# THE LOUDNESS OF SOUND

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The loudness of sound is usually thought of as the intensity, which is an erroneous conception. Recent experiments have established the fact that the loudness of sound is proportional to the logarithm of the intensity. For instance, if one speaker generates an average sound of 10,000 units, 100 speakers would generate 1,000,000 units, so that the intensity would be 100 times greater, but the relative loudness would be in the ratio of log 1,000,000 to log 10,000, or 6 to 4.

Telephone engineers express these values as 10 times the logarithms or "decibels," so that the reduction in the last example would be from 60 to 40 decibels, or db.

The range of loudness as given in the accompanying figure* shows that the threshold sound in zero loudness, rustle of leaves in a breeze is 10 db., conversation loudness varies from 35 to 65, a subway gives 80 db and an airplane 95 db. The loudest sound of 108 db is the threshold of feeling where the loudness of the noise produces pain in the ears. These values are results of actual measurements taken at the Bell Telephone Laboratories, together with measurements in buildings and trains, etc., by Mr. Waterfall.

A further example of the use of loudness is interesting. Suppose two rooms are separated by a partition, and it is desired to know the loudness of the sound transmitted into one room from the other. Assume the loudness of conversation to be 60 db. The absorption of the room, due to suitable padding of the ceiling, will reduce this about 5 db, or to 55 db. The partition between rooms reduces this, say, 40 db, to 15 db, while the padding in the second room reduces it 5 db more to a final loudness of 10 db. Reference to the values in the figure shows this sound is no stronger than the rustle of leaves and therefore not objectionable. However, if the rooms are not padded, and the partition is not efficient, the original 60 db may be reduced only 25 db to 35 db and this sound would be loud enough to be disturbing. The sound insulating values of partitions are now given in decibels (db).

Further examples of the use of loudness could be given, but the foregoing illustrations make clear the modern method of representing sound.

* "A Loudness Scale," by Wallace Waterfall, Engineering News-Record, Vol. 102, p. 60, 1929. (Reproduced here on page 372.)