TABLE 9. FOR SIZING EXTENDED PLENUM

COMBINATION	ROUND BRANCH DIAM Inches	RECTANGULAR SIZE (8-in. Depth) Inches	PLENUM ADDITION Inches
1	8	6 x 8	4
2	9	8 x 8	5
3 or 3d	10	11 x 8	8
4 or 4d	12	16 x 8	12

EQUIVALENT PLENUM SIZE FOR CHANGE TO DEPTH OTHER THAN 8 IN.

8-IN. DEPTH Inches	10-IN. DEPTH Inches	12-IN. DEPTH Inches
16 x 8	12 x 10	....
18 x 8	14 x 10	12 x 12
20 x 8	16 x 10	13 x 12
22 x 8	17 x 10	14 x 12
24 x 8	18 x 10	15 x 12
26 x 8	19 x 10	16 x 12
28 x 8	21 x 10	17 x 12
30 x 8	22 x 10	18 x 12
32 x 8	24 x 10	19 x 12
34 x 8	25 x 10	21 x 12
37 x 8	27 x 10	22 x 12
39 x 8	29 x 10	23 x 12
42 x 8	31 x 10	25 x 12
45 x 8	33 x 10	26 x 12
47 x 8	35 x 10	28 x 12
51 x 8	37 x 10	29 x 12

Solution: From Table 8 find Combination Number 37 which will service 37,800 Btu per hr. Refer to Table 4 to find that Combination Number 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.

REFERENCES

[1] The engineering data were obtained from *University of Illinois, Engineering Experiment Station Bulletins* Nos. 141, 188, 189 and 246; Warm Air Furnaces and Heating Systems, by A. C. Willard, A. P. Kratz, V. S. Day, and S. Konzo. See also Manual 5: Gravity Code and Manual for the Design and Installation of Gravity Warm Air Heating Systems, 5th Edition, 1954, published by the *National Warm Air Heating and Air Conditioning Association*.

[2] Simplified Procedure for Selecting Capacities of Duct Systems for Gravity Warm Air Heating Plants, by A. P. Kratz and S. Konzo (*University of Illinois, Engineering Experiment Station Circular* 45, Dec., 1942).

[3] Gravity Code and Manual for the Design and Installation of Gravity Warm Air Heating Systems, Manual 5, 5th Edition, 1954, (*National Warm Air Heating and Air Conditioning Association*).

CHAPTER 20

FORCED WARM AIR SYSTEMS

Air Distribution, Standard Combinations of Parts, Simplified Method of Design, Design Procedure for Large Systems, Automatic Controls, Ceiling Panel Systems, Perimeter Systems, Summer Operation

IN forced warm air heating systems, the air circulation is effected by motor-driven centrifugal fans, commonly referred to as blowers. The advantages of forced air systems are:

1. The furnace may be placed in any part of the structure.
2. Distribution ducts can be made small enough to be inconspicuous and out of the way, or be completely concealed from view where desired.
3. Circulation of air is positive, and in a properly designed system, can be controlled in such a way as to give a comfortably uniform temperature distribution.
4. Humidity control is readily attained.
5. The air may be cleaned by filters or other means.
6. The fan and duct equipment may be designed for a complete cooling and dehumidifying system for summer, using either ice, mechanical refrigeration, or low temperature water for cooling and dehumidifying, or adsorbers for dehumidifying.
7. The use of the fan permits flexibility in the location of supply and return grilles as required to obtain proper distribution of air for comfort.
8. Ventilation air may be positively introduced and conditioned.

The construction features of forced warm air furnace units and the function and selection of the various parts of a system are discussed in Chapter 16 and other publications.[1]

AIR DISTRIBUTION

The conditions of comfort obtained in a room are influenced greatly by the type of register used, and the locations of the supply registers and return grilles. In general it has been found that changes in the type, air velocity, and location of the supply register affect the room conditions much more than the changes in the location of the return grilles. One method is to locate the supply register near the floor, or high in the side wall, so that the warm air from the register *blankets* a cold wall, and mixes with the cold air descending from the exposed walls and glass. Another method is to locate the supply openings near the floor, or high in the side wall, on the inside wall, and the return openings near the greatest outside exposure. Still another method is to locate all supply openings around the outside wall, near the source of the greatest heat loss, usually beneath the windows, and to use grilles designed to blanket the cold area. This causes mixing of the warm air delivered with the cool air from the heat loss area and the