If the published ratings are in terms of decibels per square foot, correction must be made for area to secure to total sound level of outlets of more or less than one square foot area. This can be done by use of the following formula:

$$\text{Decibel Addition} = 10 \log_{10} A \qquad (1)$$

where:

A = core area, square feet.

In practice the allowable total sound and the required air flow are usually known, and it is desired to determine the maximum allowable velocity. Since total loudness and air flow are both functions of velocity and area, the solution of the problem by use of the previous analysis implies a trial and error method. It has been found possible to present

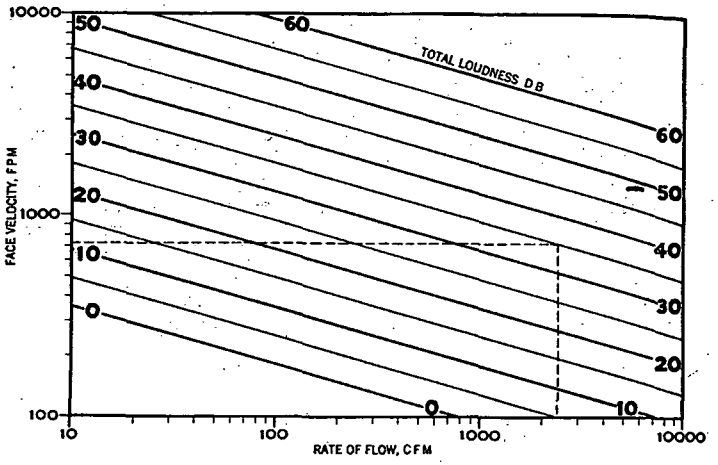

FIG. 11. AIR FLOW AND LOUDNESS CHART

these data with sufficient practical accuracy as a family of uniform curves as illustrated in Fig. 11. With this chart it is possible to find directly the velocity in feet per minute which will give a predetermined total loudness at a predetermined rate of flow expressed in cubic feet per minute. The values used are arbitrarily chosen for the purpose of discussion and do not necessarily represent data referring to any particular make of grille, register or air outlet. It is assumed that Fig. 11 is based on a room having 100 sabins of sound absorption. In such a room the sound level due to other sources may be 35 db. As previously stated an outlet having a noise level of 30 db would be substantially inaudible in such a room.

If 1000 cfm are required with a total noise due to outlet of 30 db, a velocity (Fig. 11) of about 675 fpm may be used. From this velocity and the rate of flow, the core area can be computed. This determination was on the basis of a room absorption of 100 sabins. If the absorption is greater, the 675 fpm velocity is safe, since the loudness level will go down. However, correction can be made if desired by the use of the chart of

Fig. 12. Thus, if the absorption is 200 sabins, a correction of +1.3 db may be made and the permissible velocity becomes that corresponding to a total loudness level of 31.3 decibels or approximately 750 fpm. If the room is highly reflecting and has an absorption of less than 100, correction is much more important. For instance, for 35 sabins a correction of −3 db

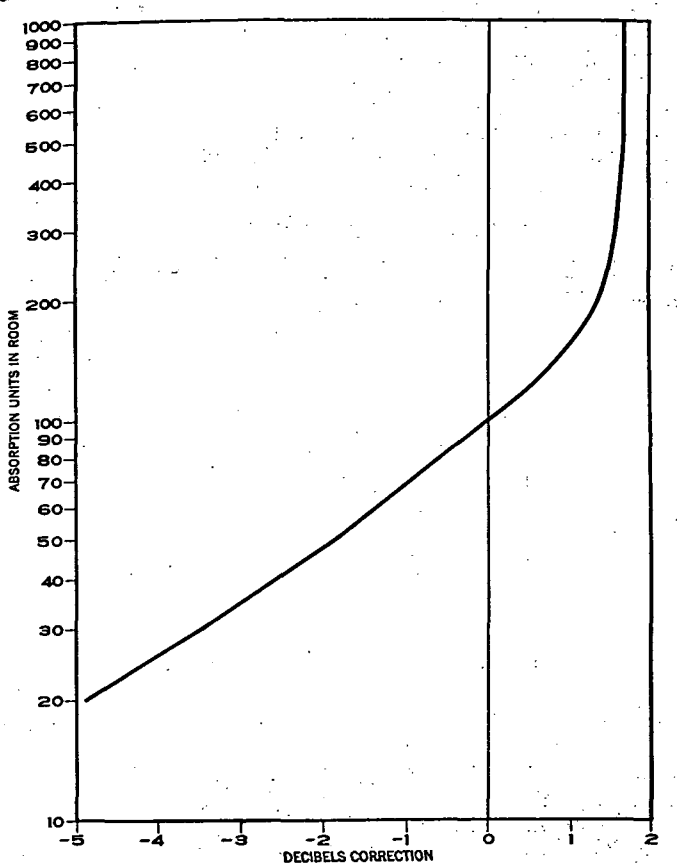

FIG. 12. ROOM ABSORPTION CORRECTION CHART

must be made and the maximum velocity corresponding to 27 db total loudness chosen; that is, approximately 550 fpm.

Where more than one outlet must be considered, the problem is more complicated. If a similar outlet is added in a far corner of a highly absorbent room, the change in noise level at the 5 ft station at the first outlet is small; however, if the room is small, or highly reverberant or both, the intensity at the 5 ft station may be almost doubled and the noise level increased nearly 3 db thereby. The simplest method of hand-