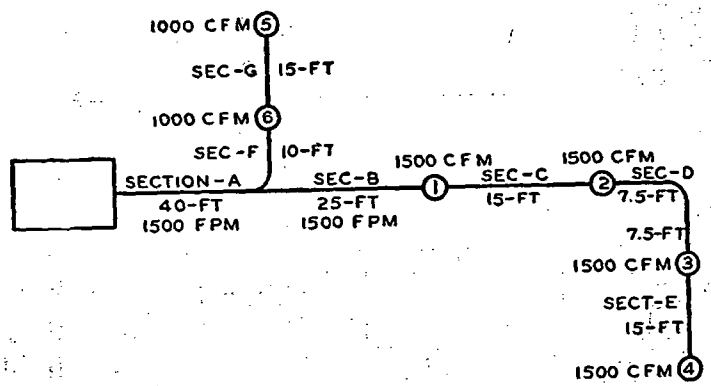


FIG. 14. DUCT LAYOUT FOR EXAMPLE 6

mately 17 in. (Fig. 3). This is equivalent to a 15 x 16 in. duct, which will be used for Section F. The velocity in Section F will be 1200 fpm.

2. Determine the pressure loss in Section F. Actual length of duct is 10 ft; equivalent length of elbow take-off is assumed as 10 W, or 12.5 ft. Therefore, the total equivalent length is 22.5 ft. The pressure loss in F = 0.13 in. $\times \frac{22.5}{100}$ = 0.03 in. water.

3. Using Static Regain Chart, Fig. 13, size Section B for a net pressure loss equal to the loss in F, or 0.03 in. water as follows:

The operation is indicated by arrow heads on the dotted line on Fig. 13. On Fig. 13, start at the velocity in Section A (1500 fpm) at left margin. Proceed horizontally to 6000 cfm ordinate, and then run parallel to the curved lines to intersect the diagonal Base Line. From this point, rise vertically to the 0.03 net static pressure loss line, and from this intersection proceed horizontally to the Air Velocity Base Line. Proceed parallel to curved lines to intersect ordinate for 25 ft equivalent duct length, and then move horizontally to left margin and read the velocity (1500 fpm).

Since Section B carries 6000 cfm, the area required will be $\frac{6000}{1500}$ = 4 sq. ft, and the size of duct will be 36 x 16 in.

4. Using Static Regain Charts (Figs. 12 and 13) determine size of Sections C, D, E and G, but instead of allowing 0.03 in. net loss, which was used for Section B, proceed from the diagonal Base Line vertically to the *no gain or loss* diagonal. The procedure for Section E is shown by the dotted line and arrows on Fig. 12: starting from 1040 fpm velocity, which is the velocity in Section D.

Duct sizes determined by the given procedure are listed in Table 7.

TABLE 7. TABULATION OF RESULTS (EXAMPLE 6)

Section	Air Volume cfm	Equivalent Length ft	Velocity fpm	Rectangular Duct in.	Diam. in.	Friction Per 100 ft in. H_2O	Net Pressure Loss in. H_2O
A	8000	40	1500	48 x 16	29.2	0.13	.05
B	6000	25	1500	36 x 16	—	—	.03
C	4500	15	1300	31 x 16	—	—	0
D	3000	26*	1040	26 x 16	—	—	0
E	1500	15	860	16 x 16	—	—	
F	2000	22.5	1200	15 x 16	17.	0.13	.03
G	1000	15	900	10 x 16	—	—	0

* Includes additional equivalent length of elbow between outlets 2 and 3, which is assumed as 5.5 W, or 11 ft equivalent length of duct. (Based on 3000 cfm at estimated velocity of 1100 fpm).

5. Total pressure loss of the system is the loss in Section A, plus the loss in Section F (or B), plus the loss in the outlet as follows:

Loss in Section A = 0.13 in. $\times \frac{40}{100}$	= 0.05
Loss in Section F (or B)	= 0.03
Outlet Loss	= 0.12
Total Pressure Loss	= 0.20 in.

DUCT CONSTRUCTION DETAILS

Straight sections of round duct are usually formed from sheets, rolled to the proper radius with a longitudinal grooved seam. Each section is swaged 1.5 in. from each end and assembled with the larger end of the adjoining section butting against the swage. The sections are held in place by rivets, sheet metal screws, or by soldering.

Rectangular ducts are generally constructed by breaking the corners and grooving the longitudinal seam, although some fabricators still use the standing seam. 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 constructions of these various seams, as well as the types of girth connections, are shown in Fig. 15. The application of the various slips and connections is outlined in Table 8. 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 the drive slips on only the maximum side.

Designs M to P of Fig. 15 are for flush type seams on ductwork where joints are to be concealed. For smooth appearance the seams may be soldered flush or filled with auto body filler. Screws or rivets used should be of flat-head type.

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 pressure.

The construction of elbows and changes of shape cannot be definitely outlined, because of the varied conditions encountered in the field, but in general, long radius elbows and gradual changes in shape tend to maintain uniform velocities accompanied by decreased turbulence, lower resistance and a minimum of noise.

Heavy canvas connections (asbestos cloth if there is a fire hazard) are recommended on both the inlet and outlet to all fans. Self-vulcanizing adhesive tapes are available for this purpose and for sealing joints in duct work. The fan discharge connections shown in Fig. 15 are marked *good*, *fair*, and *poor* in the order of the amount of turbulence produced. An inspection of the heater connections shown in Fig. 15 will readily show that uniform velocity through the heater cannot be expected in the diagram noted *poor*. When obstructions cannot be avoided, the duct area should never be decreased more than 10 percent, and then a *streamlined* collar should be used. Larger obstructions require an increase in the duct size in order to maintain as nearly uniform velocity as possible. Branch take-