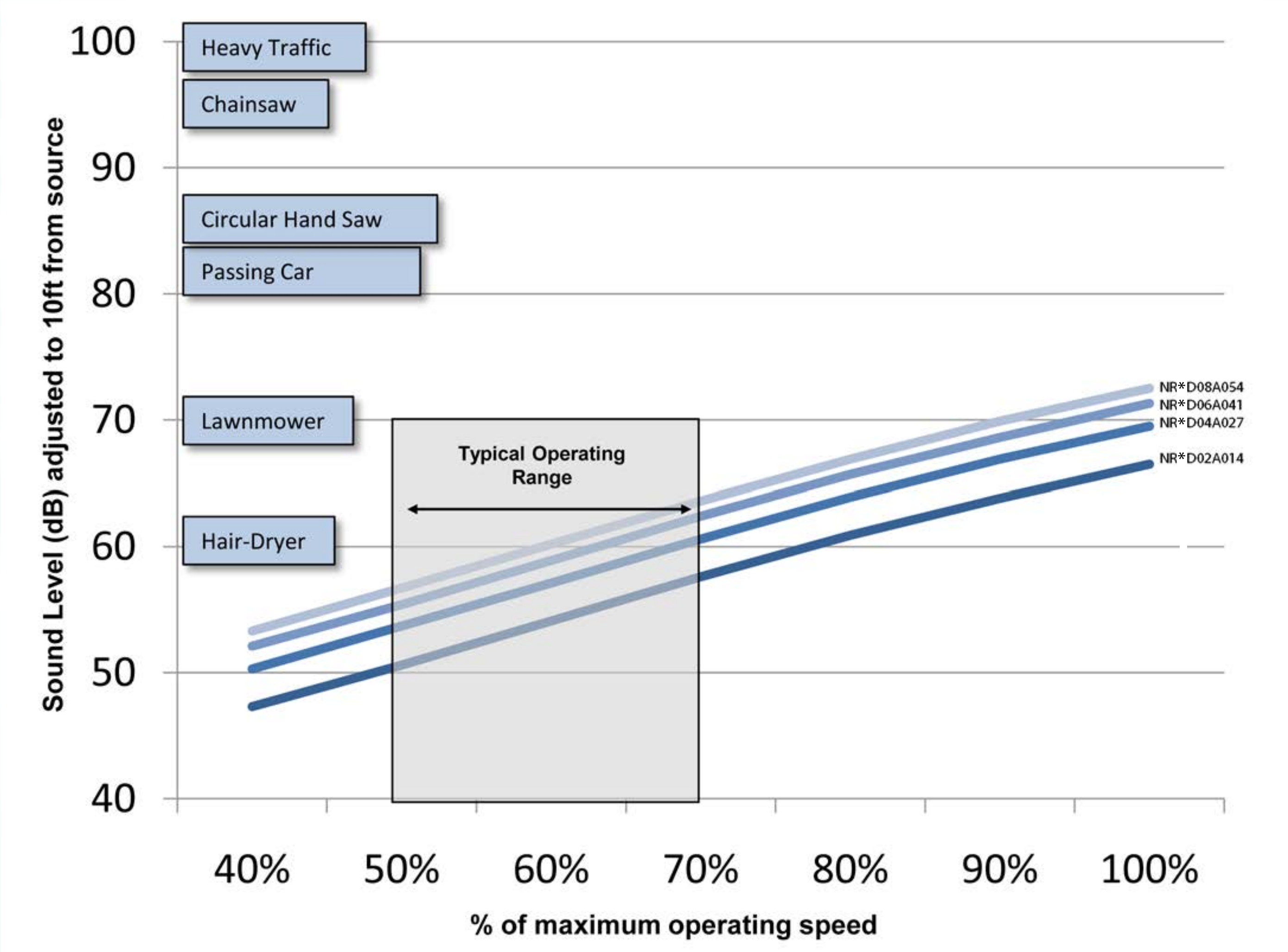
Condenser Performance: Sound Pressure

Model	Sound Pressure (dBA @ 10 ft)			
	At 30% Speed	At 50% Speed	At 70% Speed	At 100% Speed
NR*D02A014	44.3	50.6	57.6	66.5
NR*D04A027	47.3	53.7	60.6	69.5
NR*D06A041	49.1	55.4	62.4	71.3
NR*D08A054	50.3	56.7	63.6	72.5

** = G for VSEC, J for AC*

Sound Comparison Chart



Source: http://www.sengpielaudio.com/tableofsoundpressurelevels.htm > Adjusted to 10ft

Table 7-44. VELOCITY OF SOUND IN BAR-SHAPED SOLIDS*

Longitudinal Direction

Material	Velocity[a] m/s	Velocity[a] f/s
Metals:		
Aluminum	5,240	17,200
Antimony	3,400	11,200
Bismuth	1,790	5,880
Brass	3,420	11,200
Cadmium	2,400	7,880
Constantan	4,300	14,100
Copper	3,580	11,750
German silver	3,580	11,750
Gold	2,030	6,650
Iridium	4,790	15,700
Iron	5,170	16,950
Lead	1,250	4,100
Magnesium	4,900	16,100
Manganese	3,830	12,570
Nickel	4,760	15,620
Platinum	2,800	9,200
Silver	2,640	8,550
Steel	5,050	16,600
Tantalum	3,350	11,000
Tin	2,730	8,950
Tungsten	4,310	14,150
Zinc	3,810	12,500
Cork	500	1,640

Material	Velocity[a] m/s	Velocity[a] f/s
Crystals:		
Quartz *X*-cut	5,440	17,850
Ammonium dihydrogen phosphate ($NH_4H_2PO_4$) 45° *Z*-cut	3,280	10,770
Rochelle salt (sodium potassium tartrate, $KNaC_4H_4O_6 \cdot 4H_2O$) 45° *Y*-cut	2,470	8,100
Calcium fluoride (CaF_2, fluorite) *X*-cut	6,740	22,100
Sodium chloride (NaCl, rock salt) *X*-cut	4,510	14,800
Sodium bromide (NaBr) *X*-cut	2,790	9,150
Potassium chloride (KCl, sylvite) *X*-cut	4,140	13,600
Potassium bromide (KBr) *X*-cut	3,380	11,100
Glasses:		
Heavy flint	3,490	11,440
Extra-light flint	4,550	14,930
Crown	5,300	17,400
Heaviest crown	4,710	15,440
Quartz	5,370	17,600
Granite	3,950	12,970
Ivory	3,010	9,880
Marble	3,810	12,500
Slate	4,510	14,800
Woods: Elm	1,010	3,320
Oak	4,100	13,480

[a]Sound velocities in bulk material are somewhat higher (see Table 7-43).

*Data from: "Wavelengths of Sound", B.W. Henvis, *Electronics*, 20:134–136, March 1947; copyright McGraw-Hill, Inc., 1947.

Table 7-45. TYPICAL SOUND PRESSURE LEVELS

Measurements by Standard Noise Meter

Sound level, db	*Relative sound power*	*Typical location or source*
10	0.001	Soundproof vault; threshold of audibility
20	0.01	Whisper or rustle; sound picture studio
25		Broadcast studio; church; very quiet office or study
30	0.10	Country residence; empty concert hall
35		Drama theater; sleeping area; large table conference room; voice range 10–30 ft
40	1.00	Private office; library; movie theater; hospital
45		Classroom; auditorium; conference room
50	10	Average office; hotel lobby; bank
55		Department store; laboratory
60	100	Busy dining room, kitchen; very noisy office; telephone use difficult
65		Typing and accounting office
70	1,000	City street; automobile
75		Busy machine shop; raised voice necessary for communication at 2 ft; telephone use unsatisfactory
80	10,000	Motor bus; noisy factory
85		Vehicular tunnel; voice communication nearly impossible
90	100,000	Superhighway; New York subway
95		Large motor trucks
100	1,000,000	Busy woodworking stop
110	10,000,000	Riveting shop
120	100,000,000	Propeller plane take off; thunder
130	1,000,000,000	Jet plane at 100 ft; space rocket, 1 mile; 1-minute hearing damage; pain—use earplugs

Table 7-46. COMPARING OR ADDING NOISE LEVELS*

For data on decibel conversion, see Table 8-24.

While it is possible to indicate an absolute level of sound energy in watts, or sound pressure in microbars, all practical measurements are comparative. Sound levels and ear response cover such a great range that it is convenient to use a logarithmic scale, using a dimensionless unit, the *bel*.[a] In terms of power, the bel is defined as the logarithm to the base 10 of the ratio of W (the sound power in question) to W_o (a reference level of sound power), i.e.,

$$\text{power level in bels} = \log_{10}(W/W_o).$$

The *decibel* (one-tenth of a bel) is the preferred unit:

$$\text{power level in decibels} = 10\log_{10}(W/W_o).$$

As sound pressure is usually proportional to the square root of the sound power, the sound pressure level is commonly expressed as:[b]

$$\text{pressure level in decibels} = 20\log_{10}(P/P_o).$$

The reference levels most widely used correspond roughly to the threshold of audibility for the average human ear:[c]

$$W_o = 10^{-12}\ \text{watts};\ P_o = 0.0002\ \text{microbars.}^d$$

Unless otherwise stated, all values are rms (effective) quantities.[e]

The human ear will not ordinarily detect sound-level differences of less than one decibel; thus, engineers usually prefer to express noise levels to the nearest decibel or half decibel.

Comparing two sound measurements[f] as a positive decibel difference, the pressure ratio and the power ratio may be computed from the previously discussed relationships. It is convenient to show these ratios in tabular form.

ADDITION OF TWO SOUND-METER MEASUREMENTS

When two noise sources operate simultaneously but have been separately evaluated, the cumulative noise level may be obtained readily from the power levels. Usually it is desired to find how much a noise source raises the decibel level above the level existing before it became operative. A direct answer, without the need for finding the energy ratios, may be obtained from the following table. Using the difference between the two previous sound-meter measurements, find the increment to be added to the higher reading.

Difference, db	*Increment, db*	*Difference, db*	*Increment, db*	*Difference, db*	*Increment, db*
0.0	3.0	5.5	1.1	10.5	0.4
0.5	2.8	6.0	1.0	11.0	0.3
1.0	2.6	6.5	0.9	11.5	0.3
1.5	2.4	7.0	0.8	12.0	0.3
2.0	2.2	7.5	0.7	12.5	0.2
2.5	1.9	8.0	0.6	13.0	0.2
3.0	1.7	8.5	0.6	13.5	0.2
3.5	1.6	9.0	0.5	14.0	0.2
4.0	1.4	9.5	0.5	14.5	0.2
4.5	1.3	10.0	0.4	15.0	0.1
5.0	1.2				

[a]A scale based on Naperian logarithms is used in certain rare cases; the unit is then designated as the *neper*.

[b]In some sound fields the sound pressure is *not* proportional to the square root of the sound power.

[c]Other reference levels, used in certain cases, are $W_o = 10^{-13}$ watts and $P_o = 1$ microbar.

[d]A microbar is 0.1 newton per square meter (N/m^2) or 1.0 dyne per square cm (dyn/cm^2). One atmosphere is 1 013 250 microbars, or 101 325 N/m^2.

[e]The tabular values apply to any two sound meter readings taken with the same response network, i.e., A(40), B(70), or C(flat), or to any single reading (giving ratios above the reference levels).

[f]Each measurement may be the result of many observations, as the measurement of noise levels as specified in the applicable test codes almost always involves multiple readings. Accurate results depend also on the character of the room. Completely reflecting (reverberant) or completely absorbing (anechoic) rooms are unusual in field testing.

*Compiled and computed.