

2.5 Factors affecting acoustics of buildings and their remedies

The factors affecting acoustics of buildings and their remedies are as follows:

1. Reverberation time:

If the reverberation time is very small, the sound intensity decreases very fast and makes the sound appear dead. On the other hand, a large reverberation time causes mixing of different syllables and hence causes confusion.

For good quality sound, optimum reverberation time is required

Remedies:

- i) Heavy curtains with folds are used to reduce reverberation time by increasing absorption of sound
- ii) Floor is covered with carpets to absorb sound.
- iii) Windows and openings are provided in the hall which can be opened or closed to control the reverberation time.
- iv) Walls and ceilings are covered with sound absorbing materials.
- v) If the hall is filled to its maximum capacity of audience, reverberation time is less.

2. Loudness:

There should be adequate loudness in all parts of the hall.

Remedies:

- i) Large sounding boards are used behind the speaker facing the audience.
- ii) Loudspeakers are used to increase the loudness.
- iii) Low ceilings help to reflect the sound towards the audience.
- iv) Sound absorbing materials are used in those parts of the hall where sound intensity is large.

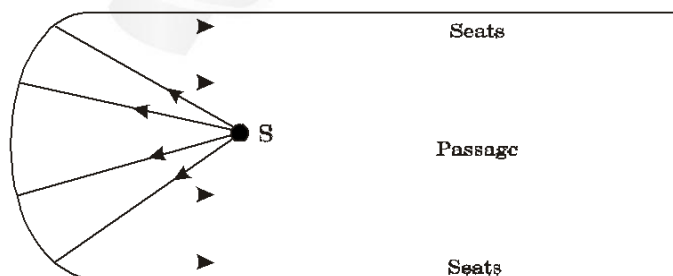


Fig:2.5.1- Reflection of sound

(3)Echo:

The reflection of sound from a distant reflecting surface is known as echo. If the echo reaches the listener about $1/15^{\text{th}}$ of a second after the direct sound, the listener hears two sounds instead of one which causes confusion. Such echoes must be eliminated in halls.

Remedy:

High ceilings and distant walls are covered with sound absorbing materials.

(4)Echelon effect:

Succession of echoes produced by a set of regularly spaced reflecting surfaces like staircase causes confusion in original sound. This effect is known as echelon effect.

Remedy:

The regularly spaced reflecting surfaces like stairs are covered with sound absorbing materials like carpets.

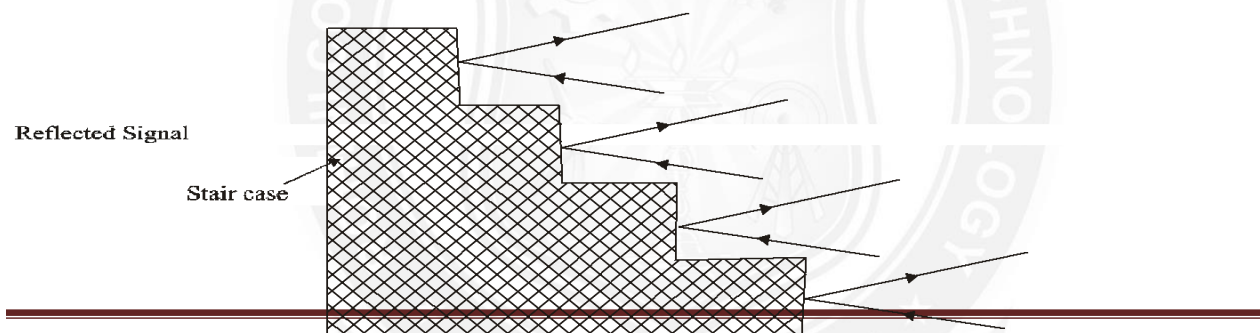


Fig:2.5.2- Stairs like reflecting surfaces

(5)Focusing:

Concave and parabolic surfaces in the hall focus sound. This causes concentration of sound in certain regions of the hall which is not desirable.

Remedies:

Curved surfaces are avoided, If there are curved surfaces, they are covered with sound absorbing materials.

(6)Resonance:

Loose fitting window panels and some other objects resonate at some audible frequencies creating more sound of these frequencies. This distorts the original sound.

Remedies:

Window panels are fixed properly, Vibrating objects are placed on sound absorbing materials.

(7)Noise:

Noise from different sources adversely affects the quality of sound in a hall. The noise can be **air borne, structure borne or inside noise.**

a)Air borne noise: the external noise, for example of traffic, which enters the halls through doors, windows and ventilators is known as external noise.

Remedies:

- i) Openings for ventilators inside the hall are avoided.
- ii) Doors and windows are provided with rubber covering on frames so that they shut without any gaps.
- iii) Double doors and windows having separate frames enclosing sound absorbing materials are used.

b)Structure borne noise:

Noise produced by activities like drilling and hammering or the vibrations of heavy machinery is transmitted through the structure of the building. This is known as structure borne noise.

Remedies:

- i) Heavy machinery is mounted on sound absorbing materials like wood or rubber.
- ii) Double walls are used with space between them.

c)Inside noise:

It is the noise produced inside the hall by machinery, fans, air conditioners etc.

Remedies:

- i) Sound absorbing materials and curtains are provided near the sources of noise.
- ii) The sources of noise are mounted on sound absorbing materials.