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Notes for
B. Sc. Part - I
Paper - 1st

"Acoustics of Building"

The acoustic properties of a confined space such as a hall or room have marked effects on speech and music. It is well known that in some halls the speech delivered is quite intelligible to a listener. Such halls are said to be acoustically good. In some halls the speech is an intelligible and confusing. Such halls are said to be acoustically bad.

W. C. Sabin in 1911 gave the essential features for good acoustics :—

(I) The sound heard must be sufficiently loud in every part of the hall.

(II) The quality of the sound must be remain unaltered.

(III) The successive syllables must not overlap.

(IV) There should be no undesirable echoes.

(V) There should be no concentration of sound in any part of the hall.

(VI) Undue noise must not be present.

To fulfil these accoustical demands the following conditions are necessary :—

(1) Optimum reverberation :— A common defect in halls and auditoriums is the undue persistance of sound. A short sound made in a hall reaches a listener directly as well as after successive reflections from the walls. The listener therefore receives a series of sounds of diminishing intensity. Similary when a prolonged sound is made in the hall, some of the sound waves reach the listener directly, while other reach after successive reflections. The listener therefor receives an increasing sound intensity,

(P.T.O)

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This gradual dying out of sound is known as reverberation.

Sabine made an extensive study of the Problem of reverberation. He found that there is an optimum period of reverberation depending upon the size of of the hall at which best results are obtained. The Period is greater for music than the Speech.

Sabine formula :— Sabine observed that period of reverberation depends upon the size of the hall, and the absorbing powers of the objects in it and its wall. He showed that

$$T = \frac{0.16V}{A}$$

where T is the Period of reverberation in seconds. V is the volume of the hall in $meter^3$ and A is the total absorption of sound in the hall and is given by

$$A = a_1S_1 + a_2S_2 + a_3S_3 + \cdots$$

where $a_1, a_2 \cdots$ are the absorption co-efficients of the surfaces of areas S_1, S_2 — respectively of different materials present in the hall. If V and A are in ft^3 and ft^2 then $T = \frac{0.05V}{A}$

Saban defined the absorption co-efficient of a surface as the ratio of sound energy absorbed by the surface to that absorbed by an open window. Thus in big halls, the reverberation period can be reduced to its optimum value by increasing absorption of sound. This is done by taking some of the following steps:— (a) The windows and ventillators are opened.
(b) The floor is covered with carpets or tapestries.
(c) The walls and ceelling are lined with absorbent materials.

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