ECHO BARRIER®
Environmentally Sound

# Field Performance of Noise Barriers

Why **30dB** attenuation on paper can become **10dB** in practice...

## 1. Noise Mythology

There is a considerable volume(!) of mis-information published concerning the attenuation provided by acoustic barriers. For example, claims of "up to 32dB attenuation" remind me of shampoo adverts - "up to 100% effective at eliminating the signs of dandruff". This covers everything from 0% upwards - unless you are a footballer, when, apparently, up to 110% is available…

Whilst we also put this data in our technical notes, we try to make it very clear that the field performance of noise barriers is very different. The specification battle means that people quote the highest attenuation possible at any frequency from lab test data (so you can refer to BS EN numbers etc). However, this is taking advantage of the technical nature of sound to obscure, rather than to inform potential customers who are not noise experts.

This technical note provides you with an honest appraisal of the technical and practical factors that affect the real world performance of any acoustic barrier. It also provides you with the results of a field test on a range of noise barriers from various suppliers. You can use this data to get a realistic feel for the benefits that you can get in practice from acoustic barriers in real applications - and to inoculate yourself against the hyperbole commonly associated with product literature.

## 2. Real World Barrier Attenuation Results

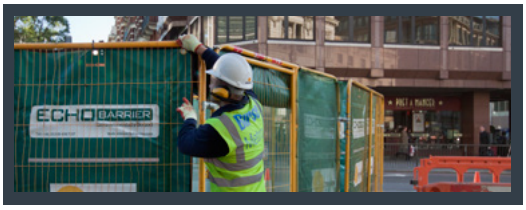
***Field noise reductions from acoustic barriers - all figures in dB(A)***

| Barrier Type | 1m | 10m | |
|---|---|---|---|
| **Rstandard** | **9.5** | **12** | Conventional, 12kg each, 3 per Heras panel, acoustic absorbent lined barriers |
| **Rsingle** | **14.5** | **9** | 15kg single sheet per Heras panel - with just a hint of acoustic absorbent... |
| **LMsheet** | **13.5** | **9** | low mass single sheet Heras panel, no acoustic absorbent barrier |
| **Echo H series** | **12.5** | **12** | < 6kg lightweight, 3 per Heras panel, hi-tech acoustic absorbent lined barriers |
| **Echo H series x2** | **14.5** | **14** | local double layer of H series barrier as recommended for high performance |
| **Echo H series x2** | | **19** | * diamond drill high frequency noise source - 31dB lab data reduction |


The figures show the overall noise reduction in dB(A) for the various barriers at distances of 1m and 10m from the barrier. Data for the highest performing barrier is also provided for a different application where the noise source is predominantly high frequency. The test setup shown here is a 3 sided barrier round a large loudspeaker used as the noise source. This setup means that the only noise paths are through the barrier material, through leaks and over the top of the screen. No sound will pass round the ends (technically equivalent to a barrier of infinite length). The source was pink noise ("pink" is a technical term in acoustics. It is a standard test sound that theoretically has equal energy in each octave band - like white noise, but with more energy at low frequencies).

## 3. How to Select your Barriers - the Practical Considerations

The difference between the attenuations of the worst and best barriers was 5dB(A). The two single layer, 3 part barriers (12kg each for the Rstandard versus 6kg each for the Echo H series) had exactly the same performance in this test. Consequently, the key considerations in choosing between these two types of barrier are not acoustic. They are the practicalities of fitting/removing, transportation, water retention and the way they look.




*The Echo H series design means that they are:-*

- half the weight and can be fitted two or three times faster (by one person), saving time and money on site
- do not retain water (so no mess and remain at a weight of 6kg…)
- are easier to transport and are designed to be doubled-up locally if necessary to increase the attenuation
- they are also very good looking. Unlike the other factors, however, that is a subjective judgment……

## Field Noise Attenuation Data

### *Noise Jargon*

- **Frequency Range;** Human hearing is c 20Hz to 20kHz. 100Hz (low frequency) is mains hum; 1kHz (1000Hz - mid/high frequency) is used as the time pips. Acoustic testing for attenuation and absorption usually covers the 63Hz to 4kHz range.
- **Loudspeaker - pink noise source**; A standard test sound that, in theory, has equal energy in each octave band. We played this through a large speaker.
- **Octave bands;** These are like graphic equalisers on hi-fi - they tell you how much noise there is in each standard frequency range.
- **"A" weighting - dB(A) v dB (or dBLin);** The "A" filter in sound level meters progressively attenuates low frequencies in a similar way to the ear. It is designed to tell you how damaging the sound would be to your hearing.

### *Factors affecting Real-World Barrier Performance*

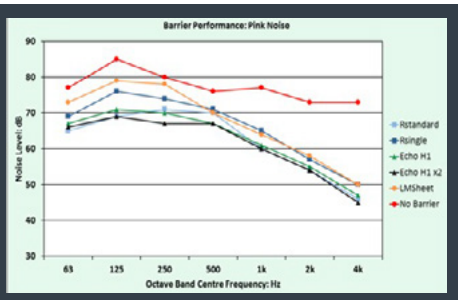
For this test geometry, there are 3 paths for the noise from the source to the receiver. Through the barrier material (governed by mass), through leaks (governed by gaps between panels and between the panels and the ground) and over the top of the screen. The transmitted sound is the total of the sound from all 3 paths. There is also a secondary effect due to reflections between the barriers - particularly at lower frequencies. The LMSheet and Rstandard barriers are low mass with no panel leaks - but ultimately have lower performance as too much sound passes through them.

The first plot shows the unweighted octave band noise levels with a dominant component in the 125Hz band. The performance of the barriers increases with frequency, due both to geometric factors and to the affect of mass (both reduce barrier attenuation at low frequencies). The second plot shows the same information, but with the data "A" weighted (the lower frequencies contributing progressively less to the overall level). In the latter case, the dominant component now is the 1kHz band. Once the barrier attenuation is taken into account, the dominant contributions to the overall level are now the 250Hz - 500Hz bands.

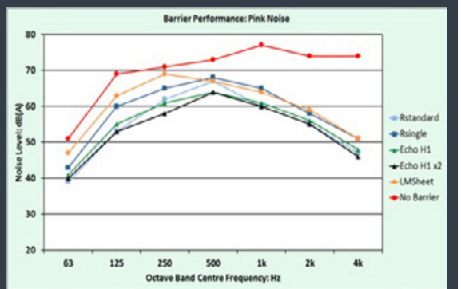
The third "A" weighted plot shows the performance of the best barrier for a predominantly high frequency noise source, a diamond drill. As all the sound is at higher frequencies, the barrier performs better, giving 19dB overall attenuation. Despite this type of source being ideal to demonstrate maximum barrier attenuation, you could quote "up to 31dB" from the lab data. This is 12dB higher than the field results - a factor of x16 in terms of noise energy! Clearly misleading…. Echo Barriers have been very carefully designed to provide a uniquely high level of performance in practice, on site. This has been achieved by designing for the perfect balance between mass, leakage paths and typical geometries. This explains how they can provide the same performance as barriers that are twice the weight.

***On site, this means low noise levels, a 70% or more reduction in fitting time plus easy transport, mechanical handling and storage plus no water retention.***

- *Attenuation at 10m - - unweighted noise levels*




- *Attenuation at 10m - - "A" weighted noise levels*




- *Attenuation at 10m - - "A" weighted noise levels - High frequency diamond drill noise source*