

Decibel *reference.*

Common sound levels from **silence to shockwave** — with NIOSH-recommended maximum daily exposure times. The dB scale is logarithmic, so the difference between 80 and 90 dB matters far more than the numbers suggest.

The chart

LEVEL	SOURCE	NIOSH MAX SAFE EXPOSURE
0 dB	Threshold of human hearing (young, healthy ear)	–
10 dB	Anechoic chamber, calm breathing	–
20 dB	Rustling leaves, watch ticking	–
30 dB	Whisper at 1 m, quiet rural area	–
40 dB	Library, residential nighttime	–
50 dB	Light traffic at distance, moderate rainfall	–
60 dB	Normal conversation at 1 m, dishwasher	–
65 dB	Air conditioner at 100 ft, normal office	–
70 dB	Vacuum cleaner, heavy traffic, alarm clock	–
75 dB	Garbage disposal, freight train at 50 ft	Safe (indefinite)
80 dB	Heavy traffic at 5 m, garbage truck, alarm	Safe (indefinite)

LEVEL	SOURCE	NIOSH MAX SAFE EXPOSURE
85 dB	City traffic, electric razor, blow dryer	8 hours max
90 dB	Lawnmower, motorcycle at 7.5 m, food blender	2 hours max
95 dB	Power tools, motorcycle, hand drill	47 minutes max
100 dB	Chainsaw, hand-held grinder, factory floor	15 minutes max
105 dB	Personal music player at max volume, helicopter	5 minutes max
110 dB	Rock concert at front row, leaf blower	1.5 minutes max
115 dB	Loud sporting event, ambulance siren	28 seconds max
120 dB	Threshold of pain, jet plane takeoff (200 ft)	9 seconds max
125 dB	Aircraft carrier deck, pneumatic riveter	3 seconds max
130 dB	Jackhammer at 1 m	Hearing damage immediate
140 dB	Jet engine at 30 m, .22 rifle at ear	Permanent damage instant
150 dB	Shotgun blast at ear, fireworks at 1 m	Permanent damage instant
165 dB	.357 Magnum at ear	Permanent damage instant
180 dB	Saturn V rocket launch at 100 m	Immediate eardrum rupture
194 dB	Theoretical maximum dB in Earth's atmosphere	Beyond this, sound becomes shockwave

About the exposure limits. NIOSH recommends a maximum daily noise dose using a 3 dB exchange rate — that means every 3 dB doubles the noise dose. 8 hours at 85 dB equals 4 hours at 88 dB equals 2 hours at 91 dB. OSHA's regulatory limit uses a 5 dB exchange rate (less strict), but NIOSH's 3 dB matches the physics of sound energy and is what audiologists recommend.

Common applications

WHEN YOU'D WANT A MEASUREMENT	TYPICAL CONCERN THRESHOLD
Residential noise complaints	55 dB daytime / 45 dB nighttime (varies by city)
Office noise (productivity)	55 dB ambient, 65 dB peak
School classroom (acoustics)	35 dB background, 60 dB max
Hospital ICU (sleep / recovery)	40 dB nighttime / 45 dB daytime (WHO recommendation)
Industrial workplace (hearing protection required)	85 dB time-weighted average
Construction site boundary	75–85 dB depending on jurisdiction
Concert / venue (audience safety)	100 dB sustained / 115 dB peak
Headphone listening (CDC recommendation)	85 dB max for 8 hours; below 60% volume usually safe

Common pitfalls

- **The dB scale is logarithmic.** 70 dB isn't 'twice as loud' as 35 dB — it's about 11 times louder (in perceived loudness) and 32,000 times more intense (in sound pressure energy). Every 10 dB is roughly a doubling in perceived loudness.
- **The 3 dB doubling rule.** Every 3 dB doubles the sound energy. Two identical noise sources produce 3 dB more than one source alone (not 6 dB).
- **dB without context is meaningless.** The numbers above are dB SPL (Sound Pressure Level), measured at a specified distance. 'dB' alone can refer to many different scales — electrical (dBm, dBV), radio (dBi),

acoustic (dB SPL, dBA, dBC). Always check the reference.

- **A-weighting (dBA) is the standard for human hearing.** Raw dB SPL doesn't account for the ear's frequency sensitivity. dBA applies a filter that approximates the ear's response. Almost all consumer and occupational measurements are dBA. Industrial machinery specs are sometimes dBC (flatter, used for impulse noise).
- **Distance matters.** Sound pressure drops 6 dB per doubling of distance from a point source. A 100 dB chainsaw at 1 m is 94 dB at 2 m, 88 dB at 4 m, 82 dB at 8 m. Half the distance, 6 dB more.
- **Hearing damage is cumulative and permanent.** Inner ear hair cells don't regenerate. A few minutes at 115 dB causes the same permanent damage as 8 hours at 85 dB. There's no recovery — only prevention.

Common questions

How loud is 'too loud' for hearing damage?

Sustained exposure above 85 dBA causes gradual hearing loss; OSHA mandates hearing protection at 85 dBA for 8-hour shifts. Above 120 dB causes immediate pain; above 140 dB causes physical damage even from brief exposure. As a quick check: if you have to shout to be heard from 3 feet away, you're in damage territory.

Why does +3 dB mean 'twice the power'?

Decibels are logarithmic: 10 dB = 10× power ratio, 3 dB \approx 2× (since $10^{0.3} \approx 2$). The same +3 dB means doubling regardless of starting level — 50 dB to 53 dB is the same doubling as 100 dB to 103 dB. For perceived loudness, +10 dB sounds 'about twice as loud' to humans.

What's the difference between dB, dBA, and dBC?

dB is a raw ratio with no weighting. dBA applies an A-weighting curve that approximates human hearing sensitivity (we're less sensitive to very low and very high frequencies). dBC weighs more uniformly across frequency — used for peak measurements. For workplace and traffic noise, dBA is standard; for explosive impulses, dBC.

How does noise add when you combine two sources?

Two equal sound sources add to only +3 dB louder, not double. A 60 dB conversation plus a 60 dB conversation = 63 dB. Adding a much-quieter source has negligible effect: $60 \text{ dB} + 50 \text{ dB} \approx 60.4 \text{ dB}$. This is why subtle background noise is hard to remove — quieter sources contribute little to the total.

Why can't I hear over a 90 dB fan in my computer?

First, 90 dB at fan distance is loud — about a power tool. More likely it's the spectrum: computer fans produce a broadband noise that masks speech frequencies. Even a 60 dB fan with energy concentrated in 200-4000 Hz (the speech range) is harder to talk over than 70 dB white noise. Frequency content matters as much as raw level.

Sources

- **Exposure limits:** NIOSH Publication No. 98-126 — Criteria for a Recommended Standard: Occupational Noise Exposure (1998).
- **Regulatory limits (US):** OSHA 29 CFR 1910.95 (uses 5 dB exchange rate, 90 dB action level).
- **Hospital recommendations:** WHO Guidelines for Community Noise (1999).

- **dB scale and physics:** ANSI S1.1 / ISO 80000-8 — Acoustic units and measurement standards.

Disclaimer. Decibel measurements depend heavily on distance, environment, and measurement technique. The values shown are approximate for the source at typical exposure distance. For workplace safety, use a calibrated sound level meter and follow NIOSH or local regulatory guidance.