

Integrated Noise & Safety Barriers Application of relevant hEN standards

October 2017

Circulated by G.Brero on GNB CPR SG04 platform CIRCULATION FIXTURES SECTOR GROUP OF NOTIFIED BODIES



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Foreword

The integrated noise and safety barrier is a product to be installed alongside road infrastructure.

It is a able to combine the performance of the vehicle restraint system (VRS) and the performance of the noise barrier.

The diffusion of this product on the market is increasing for the following reasons:

- it allows for saving the space which is required between the VRS and the noise barrier in order to allow for the deformation of the VRS as a consequence of vehicle impacts
- improve acoustic efficiency of the noise barrier that can be installed closer to the noise source
- reduced cost

Integrated noise-safety barriers are often used for installation on bridges or as a separation between two carriageways.



Different product types are used on the market. They can be made of concrete, steel and of a combination of the two materials. Some barriers also allow for the use of transparent sheets.

Some integrated noise and safety barriers require foundation works.

Present document has been prepared by ENBF in order to address some issues related to the application of EN standards for CE marking to be applied according to CPR 305-2011 and related national legislation.

The aim is that of supporting Manufacturers and Road Authorities for the use of these products.

Some items of present document have been brought to the attention of SG04 (the Group of Notified Bodies) during the meeting held in Milano on November 2016.

The document has been discussed by the ERF safety barriers working group in the 30th August 2017 meeting. Amendments have been made and the document finally circulated during the ENBF 28th September 2017 meeting.

The final draft of the document is brought to the attention of the SG04 working group. The scope is to integrate the document into an SG04 position paper.

Declaration of performance. Which harmonized standard applies ?

For declaration of performance (DoP) and CE marking following standards apply:

- hEN 1317.5:2012 for the VRS
- hEN 14388:2005 for noise barriers (version 2017 is under enquiry at the date of issue of present document)

Both standards refer to a full set of supporting standards about specific test procedures to assess product performance versus essential requirements as defined within CPR



- 1. Mechanical resistance and stability;
- 2. Safety in case of fire;
- 3. Hygiene, health and the environment;
- 4. Safety in use;
- 5. Protection against noise;
- 6. Energy economy and heat retention;
- 7. Sustainable use of natural resources.

Annex ZA of the hEN 14388 addresses essential requirements n. 4 and 5.

Annex ZA of the hEN 1317.5 addresses essential requirement n. 4.

For the integrated noise & safety barrier product DoP must be prepared repeating sections 5, 6a, 7 of the DoP template for the different standard, AVCP levels.

All essential requirements are to be considered and declaration has to be based on laboratory tests or calculation procedures as defined in relevant supporting standards.

Assessment and Verification of Constancy of Performance. Which level of AVCP applies?

A factory production control (FPC) must be implemented to ensure constancy of performance and the product performance has to be declared with reference to the Initial Type Testing (ITT) procedure.

CE marking can then be applied on the product if both ITT and FPC have been provided by the manufacturer.

For safety barrier AVCP system 1 applies: DoP has to be prepared by the manufacturer with reference to the CE certificate provided by the Notified Body. FPC is then implemented by the manufacturer under the surveillance of the Notified Body.

For noise barrier AVCP system 3 applies: DoP has to be prepared by the manufacturer mentioning the notification number of the NB involved. FPC is implemented by the manufacturer. The surveillance of the Notified Body is not required.

For the integrated noise and safety barrier AVCP system 1 applies for the product as a whole.



Stability requirement: maximum horizontal deformation allowed for the supporting post

Noise barrier mechanical performance has to be evaluated according to the supporting standard EN 1794-1:2012.

When the noise barrier is made of acoustic elements (panels, transparent sheets) and structural posts a minimum stiffness requirement is fixed for the post.

According to the cited standard horizontal elastic deflection measured at the top edge of the post under the design wind load should not exceed maximum values set as follows:

Deflection must be less that Ls/100, where Ls is the post length, for noise barrier height minor than 3 meters. Allowed deflection is then progressively reduced to the maximum value of Ls/150 for noise barrier height more than 4,50 meters.

I.e. in case of a noise barrier height of 5,0 meters, the maximum deflection calculated under the design wind load at the top edge of the post should not exceed the value of 33 mm.

When an integrated noise and safety barrier is considered difficulties are encountered at the design stage to fulfil above requirement given the opposite need of structure flexibility to allow for the correct barrier behavior under vehicle impact.

It often happens that priority is given to the performance of the integrated barrier in term of safety behavior and the limit for post deflection is not respected. Nevertheless this choice may raise problems for product acceptance by Road Authorities.

A solution to this issue is provided by the new version of the standard EN 1794-1 now under enquiry.

New standard allows for an increase of post deflection under design wind load.

Limits on deflection are not set within the standard. They are specified by the Designer or by the Road Authority depending on the intended use of the product.

E.g. Higher values of post deflection are set if the foundation is opf the rigid type and no rotation of the post base are expected; different values of post deflection are set depending on the type of panels used, as brittle materials may require less deflection.



How to consider product modifications

Integrated noise and safety barrier are a complex system when compared to current VRS.

Modifications may be required to adapt the integrated noise safety barrier to different needs of the specific project. Herein a non-exhaustive list of examples is provided.

- Noise barrier height can be changed for acoustic reasons
- Noise panel type can be changed for acoustic / architectural reasons
- Noise panel materials can be changed for technical specifications, aesthetics, durability.

VRS modifications are to be considered with reference to hEN 1317.5 appendix A.

It is stated within the standard that modifications are allowed if it can be demonstrated that declared performances for the characteristics listed in Annex ZA remain unchanged. Modifications and the type of demonstration required are classified in the specific table.

If modification implies changes in product performance a risk analysis must be made by the Notified Body in charge for the ITT. Consequently:

- repetition of ITT may then be required (modification type C)
- Virtual testing can be performed (modification type B)

Modification (reduction) of the noise barrier height with respect the product tested can be classified as type B.

Modification (increase) of the noise barrier height with respect the product tested can be classified as type C.

Modifications which imply changes in panel type or panel material may vary the total stiffness of the integrated noise-safety barrier and cause safety problems due to the falling debris.

Following example is provided.

Let assume an integrated noise safety barrier made of steel posts and steel cassette panels whose performance parameters have been measured through crash tests made according to EN 1317.5:2012.

The use of transparent sheets instead of metallic panel may require steel frames made of longitudinal and vertical steel profiles bolted to the posts. The supporting structure made of



vertical posts joint to horizontal steel profiles has a different rigidity pattern compared to the tested structure made of vertical posts and infill panels.

Modification required for the supporting structure necessarily affects the integrated noise safety barrier behavior under vehicle impact. Consequently, main performance parameters measured during cars test are expected to change.

Notified Body is then required to perform a risk analysis in order to state the modification type and the possible repetition of ITT.

The use of transparent sheets may cause falling debris (detached parts) and consequent damages to residentials or drivers.

Detached parts under vehicle impact is not an essential characteristic in the hEN 1317.5 and as such, involvement of the NB is not required. Detection of debris having a mass major that 2 kg is only required.

According to hEN 14388:2005 risk of falling debris has to be evaluated as a result of pendulum test according to the supporting standard EN 1794-2.

Generally for the noise and safety barrier the use of family concept is recommended: products with the expected poorest performance should be tested and that performance declared for all the products within the family.

Long term durability

For the integrated noise and safety barrier the working life of the two systems has to be declared separately according to the respective supporting standards.

Case history in Europe

A list of integrated noise and safety barriers in use in Europe is provided hereinafter















