

By Dr. Derek Conte

I have designed and built audio speakers as a hobby for 30 years. My designs have been publicly displayed in art galleries around the country and in science magazines. I am well acquainted with the subject of sound reproduction and sound pressure levels. So as a chiropractic student 25 years ago I went with relish into the anatomy and function of the human ear.

I was inspired to write this article because of an ad for retrofit motorcycle horns which really grabbed my attention. The horn is rated at 150 decibels on the loudness scale. I think giving motorcycles a louder horn will protect motorcyclists from many serious injuries and save lives by their being able to project audible warning sounds a further distance. But 150 decibels? That is ten times louder than the front row of a rock concert!

Even with judicious use, sound pressure levels like these are capable of producing strong vibrations in the chest and a "startle reflex". Even train horns aren't this loud anymore. The US Department of Transportation/Federal Railroad Administration states: "The maximum volume level for the train horn is 110 decibels which is a new requirement. The minimum sound level remains 96 decibels."

Sound pressure levels are measured in 'decibels' (dB). Decibels are gauged on a logarithmic scale. For every 3dB increase, sound pressure doubles over the reference point. For every 10dB increase over the reference point, sound pressure is 10X greater. A 20dB increase is 100X greater, a 30dB increase is 1,000X greater and a 40dB increase is 10,000X greater than the reference sound pressure level. Distance obviously affects perceived loudness. Loudness doubles as you get twice as close or drops off by half as the distance from the source doubles.

A 'whisper' has a detectible level of 20dB. A library? 30dB. Conversational speech? 60dB. A motorcycle engine? 105dB. The average car horn is about 100-110dB... very loud, as we all know. Point of pain? 115dB and up. Shotgun blasts? 120dB. A Rocket ship? 200dB. Eardrums burst at 160dB.

An important thing to understand is that even moderately high sound levels that are not painful and tolerable for long periods can still do permanent damage to human hearing (ask a machinist, musician or a factory worker), just as very brief, extremely high sound levels can destroy hearing in an instant, as in the case of an explosion or close gunshot. It is vital to take the protection of our delicate hearing apparatus very seriously because when hearing damage occurs it is irreversible.

For your reference I have included a scale of common decibel levels below:

<https://boomspeaker.com/wp-content/uploads/2018/04/noise-level-examples-chart.png>

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dB Level	Examples	Permitted Exposure (Hours per Day)
10	Breathing	
20	Whisper	
30	Library	
50	Quiet Office	
60	Conversational Speech, Electric shaver	
65	Piano Practice	
70	Noisy Restaurant	
75	Alarm Clock	
80	Vacuum Cleaner	
85	Garbage Disposal / Busy Hotel Lobby	
90	Tractor / Subway	8
100	Blender, Factory Noise	2
105	Motorcycle, Orchestra	1
110	Power Saw, Heavy Truck, Power Mower	0.5
115	Uncomfortable Feeling Starts	0.25
120	Disco / Loud Bar Music / Shotgun	0
130	Cymbal Crash, Air Raid Siren	0
140	Rock Concert Front Row / Jet	0
150	Chest begins to vibrate	0
160	Eardrum bursts	0
190	Loudest Possible Sound	0