Example 3. If the rooms and offices of the hotel building of Example 2 are to be served from a manufactured unit with a capacity of 22,935 cfm against an external resistance of 0.35 in., the known resistances are calculated as:

(1)	Fresh air inlet	0.094 in.
(2)	Allowance for damper adjustment	0.050 in.
(3)	Supply grille resistance (from manufacturer's tables)	0.036 in.
	Total known resistance	0.180 in.

Subtracting this from the total available resistance: 0.35 in. − 0.18 in. = 0.17 in. available for duct resistance.

Known length of run	150 ft
The duct width is then estimated for the following elbow calculations:	
Four 150% ratio elbows, 4 x 13 x 3.5 ft	182 ft
Three 75% ratio elbows, 3 x 35 x 1.5 ft	158 ft
Total estimated length	490 ft

The duct friction per 100 ft is then 0.17 ÷ 4.90 = 0.0347 in. and the mains and branches are sized from the 0.034 in. friction line in Fig. 2.

If it is desired to size each branch for equal resistance, the total resistance back to the point of juncture is calculated and the branch is then sized in a manner similar to that outlined in Example 3.

SOUND CONTROL

Frequently the problem of sound prevention in a heating, ventilating or air conditioning system imposes more severe restrictions than the prevention of excessive pressure drop. Tendencies toward higher duct velocities have produced noise control problems which require consideration of enumerable factors in air duct design. Naturally some types of occupancy and application permit relatively higher sound levels to be maintained than others, but the design trend is progressively directed towards noise reduction wherever possible. Sound absorbent materials have been successfully applied to duct construction to reduce noise. The basis used for the selection of the proper amounts of absorbent materials will be found in Chapter 32.

DUCT CONSTRUCTION DETAILS

Straight sections of round duct are usually formed by rolling the sheets to the proper radius and grooving the longitudinal seam. Rectangular ducts are generally constructed by breaking the corners and grooving the longitudinal seam, although some fabricators still use the standing seam due to lack of equipment. Elbows and transformation sections are generally formed with *Pittsburgh* corner seams because this seam is easier to lock in place than the double seam, but complicated fittings such as double compounded elbows are usually constructed with double seam corners.

The construction of these various seams as well as the types of girth connections are shown in Fig. 7. The application of the various slips and connections are outlined in Table 4. The end slip may be used wherever *S* slips are recommended. Where drive slips are used the end slip may be applied on the narrow side of the duct and only the drive slips on the

maximum side. Ducts 25 to 30 in. in size should be reinforced between the joints, but not necessarily at the joint. Ducts 31 in. and up should be reinforced at the joint and between the joints; if drive slips are used the angles are usually riveted to the duct about 2 in. from the slips. It is good practice to cross-break or kink all flat surfaces to prevent vibration or buckling due to the air flow and accompanying variations in internal

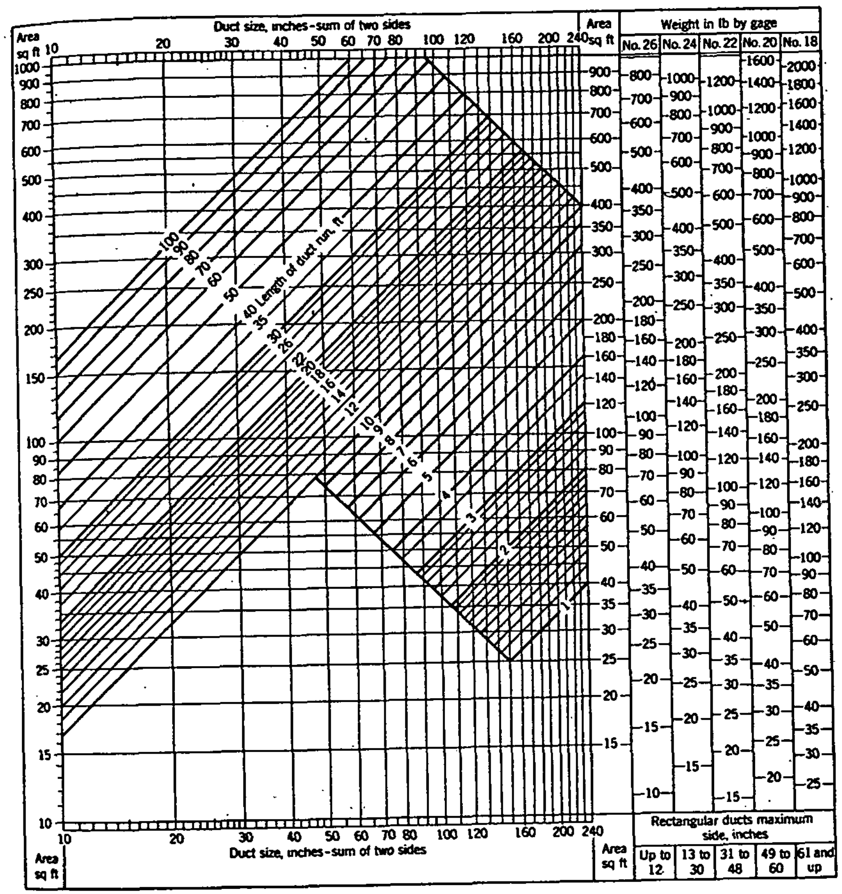

Fig. 8. Area and Weight of Rectangular Sheet Metal Ducts

pressure. Round ducts are sometimes swedged 1.5 in. from the ends so that the larger end will butt against the swedge and are held in place with sheet metal screws. Where swedges are not used it is general practice to paste the joint with asbestos paper to insure a tight joint.

The construction of elbows and changes of shape cannot be definitely outlined because of the varied conditions encountered in the field, but in