

Units Describing Human Noise Load

Sound Characteristics

Sound may be defined as pressure variation (wave) in dense environment caused by vibration of material. This environment is usually the air; however sound propagates also in other material. The waves are alternate rings of compressed air and then rarefied air moving away from a central source at a constant speed in all directions. As each wave, first a compression then a rarefaction, encounters an object it exerts a force, push then pull, on the object (This is why glass can be broken by sound waves)

As the pressure changes become greater the sound becomes more intensive. The frequency of sound corresponds to how often these changes follow each other. Thus the sound is characterized by 2 quantities: acoustic pressure indicated in Pascal's, Pa(N/m²) and frequency in Hz(s⁻¹)

Intensity

Because energy or intensity of sound is proportional to the square of acoustic pressure (p^2), it would be correct to express, measure and evaluate the intensity of sound in these units. Despite this, these units are not used in current measuring because human ear is so sensitive that it can distinguish changes in values p^2 in the extend of about 13 orders of magnitude and operating with such a broad spans of figures would not be feasible. Therefore the quantity called level L (dB) is used. The Level, is a non-dimensional quantity given by a logarithmic relation of the measured and reference quantities; its unit is a bel or a decibel for a tenfold multiple.

- The range of usual level values of acoustic pressure is 0-140dB;
- The zero on the decibel scale is based on the lowest sound level that the healthy human ear can detect;
- Sound levels in dB are calculated on a logarithmic basis. The human ear also works logarithmically;
- An increase in 10 dB represents a 10-fold increase in acoustic energy, while 20dB represent a 100-fold increase (10x10) and an increase of 30dB represents a 1 000-fold increase in acoustic energy (10x10x10).

Frequency (f)

- Is the number of cycles that a periodic signal completes in one second;
- The unit of frequency is Hertz (Hz);
- Frequencies vary from 16-20 000Hz;
- <16Hz is called infrasound; >20kHz is called ultrasound.

Sound	Level (dB)
Threshold of hearing	0
Whisper	30
Hum of refrigerator	40-50
Normal speech	50-60
Busy car traffic	70
Rock concert	120
Threshold of pain	130
Jet taking off	140

Links

Related Articles

- Noise
- Adverse Noise Effects

Bibliography

- BENCKO, Vladimir, et al. *Hygiene and Epidemiology : Selected Chapters*. 2nd edition. Prague. 2008. ISBN 80-246-0793-X.

References