

SOUND LEVELS - WARNING LEVEL INTERFERENCE CHALLENGES

ALL VEHICLES SHOULD HAVE A WARNING PANEL WITH MULTIPLE WARNING LEVELS SPECIFICALLY TO WARN THE DRIVER PRIOR TO ENTERING THE VEHICLE. PER NFPA 52 2010, SAE J2343-2009 AND THE CAL HIGHWAY PATROL TITLE 13 WITH SAFETY EXEMPTION.

| Decibel Level | Sound Level | Real-World Equivalents |
|---------------|-------------------|---|
| 0 | VERY FAINT | Threshold of Hearing |
| 10 | | |
| 20 | | Rustle of leaves, whispering |
| 30 | FAINT | Country dwelling (indoors) |
| 40 | | City dwelling (indoors) |
| 50 | MODERATE | Quiet auto at low speed |
| 60 | | Ordinary conversation at 3 feet, office interior |
| 70 | LOUD | Department store interior |
| 80 | | Busy street |
| 90 | VERY LOUD | Motorcycle at 25 feet, stereo music |
| 100 | | DC-10 at 300 feet on approach, industrial noise |
| 110 | DEAFENING | Rock band |
| 120 | | Turbo-fan aircraft takeoff at 200 feet, pneumatic drill |
| 130 | | Military jet takeoff at 50 feet |
| 140 | | Threshold of pain |

COMPARISON OF SOUND PRESSURES AND LEVELS

| <u>Outdoor Sound Levels</u> | <u>Sound Pressure</u> <u>(μPa)</u> | <u>Sound Level</u> <u>(dBA)</u> | <u>Indoor Sound Levels</u> |
|------------------------------|--|------------------------------------|---------------------------------|
| | 6,324,555 | 110 | Rock Band at 5m |
| Jet Over-Flight at 300m | | 105 | |
| | 2,000,000 | 100 | Inside NY Subway Train |
| Gas Lawn Mower at 1m | | 95 | |
| | 632,456 | 90 | Food Blender at 1m |
| Diesel Truck at 15m | | 85 | |
| Noisy Urban Area (daytime) | 200,000 | 80 | Garbage Disposal at 1m |
| | | 75 | Shouting at 1m |
| Gas Lawn Mower at 30m | 63,246 | 70 | Vacuum Cleaner at 3m |
| Suburban Commercial Area | | 65 | Normal Speech at 1m |
| | 20,000 | 60 | |
| Quiet Urban Area (daytime) | | 55 | Quiet Conversation at 1m |
| | 6,325 | 50 | Dishwasher in Adjacent Room |
| Quiet Urban Area (nighttime) | | 45 | |
| | 2,000 | 40 | Empty Theater or Library |
| Quiet Suburb (nighttime) | | 35 | |
| | 632 | 30 | Quiet Bedroom at Night |
| Quiet Rural Area (nighttime) | | 25 | Empty Concert Hall |
| Rustling Leaves | 200 | 20 | |
| | | 15 | Broadcast and Recording Studios |
| | 63 | 10 | |
| | | 5 | |
| Reference Pressure Level | 20 | 0 | Threshold of Hearing |

Notes: μ Pa - MicroPascals describe pressure levels (force per unit area).
dBA - A-weighted decibels describe pressure logarithmically with respect to 20 μ Pa (reference pressure level).

Sound level comparison: Here are the real-world equivalents of various decibel levels.

Note: The following chart is based on a Wisconsin State Journal article which included noise level analysis prepared as part of an environmental impact statement for the new runway at the Dane County Regional Airport.

| Environmental Noise | |
|---|------------------|
| Weakest sound heard | 0dB |
| Whisper Quiet Library | 30dB |
| Normal conversation (3-5') | 60-70dB |
| Telephone dial tone | 80dB |
| City Traffic (inside car) | 85dB |
| Train whistle at 500', Truck Traffic | 90dB |
| Subway train at 200' | 95dB |
| <i>Level at which sustained exposure may result in hearing loss</i> | <i>90 - 95dB</i> |
| Power mower at 3' | 107dB |
| Snowmobile, Motorcycle | 100dB |
| Power saw at 3' | 110dB |
| French horn | 90 - 106dB |
| Trombone | 85 - 114dB |
| Tympani & bass drum | 106dB |
| Walkman on 5/10 | 94dB |
| Symphonic music peak | 120 - 137dB |
| Amplifier rock, 4-6' | 120dB |
| Rock music peak | 150dB |

NOTES: High frequency sounds of 2-4,000 Hz are the most damaging. The uppermost octave of the piccolo is 2,048-4,096 Hz. Aging causes gradual hearing loss, mostly in the high frequencies. Speech reception is not seriously impaired until there is about 30 dB loss.