

Echo Barrier's guide to successful noise attenuation with portable acoustic barriers

Echo Barrier leads the world in combating noise pollution with its modular system of portable acoustic panels.

This introductory guide defines:

- Why Echo Barrier's portable acoustic panels are so effective in mitigating noise,
- Why they offer superior performance in diverse operating conditions, and
- How you can achieve best results with them, in terms of both noise attenuation and broader commercial and reputational benefits.

Echo Barrier is committed to combating noise pollution – and enhancing the sustainability of projects and businesses – through the practical application of innovative technology.

Decibels, noise attenuation and the human ear

Noise levels are measured in decibels (dB). Since the decibel is a logarithmic (non-linear) unit of measurement, noise attenuation of 'just' 3dB is equivalent to a substantial reduction in noise energy, i.e. 50% yet that reduction is only just perceptible to the human ear. If noise attenuation increases to 10dB, it equates to a reduction in noise energy of 90%; the human ear senses that as noise reduction of 50%.

The chart below places this in the context of the performance of Echo Barrier's H Series of acoustic panels. Taking this further, the chart makes clear why, in the field (on site), it becomes difficult to attenuate noise by more than 20dB.

Barrier Noise Attenuation Chart



Especially important is that noise reduction of 20dB equates to energy reduction of 99%, yet the remaining 1% of energy represents 25% of the noise level perceived by the human ear.

Decibel Reduction (dB)	Energy Reduction (%)	Noise reduction as perceived by the human ear
10	90	Sounds 50% as loud (Reduction of 50%)
20	99	Sounds 25% as loud (Reduction of 75%)
30	99.9	Sounds 12.5% as loud (Reduction of 87.5%)
40	99.99	Sounds 6.25% as loud (Reduction of 93.75%)

Key factors in successful noise attenuation

There are **FOUR** key factors that determine the noise attenuation achieved by a barrier of any kind:

1. Geometry

The position of the barrier in relation to the noise source.

2. Noise absorbtion

The degree to which the barrier absorbs sound, rather than simply reflecting it. When noise is reflected, it can reverberate, aggravating noise pollution.

3. Barrier mass

Greater mass offers greater noise attenuation (i.e. results in greater transmission loss), but for the sake of practicality, a barrier also needs to remain manageable in terms of its size and weight, especially if it is to be portable.

4. Barrier aesthetics

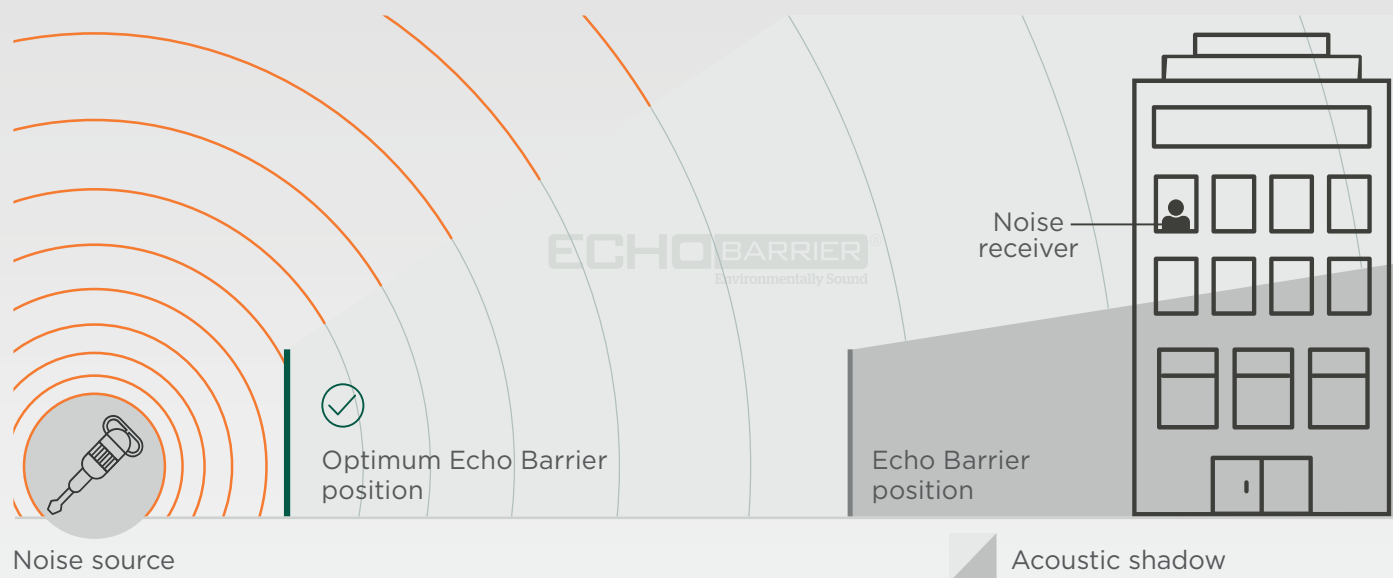
If barriers are manufactured to a high standard and present a professional image, the perceptions of their performance can be considerably enhanced.

More details on each of these factors follow.

1. Geometry

Optimum configuration and noise attenuation with Echo Barrier's modular system

Figure 1: Barrier geometry - the key to optimum noise attenuation



The geometry of noise attenuation concerns the relative positions of:

- i) any barrier,
- ii) the source of the noise it is intended to attenuate,
- iii) and the noise receiver (the human ear).

The closer the barrier is placed to the noise source, the greater the noise attenuation, since the barrier's 'acoustic shadow' becomes larger – just as an object's visual shadow becomes larger when placed closer to a light source. If a barrier is made taller, this also increases the size of the acoustic shadow and reduces the amount of sound that passes over the barrier.

High-frequency sound is more directional than lower frequency sound. This means that higher-frequency sounds encountering a barrier are easier to attenuate than low-frequency sound, which is more likely to diffract and 'leak' round the barrier.

For optimum attenuation of low-frequency sound, any barrier should be as tall as practically possible. Echo Barrier's modular system of acoustic panels can respond to this need, since the panels can be readily assembled to create an acoustic 'wall' or 'curtain'.

2. Noise absorption

Echo Barrier's patented technology means that sound is absorbed, not reflected

Essentially, there are three kinds of barriers that are used in efforts to manage noise:

- i) massive, heavy barriers made of hard materials such as wood, metal or glass;
- ii) basic 'sound blankets' and conventional acoustic barriers which make use of generic sound-absorbing materials such as fibreglass and Rockwool, and
- iii) Echo Barrier's high-tech acoustic panels, which are built around a lightweight composite which is highly sound-absorbent

The capacity of materials to absorb sound ranges from 0 (total reflection of sound) to 1 (100% absorption of sound, i.e. zero reflection). Hard materials such as wood, PVC, steel and glass in fact behave like acoustic mirrors, reflecting sound that strikes them and creating an echo. This means that a barrier made of hard materials can cause noise to be amplified rather than attenuated, the opposite of its intended effect. By contrast, the patented hi-tech composite that forms the heart of Echo Barrier's panels 'cushions' and absorbs the noise. In fact, at certain frequencies it absorbs 100% of sound.

The soft, sound-absorbent materials used in basic 'sound blankets' and conventional acoustic barriers, such as fibreglass and Rockwool, are hazardous to handle. Echo Barrier's innovative panels, however, contain no hazardous components, and are easy and safe to handle. Moreover, Echo Barrier's lightweight composite vastly outperforms conventional sound-absorbent materials when it comes to attenuating low-frequency sound.

Conventional materials such as fibreglass and Rockwool also soak up water, which can reduce their performance by 50%. Echo Barrier's innovative composite is protected (to BSEN60529:1992 IPX6 / IPX9) by a waterproof membrane, so that Echo Barrier panels can withstand wet weather conditions and be jet-washed safely, with no risk to their efficacy.

3. Barrier mass

Mass and weight: an effective, practical balance

Generally speaking, the mass of a barrier has a major impact on the transmission of sound: the heavier the material, the less it vibrates, and consequently less sound passes through it. In practice, more sound tends to pass over a barrier rather than through it, so it can be advantageous for a barrier to be taller rather than simply greater in mass.

For a portable noise barrier to be both effective at noise attenuation and physically manageable, it needs to strike the optimum balance between mass, weight and dimensions. Echo Barrier's modular system of compact panels has been specifically conceived with this optimum balance in mind.

At the heart of each panel is Echo Barrier's lightweight, but highly sound-absorbent composite. The panels have been designed for easy and rapid configuration in order to provide maximum noise attenuation across diverse site geometries. The various components of Echo Barrier's system can be positioned, combined and layered to provide the best possible response to the particular conditions and challenges of a project. To create an acoustic wall or curtain, they can be linked both vertically and laterally, or doubled up in thickness (which substantially increases noise attenuation).

Intelligent design

The absorption of low-frequency sound achieved by Echo Barrier's patented composite is comparable with the performance of conventional sound-absorbent materials that are more than twice as thick. As a result, Echo Barrier panels are much slimmer and lighter than conventional acoustic barriers - and they offer the same level of performance under both dry and wet conditions.

If barriers are to achieve optimum attenuation of noise, they must be particularly effective at absorbing frequencies in the 300Hz-800Hz range (low/medium frequencies). Higher frequencies, by comparison, are relatively easy to block. Any sound-absorbing barrier (including Echo Barrier's panels) needs to be a minimum of 25mm/1" thick to be effective. To absorb low frequencies (e.g. 250Hz), conventional sound-absorbing materials need to be 100mm/4" thick. As a consequence, basic sound-absorbent blankets can become excessively heavy and cumbersome if they are to be effective across the full range of sound. These problems do not occur with Echo Barrier's modular range of acoustic panels, which are lightweight in themselves and can easily be layered to provide extra thickness and sound attenuation.

Portability and reconfiguration

In the course of any project, the geometries between barriers, noise sources and noise receivers change frequently, sometimes constantly. As conditions change, so should your noise-attenuation measures if optimum results are to be achieved.

Massive hard barriers are not 'portable', since they are too heavy and cumbersome to be reconfigured or moved around in the course of a project. By contrast, Echo Barrier offers a modular system of portable acoustic panels which are not only effective at attenuating sound, but also quick and easy to deploy. They offer flexibility and favor constant optimization of performance as circumstances and needs change.

Independent tests have shown that, in the field, Echo Barrier's panels can provide no less than three times the attenuation at low frequencies that was recorded in Echo Barrier's own laboratory tests and subsequently published.

4. Barrier aesthetics

Looks really do matter

Echo Barrier's panels are hand-finished to ensure both outstanding durability and unrivalled quality of visual presentation.

Echo Barrier's products thus prove an asset when it comes to projecting a professional and responsible corporate image on site. The panels can be printed with brand logos and community care messages, enhancing brand awareness and communication.

Independent research has shown that the evident quality of Echo Barrier's products enhances perceptions of their already exceptional performance. Notably, the high-quality presentation of Echo Barrier's products led research respondents to perceive them as considerably more effective at attenuating sound than typical shabby-looking barriers. Positive perceptions of this kind reduce the likelihood of complaints from people in the vicinity of a site. Echo Barrier's panels, which can be jet-washed, maintain their appearance throughout their usable life, remaining a visual as well as a practical asset.

Ease of use, safety & environmental responsibility

Echo Barrier's innovative acoustic panels are designed for easy transportation and for quick installation and disassembly.

When compared with conventional acoustic barriers, an Echo Barrier system can be installed twice as quickly by half the number of staff. This creates obvious economies, and rapid deployment proves invaluable for quick-turnaround projects such as night-time rail maintenance and urgent road works. Echo Barrier offers a dedicated rapid installation kit for its lightweight panels, and the panels can be simply rolled up for easy storage and transportation.

In the course of a project, the panels can be readily reconfigured in response to changes in site geometry and requirements for noise attenuation. They can also be linked both vertically and laterally, and doubled up in thickness, to create an acoustic wall or curtain.

Health & Safety

Echo Barrier's panels are constructed with an innovative hi-tech composite that has been rigorously tested, both in the laboratory and in the field. They do not contain fibrous materials such as Rockwool and fibreglass (used in sound blankets and conventional acoustic barriers), which can prove hazardous, since they irritate skin and can cause dermatitis. Not only will blankets eventually tear or rip, releasing fibres, they can also harbor large quantities of dust, which can prove a respiratory hazard. Moreover, the slimness and light weight of Echo Barrier's panels make for easy and safe handling, and they are resilient and tough, so not prone to tearing or ripping.

Environmental responsibility

Echo Barrier is proud to say that its latest generation of acoustic panels incorporate a substantial proportion of recycled materials. All panels returned at the end of their lifecycle to Echo Barrier are either recycled or disposed of in accordance with strict guidance provided by the Carbon Footprint Association.

Echo Barrier vs other acoustic barriers

Checklist

Feature	Echo Barrier	Other Barrier	Reason
Acoustic performance			
Waterproof (to BSEN60529)	√		Waterlogging compromises performance by up to 50%
3kg/m ² or 5lb/yd ² > weight > 2.5kg/m ² or 4lb/yd ²	√		Optimum weight for most applications
Acoustic absorption > 80% (300Hz - 800Hz) 40mm	√		Achieve highest performance in the field
40mm or 1.5" > thickness > 25mm or 1"	√		Effective sound absorption - but slim
Rapid installation kit	√		Easy optimization of site geometry/Rapid deployment
Aesthetics	√		Considerably enhances perceptions of efficiency in noise mitigation
Panels can be doubled-up on site	√		Increase mitigation where needed
Performance: total marks from a possible 7	7		

Site practicalities & handling			
Rapid installation kit	√		Install 2x faster with 1/2 the personnel
Lightweight	√		Better/easier manual handling
No fiberglass/Rockwool	√		Not hazardous to skin
No water retention	√		Less weight/mess/mildew
No retention of dust i.e. non-porous	√		Avoid respiratory hazards - dust diseases
Roll-up design feature	√		Better/easier manual handling/storage/transportation
Scaffold curtain fit kit	√		Quicker installation with fewer personnel
Minimum 5-year life (durable and well made)	√		Value for money
Site: total marks from possible 8	8		

Site safety and security			
No fiberglass/Rockwool	√		Not hazardous to skin
No retention of dust i.e. non-porous	√		Avoid respiratory hazards - dust diseases
Fire-resistant	√		Reduced fire risk
Lightweight	√		Better/easier manual handling
Reflective strips	√		Night-time visibility
Anti-theft cable	√		Reduced potential for theft from site
Total safety marks from possible 6	6		

Aesthetics & corporate image			
High-quality materials and construction	√		Corporate image on site combined with durability
Colour options	√		Harmonize with corporate branding/environment
Printing of logos, messages, contact details...	√		Company branding, corporate image and marketing
Minimum 5-year life (durable and well made)	√		Site looks professional and well-run over project period
Aesthetics marks from possible 4	4		

Recycling			
Extensive use of recycled materials	√		Substantially reduced carbon footprint
Comprehensive recycling policy	√		Environmentally responsible
Recycling: marks from possible 2	2		

Purchase Costs - ROI			
Cost per barrier divided by typical lifespan	√		Industry norm is 6 months to 2 years. Projected life of Echo Barrier H4 range is 3-5 years outdoors, up to 10 years indoors
Total checklist marks from possible 28	28		