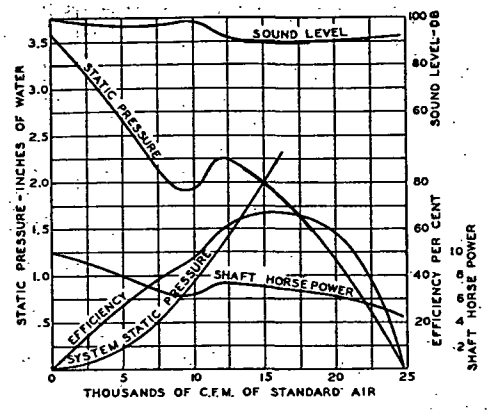

FIG. 2. SOUND LEVEL CHARACTERISTICS OF TYPICAL VANEAXIAL FAN

rating information should be made to arrive at the sound emission of a particular type.

In general, that size of fan, which is so selected as to operate at or near peak static efficiency, will also provide the lowest sound level attainable with the particular type and design of fan.

The characteristic trend of the sound level curve of a typical vaneaxial fan, adaptable to moderate pressure ventilation requirements, is shown in Fig. 2. The sound level of a particular fan is primarily governed by the operating speed required to produce a desired delivery against the system static pressure. Fig. 3 illustrates the variation of fan sound level in decibels with operating speed, the fan operating in connection with a conventional fixed system. The influence of high static pressures is evident in increased operating speed and higher sound level.

The range of sound levels to be experienced in fan application is widespread due to volumetric and pressure requirements which extend over a broad field. Fig. 4 illustrates the general scope of sound levels of centrifugal ventilating fans over a wide range of volumetric capacities and static

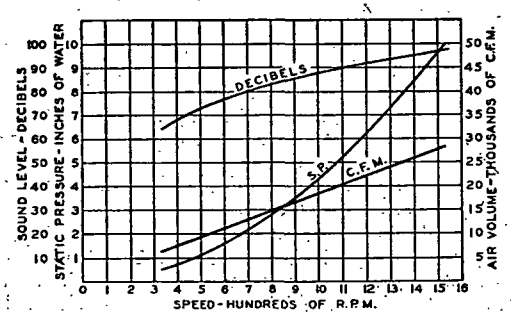

FIG. 3. RELATION OF SOUND LEVEL TO OPERATING SPEED OF A CENTRIFUGAL VENTILATING FAN

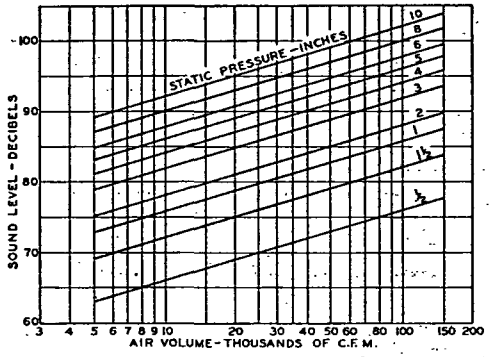

FIG. 4. TYPICAL SOUND LEVELS AT POINT OF MINIMUM SOUND EMISSION FOR CENTRIFUGAL VENTILATING FAN

pressures. The sound levels are based upon a general average of the sound emission that can be anticipated from the several types of fans adaptable to ventilating and air conditioning duties. The sound levels are typical of the centrifugal fans as a class, and specific types may exhibit sensible departure from the charted values. Exact application should be based upon applicable test data derived from the particular equipment under consideration.

NATURAL ATTENUATION OF DUCT SYSTEM

Straight Sheet Metal Ducts. The attenuation of sound in straight sheet metal ducts is a function of the length, shape, and size of the duct.[4] Attentuation values are given in Table 4. In general this attenuation is so negligible, except for long runs, that it may be disregarded for all practical purposes.

Elbows and Transformations. Due to reflective interference, attenuation will take place at elbows and transformations. The magnitude of the attenuation will depend on the size and abruptness of the elbow or transformation as shown in Table 5.

When the area of a duct increases abruptly, an attenuation of noise level takes place in the duct. In duct design practice the total area of the branch ducts is greater than the supply duct. Similarly with outlets, the area of the outlet, plus the area of the duct after the outlet is greater than the duct area before the outlet. Therefore in an outlet run, attenuation occurs in the duct as it passes each outlet. Table 6 gives the db reduction for various ratios of total branch duct and outlet area to supply duct area.

Grilles to Room. The large abrupt change in area between the grilles and the surfaces within a room results in an appreciable noise attenuation.

TABLE 4. ATTENUATION IN STRAIGHT SHEET METAL DUCT RUNS

DUCT	SIZE, IN.	ATTENUATION PER FT, db
Small	6 x 6	0.10
Medium	24 x 24	0.05
Large	72 x 72	0.01