

Sound 101

How, what, when, where, why.

HEARING

The human ear is magnificent. Hearing is one of the first senses that we develop—long before birth—and one of the last to leave us before we expire. Hearing and sound affect virtually every facet of our lives.

WHAT IS SOUND

Sound is best defined a form of energy or otherwise known as physics. Unlike light or magnetic energy, sound requires a medium such as air or water to exist.

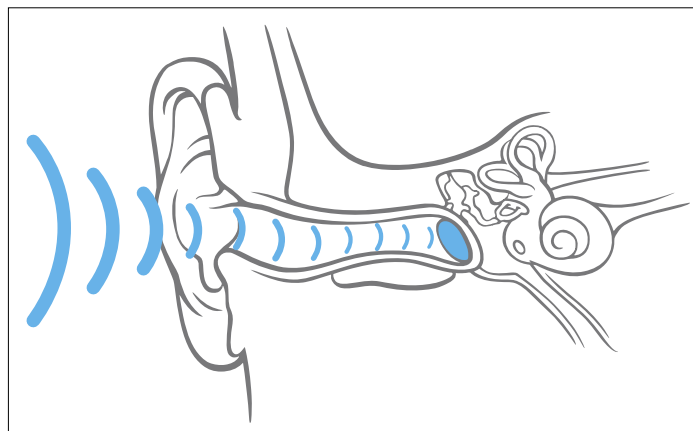
SOUND IS A WAVE

Small periodic changes in pressure reach our ears, resulting in audible sound. These sound waves radiate from all kinds of sound sources.

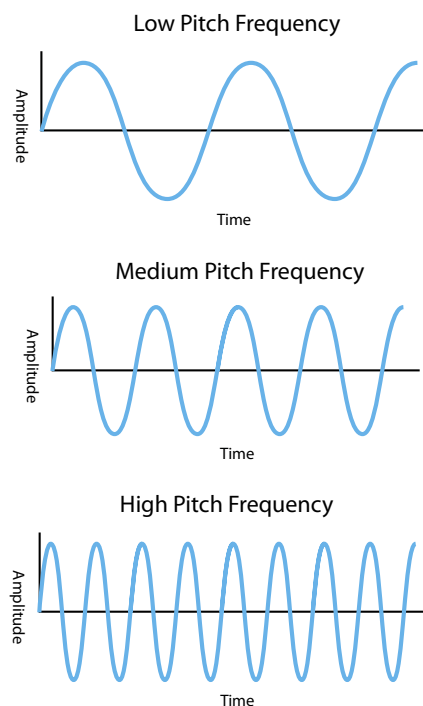
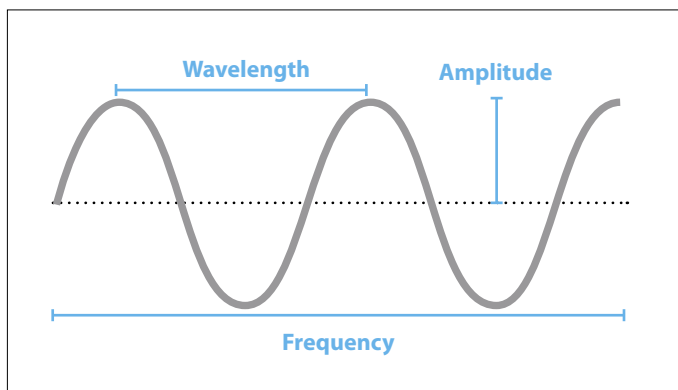
Sound waves have some essential characteristics that determine how they sound to us when they reach our ears. Storage boxes can come in different shapes, sizes, and colors that make them useful for organizing and storing. In a similar way, sound waves come in different frequencies (pitch), wavelengths (speed), and amplitudes (volume). Each characteristic changes how we perceive the sound we hear.

FREQUENCY & WAVELENGTH

If you are swimming in the ocean there is a big difference between the peaks of the waves when you are out in the open ocean versus when you are near the shore. Near the shore the wavelengths get smaller, causing you to float up and down faster. Sound waves behave similarly. When the wavelength of sound is shorter, the number of oscillations that occurs every second increases.



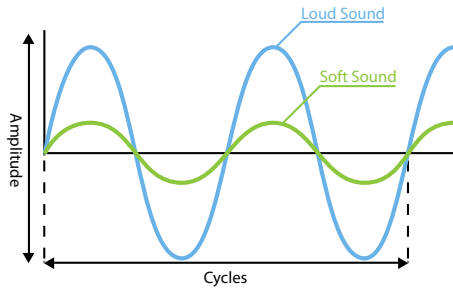
Frequency, measured in **Hertz (Hz)**, is the number of complete waves or oscillations at a point in time. Frequency is more commonly referred to as pitch. A high-speed dental drill has a higher frequency (shorter wavelength) than the passing of a dump truck down the street (longer wavelength). The audible range of frequencies for an average human is 20 Hz to 20,000 Hz.





AMPLITUDE

The amplitude of a sound wave is closely related to how loud we perceive the sound to be. What makes loudness both complicated and amazing is that we perceive sound waves at different loudness levels for each frequency in the audible range. What's even more amazing is that most humans' ears are capable of hearing such an incredible dynamic range of loudness levels that both the faint movement of a mouse and the screaming rockets of a jet engine are well within our ability to hear.



Although not directly related to loudness, sound is typically measured as a **sound pressure level (SPL)** in **decibels (dB)**. The general range of human hearing is from 0 to 120 dB. The sound of a quiet library is roughly 30 dB, while 120 dB is the threshold where the ears begin to feel pain because the sound is so loud.

THE DECIBEL IS NOT LINEAR

Something important to remember about the decibel is that it is a non-linear (where $2\text{ dB} + 2\text{ dB}$ is NOT equal to 4 dB) unit of measurement.



Building materials such as QuietRock® ES can drastically affect the decibel level of sound that we hear through building partitions. The proper application of QuietRock®, for example, can help you lower the volume of your neighbors' loud argument to a faint muffle.