For the four duct positions of Fig. 15, approximate values of Q are given in Fig. 16 for $\theta = 0$ deg. and for $\theta = 45$ deg. The abscissa is the product of frequency times L assuming that the duct is approximately square with an area of L^2 sq in. If the duct is rectangular, the value of Q should be computed for L equal to the smaller dimension.

The room constant R is defined by the equation

$$R = \bar{\alpha}S/(1 - \bar{\alpha}) \qquad (25)$$

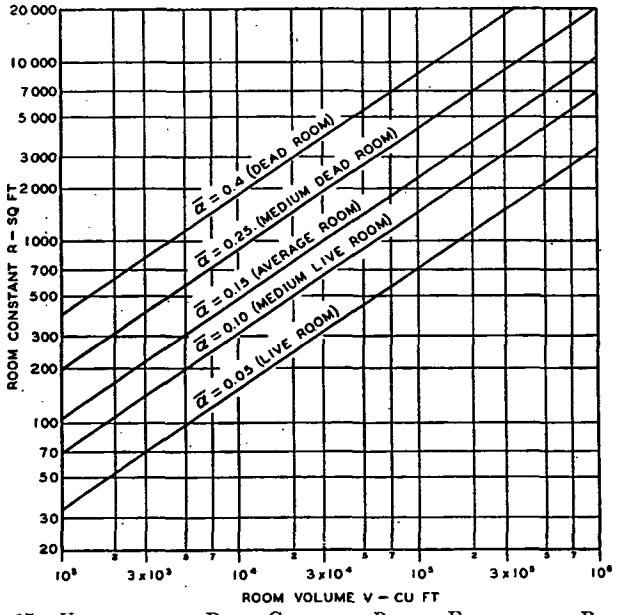

FIG. 17. VALUE OF THE ROOM CONSTANT R AS A FUNCTION OF ROOM VOLUME FOR ROOMS WITH PROPORTIONS OF ABOUT 1:1.5:2

These proportions give $S = 6.25V^{2/3}$. The parameter is the average sound-absorption coefficient for the room. The subjective ratings "dead," "live," etc., are the author's[12] and are not necessarily in standard use. From Reference 13. Used by permission.

where

$\bar{\alpha}$ = average sound absorption coefficient (dimensionless) for the room at the mid frequency of the band of noise being considered.

S = total area of the boundary surfaces of the room, sq ft.

Where a room contains several surfaces each with different absorption coefficients the average absorption coefficient may be determined by the equation

$$\bar{\alpha} = \frac{S_1\alpha_1 + S_2\alpha_2 + \cdots}{S_1 + S_2 + \cdots} \qquad (26)$$

where

S_1, S_2 = the areas of each type of absorbing material. α_1, α_2 etc., = the absorption coefficients of each type of material at the mid-frequency of the band of noise being considered. (Values of α for many materials are published by the *Acoustical Materials Association*.[10])

For estimating purposes, approximate values of the room constant R may be obtained from Fig. 17 as a function of room size for five classes of rooms.

The value of the second and third terms of Equation 24 (including 0.5 db) is plotted in Fig. 18 with distance r from the source as the abscissa,

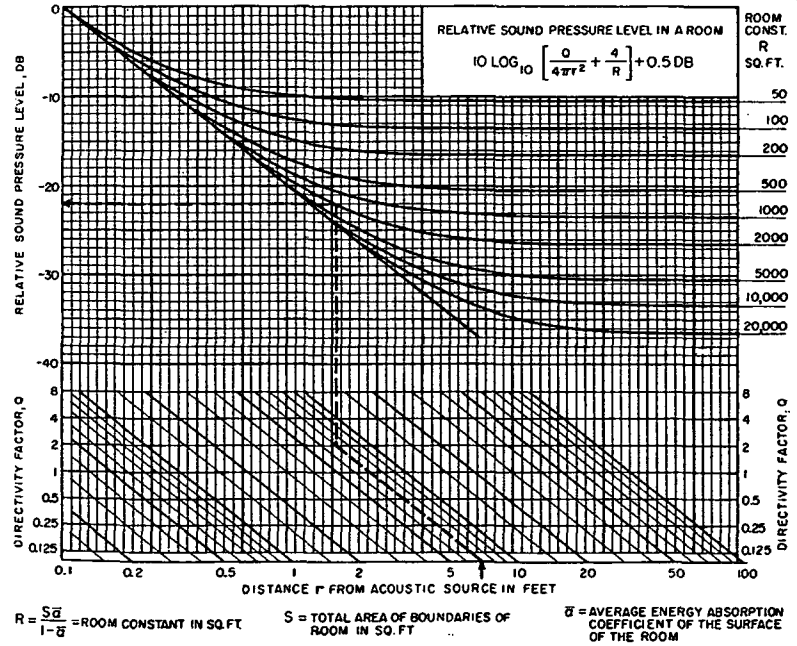

FIG. 18. CURVES FOR DETERMINING THE SOUND PRESSURE LEVEL IN THE ROOM RELATIVE TO THE SOUND POWER LEVEL

The listener's position is at a distance r and an angle θ with respect to the duct opening. Q is determined from θ and from the duct dimensions (See Fig. 16). To use the graph proceed as for the example shown by the dotted line for $r = 7$ ft $Q = 2$, and $R = 2000$ sq ft. The sound pressure level in the room equals the sum of the ordinate and the sound power level. Normal room temperature and pressure conditions are assumed.

with the sound pressure level in decibels as the ordinate and the room constant R in sq ft as the parameter.

The directivity factor Q is given at the bottom left-hand side of the graph. The procedure for using the graph is as follows:

Determine the room constant R and the directivity factor Q for the particular direction θ of interest. Enter Fig. 18 at the bottom at the distance r. Then move diagonally to the left until the value of Q is reached. Then move vertically until the value of R is reached. Then read the relative sound pressure level from the ordinate. An example is shown by the dotted line in Fig. 18 for $r = 7$ ft, $Q = 2$ and $R = 2000$ sq ft. The relative sound pressure level is added algebraically to the sound