

The science of silence

SILENT WINDOWS®

BY HUGO CARTER



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INTRODUCTION

This brochure is for anyone wanting to learn more about 'the Science of Silence®'.

It's designed to show exactly how we journey our clients from a point where they are living with the damaging effects of noise pollution... to a place where they are experiencing all the benefits of tranquility.

As well as addressing some of the questions we most often face from our clients, we also look to 'lift the lid' and shed fresh light on two things. On the acoustic principles and wisdom that shape the foundations of all we do. And on our selected materials and bespoke process that enable us to build the most effective noise reduction windows of their kind.

Our aim here is to help you understand more fully how we are able to create the quietest spaces in the very noisiest places.

UNDERSTANDING NOISE, ITS IMPACTS AND HOW TO REDUCE IT.

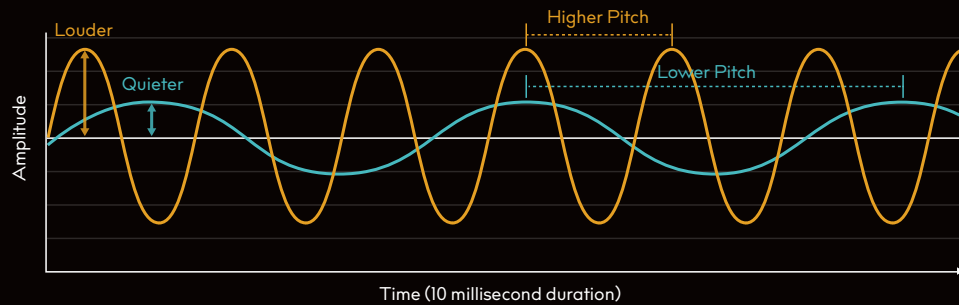
Q1 What is Noise?

Like any sound, noise travels as a vibration through a medium, such as air or water. Strictly speaking, it is only at the point where it reaches our senses that it becomes a sound or a noise.

So what is it exactly that determines whether we perceive that sound as a noise? That depends on a variety of factors: its loudness, its frequency or pitch, and – perhaps most critically – whether it's an unwanted or disturbing sound. We can now explore each of these factors a little more closely.

UNDERSTANDING WAVES AND FREQUENCIES

As noise travels as a sound wave, it always oscillates at a set frequency. The greater the energy of the sound or noise, the higher the frequency or pitch... and the shorter the wavelength.



LOW PITCH WAVEFORM OF A BASS GUITAR vs HIGH PITCH WAVEFORM OF A WHISTLE

When we talk about the 'frequency' of a sound or noise, we mean the frequency of oscillations in the wave motion. When one oscillation occurs per second, the frequency is 1 Hz.

ACOUSTIC NOISE: FOR OUR EARS ONLY

Certain frequencies are not for our ears – because they're either too high (ultrasound) or too low (infrasound) to be audible. And it is very much the frequencies we can hear – or 'acoustic noise*' – that we're concerned with here. A healthy young person can typically hear all sound frequencies from approximately 20 to 20,000 Hertz.

As you will see, it is only by knowing the exact frequency of a noise that we can design a solution to mitigate its impact.

**The word 'acoustic' comes from the Greek word 'akoustikos' meaning 'for hearing'.*

UNDERSTANDING LOUDNESS & DECIBELS

So how do we measure loudness? We do that with decibels.

Ranging from 0 to 150 dB, it is very much a 'human' scale, in terms of where it starts and ends. A sound pressure level of 0 dB represents the threshold of hearing in the most sensitive frequency range of a young, healthy ear... while the thresholds of tickling or painful sensations in the ear occur at about 120 to 130 dB.

It's important to note that it's a logarithmic scale – not an arithmetic one. So an increase of 10 dB means ten times as much sound.

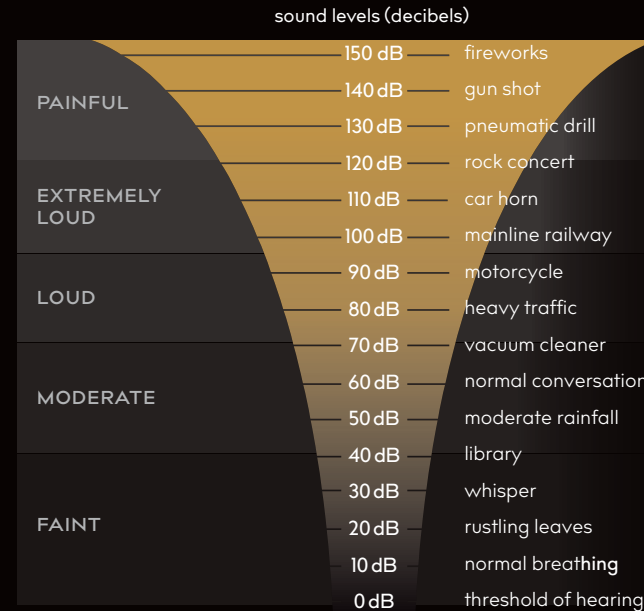
(For a decibel chart, see overleaf.)

DID YOU KNOW the decibel system was originally created in 1924 to measure the transmission efficiency of telephone facilities by Bell Telephone Laboratories, and is named after its founder, Alexander Graham Bell.

Q2 What are the impacts of noise?

So how exactly are we affected by noise?

Decibels can certainly help us know the extreme levels of loudness to protect against.



At 120 dB the ear registers pain, but hearing damage actually begins at a much lower level, at about 80 or 90 dB – which is typically the SPL (sound pressure level) of heavy traffic, a noisy restaurant or a power lawn mower. Long or repeated exposure to sounds above this level can cause noise-induced hearing loss.

It's important to realise that two sounds with exactly the same loudness can have two very different impacts upon us.

WHY DECIBELS ONLY TELL HALF THE STORY

Most people wouldn't be bothered by the sound of a 21-gun salute on a special occasion. On the other hand, the thump-thump of a neighbour's music at 2 a.m., even if barely audible, could be a major source of stress.

Similarly a reading of 60 dB could mean one of two things. Either the sound of a normal conversation, or the noise of a plane flying overhead. According to the World Health Organisation, those living with noise pollution of over 55 dB (which applies to 1.6 million Londoners) are likely to suffer health problems.

At night, if you're constantly subjected to just 45 dB of unwanted noise, you may struggle to sleep. And that can lead to all kinds of health issues, such as cardiovascular disease and an increased risk of stroke and greater levels of stress.

MISSING: THE HEALING BENEFITS OF TRANQUILITY

One of the greatest and most negative impacts of noise is what it denies us.

By direct contrast with noise, silence and tranquility have the power to heal... and to enable us to become less stressed, more focused and more creative.

Research has found that silence can release tension in the brain and body. When we distance ourselves from the sonic disruptions that keep us on the shallow surfaces of the mind, our brains have the opportunity they need to restore themselves.

By being better able to tap into our inner stream of thoughts, memories and ideas, we raise our prospects of living more creative, meaningful and fulfilling lives.

DID YOU KNOW that the quietest known place on earth is an anechoic chamber, where it is possible to record a negative level of decibels. Anechoic chambers were first created by NASA to prepare astronauts for the silence of space.

By having all our designers and engineers trained by experts from the Institute of Acoustics, we can draw on the latest wisdom about the 'science of silence' to achieve new levels of noise reduction.

Q3 How do we reduce noise?

The heavy rumble of traffic is never going to obediently cease on request. If only it were that easy.

The fact is, with most noise pollution, instead of quietening the actual source of the noise, we need to find the very best ways to reduce its impact... and lessen the energy of its vibrations.

And if we are to design a powerful and suitably tailored solution, it's vital that we understand and measure different aspects of that noise.

UNDERSTANDING RESONANCE

To protect ourselves from any noise, we need to know its exact frequency. This is because of something called 'resonance' – a principle integral to noise reduction.

Any structure that has the same frequency as a noise will amplify it. That includes a glass pane of the wrong thickness which – instead of dampening and reducing a noise – may actually have the opposite effect.

That is why every one of our windows is made-to-measure. Not just to fit the physical space, but also to 'fit' the acoustic profile of the noise.

DID YOU KNOW that if you were to place two identical tuning forks next to each other, and strike just one of them, BOTH would resonate. This is one of the most common demonstrations of the theory of resonance.

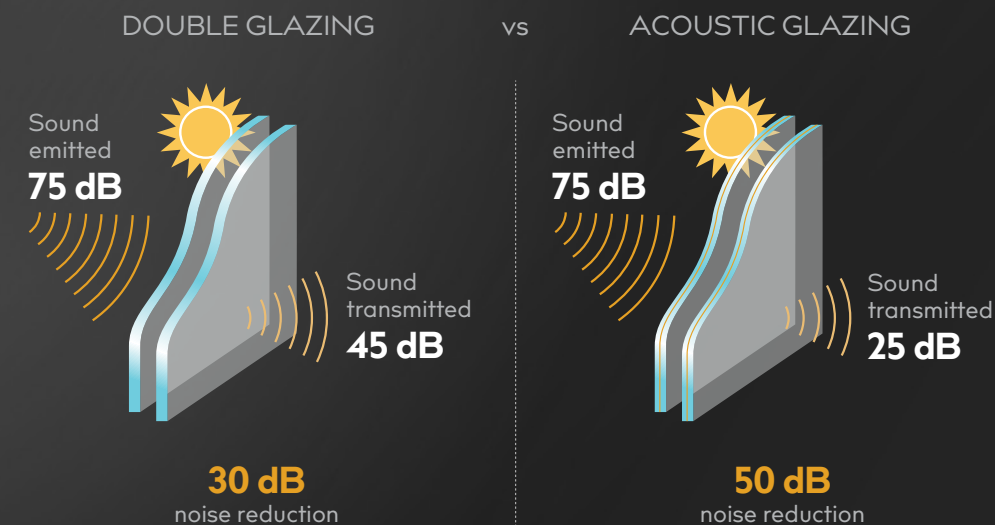
THE MYTH OF DOUBLE GLAZING vs THE IMPACT OF ACOUSTIC GLAZING

Many people mistakenly assume that double glazing is the height of their noise reduction options... only to discover how it can prove woefully inadequate.

Let's take the example of a very busy street which will typically register 75 decibels – and see exactly how double glazing and acoustic glazing compare.

If that noise level is reduced by 30 dB, the resulting sound level of 45 dB is still likely to cause sleepless nights – proven to have devastating health impacts.

By contrast, when an acoustic glazing solution reduces the noise by 50 dB, the sound ultimately transmitted is no more than 25 dB – the equivalent of a soft whisper.



THE SOLUTION

We knew that what was needed was a comprehensive, end-to-end, holistic solution and system. And we knew too there was a need to understand more deeply 'the science of silence'. That is why every one of our designers and engineers has been trained by experts from the Institute of Acoustics.

And because we never outsource, it means there is a genuinely 'seamless' continuity to that expertise – as we journey our clients from noise to silence through the three key stages of measuring, designing and installing.

The initial survey

At the outset of any project, it's vital for us to acquire an in-depth picture of the specific 'acoustic signature' of the noise source and how it effects each room within a property – in tandem with understanding the practical and aesthetic priorities.

Our engineers have been trained at Southampton Solent University in room acoustics, noise analysis and noise mitigation techniques and they use the very latest acoustic analysing equipment, such as NTI Audio XL 2.

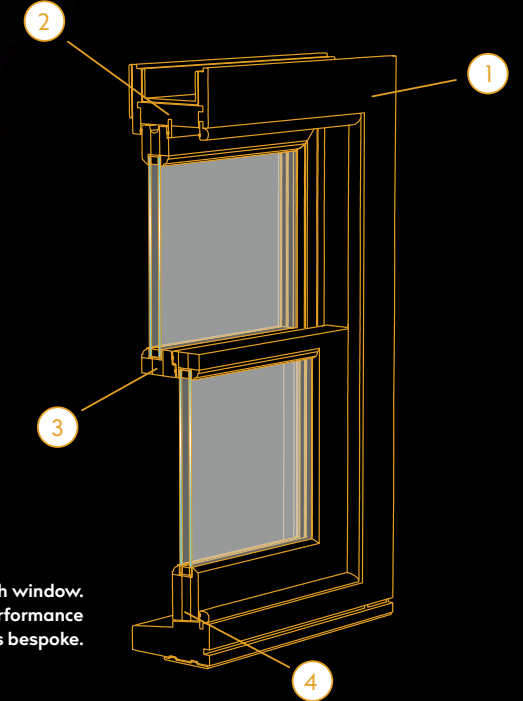
By knowing the type of noise, the loudness of the noise and also the frequency curve, we enable our manufacturing team to choose the exact type and thickness of glazing units to dampen the specific noise frequency.

We actually offer different products for different noise profiles. In this way, every window we create is completely bespoke. Aesthetically and acoustically.



2 The materials and design

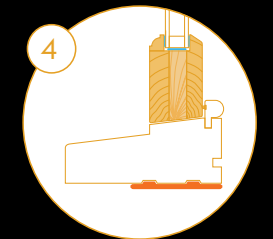
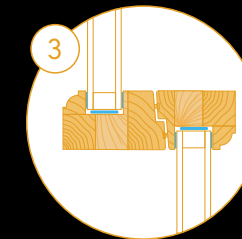
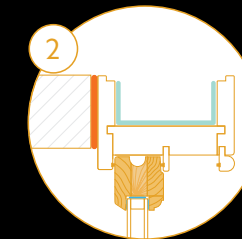
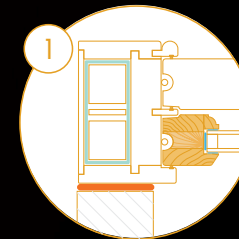
While the design process is always bespoke, every single Silent Window is created with the very finest acoustic materials. Each component of the window – and each stage of our process – is designed to optimise our capacity to dampen, distort and disperse the noise. This results in a dramatic reduction of decibels. Below we outline some of the key components that make up our state-of-the-art noise reduction system.



NB: This specific cross-section is for a sash window. We also design and install casement and high performance windows. All our windows and doors are always bespoke.

DESIGNED TO DISTURB. Using high quality engineered timber, our designs are resistant to movement across the grain and swelling. This layered design further disturbs and dampens the sound wave.

PLUGGING THE GAPS. Your noise reduction is only as good as its weakest point. Our unique installation method employs specialist mastics, sound blocks and 'low-expanding' acoustic installation foams. Together these help ensure a lifetime of noise reduction.



SILENCING AN AMPLIFIER. In traditional sash windows, the sash box can act as an amplifier. By increasing the thickness of the timber profiles inside this box, we can prevent unwanted noise penetrating through the frame.

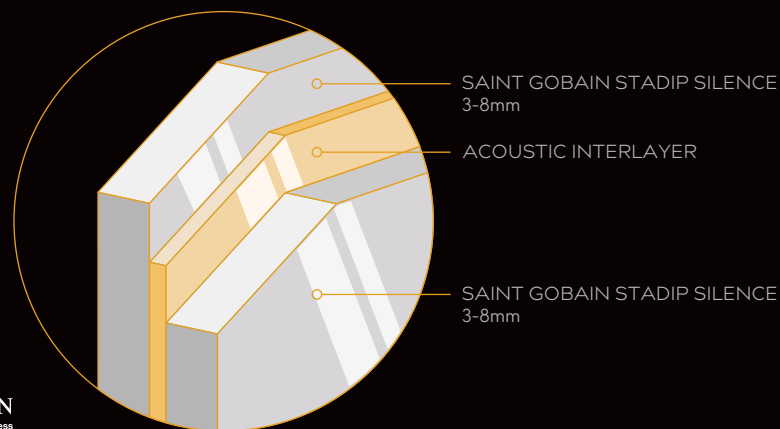
LOW VIBRATIONS. Micro rubber spacers and flexible silicone are incorporated into the fitting space, dampening the vibration of the sound wave and preventing it from being transferred from the glass to the frames.

ENGINEERED TIMBER : THE PERFECT SUPPRESSOR

In constructing our windows, we will never use 'hollow' materials, such as aluminium and UPVC, that 'leak' noise. By contrast, the natural density of our high quality engineered timber makes it the perfect noise suppressor. Exceptionally strong and durable, it is also a powerful insulator, as it comes from slow-growing tree varieties. This is thanks to its thousands of tiny air chambers per cubic inch which hold in the heat.

GLASS: THE WISDOM OF THICKNESS

We only use glass from the world's most renowned manufacturers – such as Pilkington and Saint Gobain. To dampen the noise and break the flow of the 'noise waves', we use two panes of glass of different thickness. (NB: The exact measurements depend on both the product and the level of noise reduction required.) Each sheet of glass is laminated with a specialist acoustic film (PVB), which helps absorb vibrations and further dampen the noise.



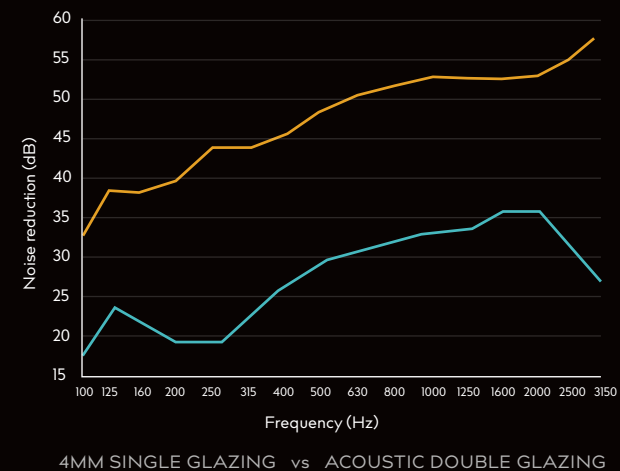
3 The installation

Your noise reduction is only as good as its weakest point.

To put it another way, there is little point investing in windows designed to achieve a high level of noise reduction, unless the process of fitting them is done to the same high standard.

That is why we have designed, with the help of chartered noise engineers, a unique installation method to complement our products. We use advanced 'low-expanding' acoustic foams – far more flexible than the norm – in tandem with specialist acoustic mastics and sound blocks. These are the same materials used in recording studios.

Overseen by an internal project manager, our expert installation teams adhere strictly to our unique process – and are trained to ensure a 'tight fit' with no gaps. Unlike window fitters who are paid according to the time taken to complete an installation, our own in-house team is committed to ensuring a lifetime of outstanding noise reduction.



MAKING THE DIFFERENCE VISIBLE WITH A FREQUENCY CURVE

This 'before and after' graph clearly shows the difference that Silent Windows can make to a property. Unlike a standard 4mm single glazing window (which reveals a dramatic dip in its capacity to keep out noise at certain frequencies), our high performance acoustic windows have no such 'weak point' – and can reduce the decibels by up to 51 decibels.

4 The unexpected benefits of Silent Windows

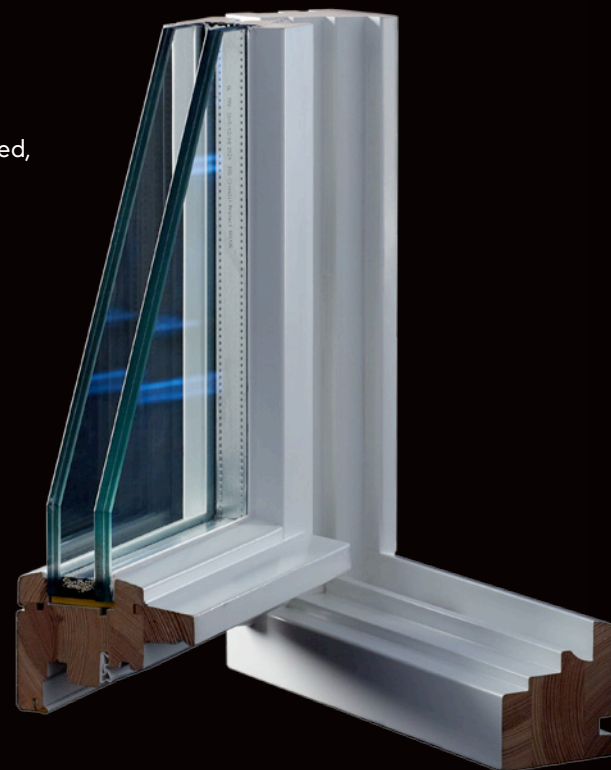
Not only does this system provide you with the best noise reduction available. There are also many advantages that can be expected, following the installation of Silent Windows.

Improved Security. Given the inherent strength of our windows – made from the finest timber and acoustic glass – and also the lengths to which they are reinforced, they naturally improve the security of any property.

Thermal Advantages. Soundproof windows are airtight windows, making them incredibly effective for thermal insulation, keeping any property warm, draught-free and cutting down on heating bills.

Profitability. Whether it's a case of optimising the value of a property, or transforming the fortunes of a five-star hotel, an investment in Silent Windows is typically one that pays off handsomely.

We also know that there are significant lasting benefits that can be harder to measure. By eliminating or substantially reducing noise, we know the dramatic difference that Silent Windows can make to living environments, and also to lives.



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WHY CHOOSE US?

- 1 Because we offer the most advanced noise reduction windows,** created with the help of experts from the Institute of Acoustics.
- 2 Because we employ engineers, not sales people,** trained by experts at Southampton Solent University in room acoustics, noise analysis and noise mitigation techniques.
- 3 Because we carry out a detailed noise analysis** to determine the type of noise and its loudness, and to create a bespoke glazing solution that is absolutely right for you.
- 4 Because of our unique installation method,** designed – with the help of chartered noise engineers – to optimise the impact of our products.
- 5 Because we can vouch for every member of our installation team.** Certified by the Glass Qualifications Authority, they are always overseen by one of our Project Managers.
- 6 Because we have satisfied customers from Margate to Dublin,** and testimonials and reviews that vouch for our world-class results and service.
- 7 Because long-term relationships matter to us.** We retain customers from when we first started trading, and offer an after-care service, guaranteed repairs and annual maintenance.
- 8 Because of who we are.** We are a timber window manufacturer, and a FENSA-registered window installer and are fully accountable for what we do.
- 9 Because of who we are not.** We will never outsource to an unsupervised contractor who might cut corners and compromise our standards and the quality of your solution.
- 10 Because all we do is underpinned by a single ethos:** to transform lives by transforming living environments. To this end, we've pioneered the solutions and systems to achieve new levels of noise reduction.

Please visit:
www.silentwindows.co.uk/about-us
to learn more reasons why to choose us.

SILENT WINDOWS®

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