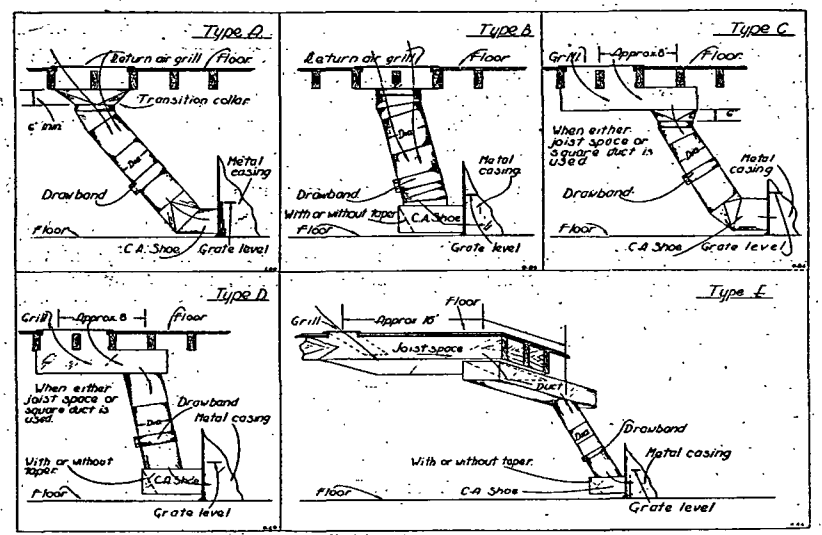
Table 6—Units 1 to 5—Warm Air Carrying Capacities to first story registers with 1 to 5 elbows and with leaders 4 to 24 ft long.

Table 7—Units 11 to 16 and 21 to 24—Warm Air Carrying Capacities to second story registers with 1 to 5 elbows and with leaders 4 to 24 ft long.

Table 8—Units 31 to 38—Return Air Carrying Capacities for types *A*, *B*, *C*, *D* and *E* return combinations.



[a]Full areas to be maintained from grille to furnace.

FIG. 3. RETURN AIR COMBINATIONS[a]

Notes:

Type A return air is direct from grille to casing, using transition collar and transition type *C*, *A* shoe.

Type B same as *A*, but without transition fittings (capacity for same size grille and pipe 84 per cent of *A*).

Type C uses joist space or square duct and transition fittings (capacity for same size grille and pipe 84 per cent of *A*).

Type D same as *C*, but without transition fittings (capacity for same size grille and pipe 69 per cent of *A*).

Type E uses *both* joist space and square duct, without transition fittings (capacity for same size grille and pipe 44 per cent of *A*).

Design Procedure

The steps to be taken in designing a gravity warm air duct system are:

1. Calculate the heat loss from each room as explained in Chapters 4, 5 and 6.

2. Prepare a layout showing (*a*) furnace, (*b*) chimney connection, (*c*) warm air registers (whether floor, base board or wall), (*d*) return air grilles.

3. Indicate on each warm air run (using symbols shown in Fig. 4): (*a*) whether the room to be heated is on the first or second story, (*b*) the approximate length of leader pipe in the basement, (*c*) the number of right angle elbows required, including the elbow at the boot connection. (Consider each 45 deg elbow as equal to ½ of 90 deg elbow, consider the two sharp 90 deg elbows in a cross-over connection as equivalent to three 90 deg elbows), (*d*) whether the register is to be located in the floor, in the baseboard, or in the wall.

4. Show the number and proposed locations of return air grilles and the type of return air system (see Fig. 3).

5. From Table 6, for first story, or from Table 7 for second story, select the unit number for the warm air system which will supply the heat required to each room, with the number of elbows and length of leader pipe previously determined. Then, using the unit number as found, read directly in Tables 2, 3, or 4 the leader, stack, and register sizes required.

6. From Table 8 select the unit number for the return air system to correspond with the Btu serviced and the type of return air system. Then from Table 5 select the duct and grille sizes, etc., corresponding to the same unit number.

7. Select a furnace having a capacity rating, in Btu per hour, equal to the total heat loss from the structure.

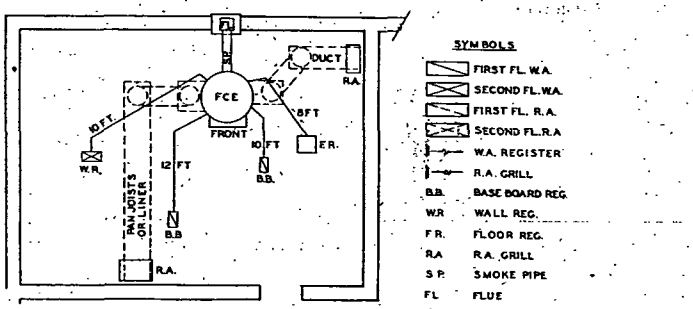


FIG. 4. TYPICAL BASEMENT LINE DRAWING

Examples

Examples 1 and 2 will illustrate the use of the tables in selecting warm air and return system sizes.

Example 1. For a room which has a heat loss of 22,500 Btu per hour select the size of first story warm air system. There are three elbows and the leader is approximately 10 ft long.

Solution: Since 22,500 Btu is beyond the capacities shown in Table 6, it is necessary to select two units of 11,250 each. From Table 6 in 10 ft leader column and in section for three elbows find 11,400 as nearest capacity which corresponds to Unit No. 4 in first column. Refer to Unit No. 4 in Table 2 and find that the leader should be 12 in. in diameter and should be used with a 12 x 14 in. floor register or a 13 x 11 in. baseboard register with a 5¼ in. extension.

Example 2. What is the size of a return system of Type D which is to service 35,000 Btu per hour?

Solution: From Table 8 find Unit No. 37 which will service 37,800 Btu per hour. Refer to Table 5 to find that Unit No. 37 will require a 22-in. diameter duct, a shoe area of 420 sq in., a metal grille 18 x 30 in., a duct 42 x 10 in. or 36 x 12 in. If joist lining is used the minimum depth should be 15 in. for two 2-joist spaces 14 in. wide, or 10 in. for three joist spaces.

TABLE 2. FIRST STORY WARM-AIR DUCTS[a]

Unit No.	Leader Pipe Diameter, In.	Register Size, In.		
		Floor	Baseboard	
			Size	Extension
1	8	8 x 10	10 x 8	2¼
2	9	9 x 12	12 x 8	2¼
3	10	10 x 12	12 x 9	3¼
4	12	12 x 14	13 x 11	5¼
5	14	14 x 16	----------	------

[a]When the calculations indicate a requirement for a given room greater than Unit No. 4, two or more smaller units totalling the required capacity are recommended.