

10 • In Fig. 3, a static pressure of 85 per cent of blocked tight pressure corresponds to three different volumes, namely 11 per cent, 30 per cent and 48 per cent of wide open volume. What will determine which volume the fan delivers?

The fan can operate only at the intersection of its pressure-volume curve and the system characteristic. The type of system, together with the specification of the volume at a certain static pressure, completely defines the system characteristic.

As illustrated in Fig. 5, a given system characteristic will intersect the fan curve in only one point.

If the 85 per cent value for static pressure is specified for the 48 per cent value of volume, it is at once obvious that the same system will not have the same resistance at any other volume.

Chapter 18

SOUND CONTROL

Measurement of Noise, Noise in Buildings, Coefficients of Absorption, Insulation of Air-Borne Sound, Location and Insulation of Equipment Room, Insulation of Machinery and Solid-Borne Vibration, Control of Noise Transmission Through Ducts, Effect of Humidity upon Acoustics

THE ventilating and air conditioning of any space affect its acoustics and become apparent when consideration is given to the requirements for good hearing in any architectural interior. The requirements which must be given careful study are:

1. The room should be free from noise, whether of inside or outside origin.
2. The useful sound, whether speech or music, should be sufficiently loud (with reference to any residual noise) to be heard easily and distinctly.
3. The useful sound should be distributed uniformly in all parts of the room, and the sound reaching the listeners should be free from long-delayed reflections which produce interference or echoes.
4. The room should be free from pronounced resonant tones which may result from either volume or panel resonance.
5. The room should contain sound-absorptive materials in such amounts, and of such qualities, as will provide a proper balance between the persistence and cessation of the articulated components of sound, that is, the reverberation in the room should be long enough to sustain harmony and impart tonal blending to music, and at the same time it must be short enough to prevent the overlapping and confusing of the separate sounds of speech.

Obviously, the first of these requirements is the one which imposes restrictions on the installation of air conditioning or ventilating equipment—the equipment noises must be unobjectionable in occupied rooms—although the fifth requirement is not entirely independent of the humidity and temperature of the air.

LOUDNESS

Loudness is the sensation of sound intensity. When it is said that one sound is louder than another a difference in intensity level is implied. Two identical whistles when sounded together do not make a sound twice as loud as one. It may take ten to make a sound 20 per cent louder than one. It has been found that loudness bears a logarithmic relationship to intensity of sound. On this basis a scale of loudness has been built and a unit, the decibel (db), has been established. This scale is illustrated in Fig. 1 which shows the loudness of some typical noises. The formula for relating loudness and intensity is:

$$L_1 - L_2 = 10 \log_{10} \frac{I_1}{I_2} \quad (1)$$