2.3 NOISE MEASUREMENT

Sound (Noise) Level

Sound and unwanted sound, called noise, is the result of fluctuations or oscillations in atmospheric pressure. These excite the ear mechanism and evoke the sensation of hearing.

The human ear responds to changes in sound pressure over a very wide range - the loudest sound pressure to which the human ear responds is ten million times greater than the softest. This large ratio is reduced to a more manageable size by the use of logarithms.

The logarithms scale provides a more convenient way of comparing the sound pressure of one sound with another. To avoid a scale which is too compressed, a factor of 10 is introduced, giving rise to the decibel unit.

It is a ratio, expressed in logarithmic scale relative to a reference sound pressure level.

1 decibel (dB) = 10 $\log_{10}$ (intensity measured/reference intensity)

The reference intensity used in the threshold of hearing which means sound which can be first heard at the sound pressure of 2×10^{-5} Newtons per sq. meter .

The level of sound pressure p is said to be L_p decibels greater than a reference sound pressure P_{ref} according to the following definition:

Sound Pressure Level (Lp or SPL)= $10 \log 10\left(\frac{P^2}{P_{ref}^2}\right)$

$= 20\log_{10} P - 20\log_{10} P_{\text{ref}}\ dB$

where P is the sound pressure fluctuation (above or below atmospheric pressure) and P_{ref} is 20 micropascals (2×10^{-5} Pa), which is approximately the threshold of hearing.

Noise meters

These are the instruments specially designed for noise measurement from low to high frequencies, characteristics of human ear capacity. Noise meters record the dB scale for routine measurement of general noise levels.

Refined noise meters have been developed to take care of peak noise levels, duration of noise exposure and quality of noise which are aspects of specified noise situation.

Decibel scale is shown in **figure 2.3.1**

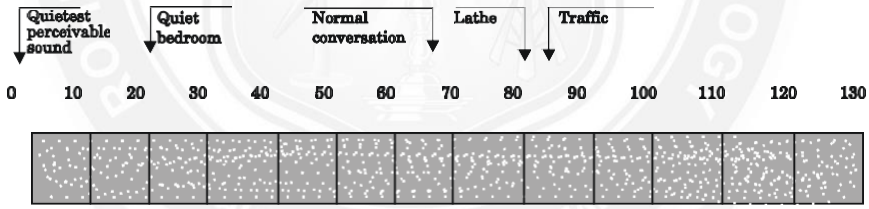

Fig. 2.3.1-The Decibel Scale