is also the moment when DoP has to be given by the supplier Noise Reducing Component for further integration in the Dop of the Noise Reducing System within the cascading procedure.

Evaluation of Performance vs Essential Requirements

Annex ZA of the harmonized standard hEN 14388 sets the essential requirements for which the product performance has to be declared. Within the present chapter, explanation is provided for those requirements and supporting technical standards which are referred to. Issues related to their application are also considered.

Acoustic performance for noise protection

Acoustic performance must be evaluated according to the set of supporting standards EN 1793. It consists of the evaluation of noise insulation and noise absorption (reflection) of the Noise Reducing Systems and Components.

If the case of noise barrier is considered, its noise insulation depends on the noise insulation of single components and on their correct combination. Leakages on junctions may be detrimental for the Noise Reducing System performance.

It is also to be noted that a difference has been stated between noise barrier intended use in reverberant field and in free field which are two different conditions in road applications.

According to an explanation given by Clairbois [1] free field conditions apply for most of noise barriers installed alongside roads. Reverberant field conditions are restricted to cladding of deep trenches and road coverings of the partial or total type.

A clarification is then required for supporting technical standard dealing with acoustic performances.

EN 1793.1 and EN 1793.2 are provided to evaluate noise absorption and noise insulation of Noise Reducing Components and Systems when installed in reverberant field.

CEN TS 1793.5 and EN 1793.6 are provided to evaluate noise reflection and noise insulation of Noise Reducing Systems when installed in free field conditions. When evaluating acoustic insulation of a noise barrier, EN 1793.6 provides a method for checking possible noise leakages between various components (i.e. post–panel, panel–transparent sheet). **The same standards allow for the evaluation of long term performance by repeating the test during the working life of noise barrier as installed.**

With reference to acoustic reflection the noise barrier performance can be evaluated by considering a portion of the noise barrier surface made of a single component or a combination of more components.

A correlation between data resulting from tests performed according to reverberant and free field methods is available [2]. Nevertheless a correlation function is not included in the standard.

From the above considerations, it is then recommended that acoustic performance evaluation for Noise Reducing Systems should be based on the relevant part of supporting standard EN 1793, depending on the acoustic characteristic of the environment. The use of Part 6 of the standard is recommended for in situ test on the NRS installed within final Work Acceptance checking procedure.

Mechanical resistance

Possible loads to take into account are of static type (self-weight, wind and snow loads) or dynamic type (passing traffic). In case traffic flow may cause alternating loads on noise barriers, effect of fatigue is to be taken into account.

Assessment of performance of Noise Reducing Systems is done by calculation according to the existing Eurocodes. Shape factors are also to be taken into account both for noise barrier ends and for discontinuities. In order to deal with above topics in a comprehensive way, the supporting standard EN 1794.1 is being revised at the date of this document.

Calculation report is prepared on behalf of the manufacturer. The Notified laboratory is responsible for the validation.

For Noise Reducing Components (i.e. acoustic panel) a test method is defined to assess mechanical performance. Maximum deflection is fixed independently of the panel dimensions. This is meant to prevent acoustic leakages when the panel is subjected to deflection for the applied loads.

Mention has to be made for the effect of snow clearance (EN 1794.1 annex E). Evaluation is required for the maximum value the noise barrier can withstand from snow projected during clearance activities. Performance can be declared on the basis of test or validated test report. The high value of performance required is due to heavy system for snow removal often used in Northern European Countries. Load requirements may be relaxed by Single Authorities in case other systems for noise removal are considered.

Safety in case of errant vehicle collision (EN 1794.1 annex D) is not included in Annex ZA. Nevertheless the supporting standard is stating that in case noise barrier is installed within the working width of the safety barrier resistance to impact has to be assessed according to hEN 1317.6 (harmonized standard for safety barrier). If this is the case noise barrier falls into another product standard having prevalence in terms of level of performance required. The matter is relevant as the integrated system noise and safety barrier is increasingly used due to the need of Road Managers to save space and costs.

Reference is also to be made to the resistance of the noise barrier to the impact of stones (EN 1794.1 annex C). This is not an essential characteristic but in the standard a test method is provide to evaluate the effect of such impacts.

Safety in use

Risk for falling debris is a safety issue related to Noise Reducing Systems and mentioned in Annex ZA of the harmonized standard. The reference supporting standard is EN 1794.2 annex B.

It is a common understanding that the above problem essentially refers to brittle material (i.e. transparent sheets) that may break even in case of minor impacts.

This document recommends that the form should prepared be on the Noise Reducing System once consideration has been given to Noise Reducing Components.

The supporting standard explains that the position where the noise barrier is installed, may be critical in case of falling debris. In this case the resistance of the full noise barrier to impact has to be evaluated. The choice of highly resistant component is essential but not enough to satisfy this safety requirement (i.e. additional links between supporting structure and acoustic elements may be required in order to prevent the intact elements from falling in case of impact).

Light reflectivity is also acknowledged among essential requirements in annex ZA and reference is made to supporting standard (EN 1794.2 annex E). It essentially refers to the gloss of barrier surfaces. High values may cause risk for road users. **Again even for this characteristic focus has to be shifted to the Noise Reducing System:** the degree of safety for the road user is dependent on the reflectivity of the material used and on the shape and position of the noise barrier installed. The performance of the noise barrier including geometry and material used is then required. This document recommends that the supporting standard should be revised accordingly.

Noise barrier behaviour in case of fire is not considered among essential requirements and performance is limited to a brush fire test according to (EN 1794.2 annex A). **Recommendation is given here to consider risk of fire in a proper way for Noise Reducing System other than noise barriers in the external environment (i.e. tunnel cladding or road coverings).** A new supporting standard as part 3 of 1794 is now being published. It will contain mandatory tests for fire behaviour and smoke development. In general, the brushfire test gives enough information for most applications for noise barriers. In cases where more stringent requirements are necessary, further testing for reaction to fire shall be done according to EN 13501-1.

Noise barrier transparency is considered for residential (static transparency) and road users (dynamic transparency). It is not considered among essential characteristics. Performance has to be evaluated for the Noise Reducing System system by means of a calculation method provided by the supporting standard (EN 1794.2 annex F).

Means of escape in case of emergency may be provided within noise barrier. It is not considered among essential characteristics. Criteria to be adopted are given in the supporting standard (EN 1794.2 annex D).

Environmental protection

Declaring possible release of dangerous substances is an essential requirement (EN 1794.2 annex B). For this purpose, the full lifecycle of the noise barrier system has to be considered.

Long term durability

Long term performance is an essential requirement both for acoustic and non-acoustic characteristics whose performance is to be assessed according to the supporting standard EN 14389.

For both characteristics working life of the noise barrier system has to be declared against road side exposure and typical environmental conditions as specified in EN 60721.3,4.

In addition for part 1 of the standard minimum values for intrinsic acoustic insulation and absorption (reflection) at the end of working life are to be declared.

Declaration is to be made for acoustic values measured in situ according to CENTS 1793.5 and EN 1793.6. Use of above standard is recommended as dismantling the noise barrier for laboratory testing would affect the functionality of the system in addition to causing unreasonable additional costs.

Sustainability

Basic Work requirement 7 “Sustainable use of natural resources” has been introduced by CPR. The scope is that of promoting a sustainable approach within the full life cycle of construction products. To assess sustainability a general criteria and measurement methods need to be defined.

At present stage a mandate has been given to the CEN standardization group for drafting a supporting standard on the topic of sustainability.

Background for the work can be found in the research project QUIESST [3] funded by EU within the 7th Framework Programme .

Term and definitions

CPD - Construction Product Directive 89/106/EEC of 21st Dec. 1988 – O.J. L 40 of 11th February 1989

CPR - Construction Product Regulation (EU) No 305/2011 of 9th March 2011 – O.J. L 88 of 4th April 2011

BWR – Basic Work Requirement

Essential Requirements – among BWRs requirements to be referred to for CE marking

Harmonized Standard – Reference standard for product CE marking

Supporting Standard – Supporting standard for product CE marking

NRD - Noise Reducing Device as stated within hEN14388 and supporting standards

NRS – Noise Reducing System as stated for the purpose of present document



NRC - Noise Reducing Components as stated for the purpose of present document

Annex ZA – Part of the harmonized standard to be considered for essential requirements di be declared

ITT - Initial Type Testing

DoP – Declaration of Performance

AVCP – Assessment and Verification of Constancy of Performance

FPC – Factory Production Control

Bibliography

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[2] www.quiestt.eu – WP4 - AIT contribution

[3] www.quiestt.eu