

Widening search for solutions to growing road noise problems

By Giles Parker

With the continual rise of traffic noise on our highways, it is becoming necessary to consider a range of attenuating measures to effectively mitigate the generated noise for surrounding communities.

Each has its own strengths and weaknesses. The benefit of low noise roads surfaces is that they reduce the noise for all but with degradation their long term acoustic benefit is limited. In contrast, noise barriers provide a durable and acoustically more substantial solution to road noise, as long as they are well designed and proportionate in size to the road noise problem.

Budget-driven mitigation

There is a noticeable difference in what 'drives' the design of noise mitigation solutions in the environmental and the transport market sectors.

In managing environmental noise complaints and assessing noise mitigation designs and proposals, local authority environmental health officers have clear and quantifiable noise limits to use that are defined and governed by such standards as BS4142:2014 for industrial noise disputes or BS8233:2014 for new-build development planning applications. Whilst context always plays a significant part in any application they are able to assess the acoustic benefit of a proposed mitigation scheme to see if the specific noise criteria are being adhered to using best practicable means. The cost of mitigation schemes does not normally fall to the local authority and therefore mitigation solutions tend to be performance driven, assessed on their acoustic performance rather than on their cost even if it is to only benefit one individual.

In contrast noise mitigation solutions for highways schemes do not have clearly defined or regulated noise limits to work to. As a KPI, Highways England has identified and targeted 1,150 NIAs (Noise Important Areas) to address by 2020 through noise mitigation. This does not mean that, once mitigated they all have to achieve the same specific noise level or criteria. Like so many areas, Highways England is under budgetary constraints in meeting its targets. Mitigation measures for the strategic road network therefore tend to be more budget-driven and take into account population density - spreading available funds to bring some benefit to as many as possible.

Low noise road surface – part of the package

For roads, noise mitigation schemes tend to come in 'packages'. This might be a combination of road layout design, low-noise road surfacing, noise barriers, bunds, speed restriction or even glazing enhancement to windows. Whilst durable noise barriers or bunds can act as noise solutions in their own right, low noise road surfaces at best can only form part of the solution package.

By effectively reducing the noise at source low noise road surfaces provide a noise benefit for the general environment and a noise reduction for all properties in the acoustic vicinity. They are therefore attractive for highways schemes that look to provide an acoustic benefit for as many as possible, but their whole-life attenuating performance is typically very low.

All road surfaces become noisier with age. When newly laid, low-noise road surfaces can provide substantial noise reductions of 5dB or more, but they currently degrade



structurally and in acoustic performance at a much faster rate than standard road pavements and require replacement over shorter periods of time. Over its life cycle the typical noise benefit afforded by using a low noise road surface might only be of the order of 2dB.

In practice, no consultant or specifier is ever asked to design a mitigation scheme that only provides a lasting 2dB of attenuation. And if a more realistic attenuation of just 4 dB were required for, say, an estate next to a highway, this could therefore not be achieved in the long term using just a low noise road surface. Though it forms a useful 'part of the package' a low noise road surface on its own cannot be a solution to road noise due to its rapid degradation in performance.

Low height noise barrier culture

Historically, the prevailing culture in UK design has been for highways noise barriers that are mostly 2 to 3 metres in height. Having worked in noise barrier design for highways across all continents over 20 years, it is noticeable that this 'culture' is in sharp contrast to the rest of the developed world. In the United States, Canada, Australia, the Far East and continental Europe, substantially higher barriers over 6 metres are commonly designed, preferred, and budgeted for to give much greater levels of noise attenuation performance.

In the UK, not surprisingly, it is much harder to justify low height noise barriers in terms of their cost-benefit to the community because they can only provide a localised acoustic benefit (in the shadow-zone of the barrier). Also the quality of build is deemed less important to prevent transmission through the barrier because for low-height barriers most of the broadband noise is 'diffracting' over the top. As a result, the UK has had a history of thin, low height, low density barriers that deteriorate rapidly.

For example, the TRL Published Project Report PPR490 provides an assessment of the acoustic durability of UK

timber noise barriers utilising the in situ test standard for airborne sound insulation BSEN 1793-6 stating: "Overall, the results would suggest that for single-leaf reflective timber barriers, any degradation in acoustic performance occurs during the first five years after construction. Depending upon the initial performance, this decrease appears to be of the order of 4-7dB". If such a marked reduction is likely to occur over just the first five years, it is therefore essential that designers and specifiers are aware of the long term acoustic performance limitations of single skinned timber barriers.

Any cost-benefit analysis should also take into account deterioration in performance and structural, allowing for the cost of ongoing maintenance and possible replacement during its design life.


Higher quality barriers

When it comes to highways noise mitigation there does need to be a cultural shift in the UK to include for taller high-quality designs that will provide substantial, long lasting solutions to traffic noise. Put simply, a sticking plaster will not be sufficient to cover a gaping wound. If the required noise attenuation is well over 2dB, which it typically will be, then low noise roads surfacing will enhance the acoustic environment a bit but essentially it will only be 'skimming off the top' rather than providing a long lasting solution.

Where there is adequate space, incorporating earth bunds remains an attractive option, especially for new build roads. In most cases, however there simply isn't the space, especially in urban and semi-urban environments.

With taller barriers the potential to reduce traffic noise levels (by 10dB or more) and over a wider geographical area is greatly increased. With taller barriers, the component of diffracted noise over the top is less dominant and therefore reducing the transmitted component of noise through the barrier through robust product design and specification is essential.

Taller high-quality noise barriers will obviously come at a higher initial cost but when robustly designed, their long-term acoustic benefit will be equally substantial. The Highways Guidance: HA 66-95 'Environmental Barriers, Technical Requirements requires environmental noise barriers to have a 20 year low maintenance life and 40 year operational life. The Instrumentation Corner in the previous IOA Bulletin Jan/Feb 2017 edition navigated through the Product Standard BSEN14388 that enables manufacturers to have their noise barrier products tested, validated and CE-marked for acoustic and structural performance and for their durability. When a noise barrier comes with a CE Mark the client should obviously not just accept its Declaration of Performance on face value but should have it fully investigated as part of the clients on liability and procurement evaluation process to ensure that the product testing has been carried out correctly and that the barrier is therefore 'fit for purpose' for its design life.

With advances, there will be greater potential to extend the structural life of low-noise surfaces and to prolong their noise attenuating performance, as this happens their long-term acoustic benefit will increase, however, as things stand, well designed and built acoustic barriers remain the only substantive solution to traffic noise. 

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