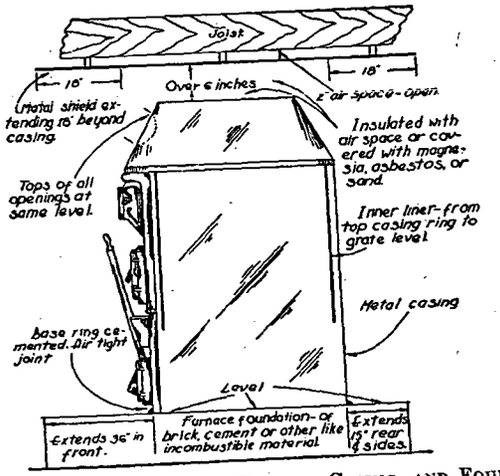

FIG. 3. DETAILS OF FURNACE BONNET, CASING, AND FOUNDATION (FROM *NWAH & ACA* MANUAL 5, FOURTH EDITION)

TABLE 5. RESISTANCES OF WARM AIR BOOT COMBINATIONS EXPRESSED IN ELBOW EQUIVALENTS

WARM AIR BOOT	NAME OF COMBINATION	EQUIVALENT NO. OF 90-DEG ELBOWS
A	45-Deg Angle Boot and 45-Deg Elbow	1
B	90-Deg Angle Boot	1
C	Universal Boot and 90-Deg Elbow	1
D	End Boot	2
E	Offset Boot	2½
F	45-Deg Angle	½
G	Floor Register—Second Story	3
H	Offset	3
I	Offset	2

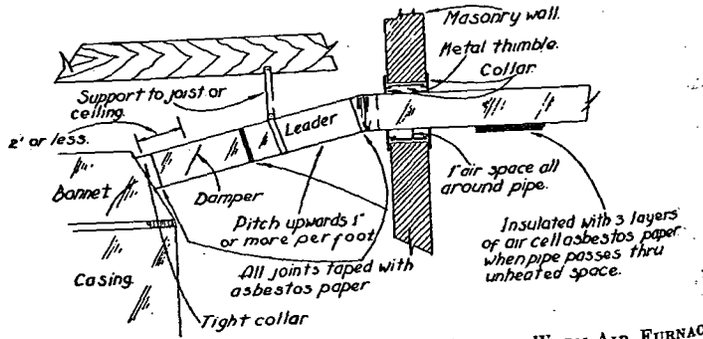

FIG. 4. DETAILS OF BONNET AND LEADER OF GRAVITY WARM-AIR FURNACE (FROM *NWAH & ACA* MANUAL 5, FOURTH EDITION)

TABLE 6. WARM AIR CARRYING CAPACITY, BTUH DELIVERED, FIRST STORY REGISTERS

COMBINATION NO.	NO. OF ELBOWS	ACTUAL LENGTH (BONNET TO BOOT) FEET	4	6	8	10	12	14	16	18	20	22
		6							4	6	8	10
		6½					4	6	8	10	12	14
		7			4	6	8	10	12	14	16	18
		7½	4	6	8	10	12	14	16	18	20	22
1	1	Height from basement floor to bottom of joists—Feet	6,020	5,850	5,680	5,510	5,340	5,170	5,000	4,830	4,660	4,490
2	1		7,620	7,400	7,180	6,970	6,760	6,540	6,320	6,110	5,890	5,680
3	1		9,400	9,140	8,870	8,600	8,340	8,070	7,810	7,540	7,270	7,010
4	1		13,380	12,970	12,590	12,210	11,830	11,450	11,080	10,700	10,320	9,950
5	1		17,520	17,020	16,530	16,040	15,550	15,050	14,550	14,050	13,560	13,060
1	2		5,850	5,660	5,490	5,330	5,160	5,000	4,840	4,670	4,510	4,340
2	2		7,380	7,150	6,940	6,730	6,520	6,320	6,110	5,910	5,700	5,500
3	2		9,090	8,840	8,580	8,320	8,060	7,800	7,550	7,290	7,040	6,780
4	2		12,910	12,540	12,170	11,800	11,430	11,060	10,690	10,320	9,950	9,580
5	2		16,940	16,450	15,990	15,500	15,040	14,550	14,080	13,600	13,120	12,650
1	3		5,620	5,460	5,310	5,150	4,990	4,830	4,670	4,510	4,350	4,190
2	3		7,120	6,910	6,710	6,510	6,310	6,110	5,900	5,700	5,500	5,300
3	3		8,780	8,530	8,280	8,030	7,780	7,530	7,290	7,040	6,800	6,550
4	3		12,450	12,100	11,750	11,400	11,050	10,700	10,350	10,000	9,650	9,300
5	3		16,360	15,900	15,440	14,970	14,510	14,050	13,600	13,130	12,660	12,200
1	4		5,420	5,260	5,110	4,960	4,800	4,650	4,500	4,350	4,190	4,040
2	4		6,860	6,660	6,460	6,270	6,080	5,890	5,690	5,500	5,300	5,110
3	4		8,460	8,220	7,980	7,740	7,500	7,260	7,020	6,780	6,550	6,310
4	4		12,010	11,670	11,330	10,990	10,650	10,310	9,970	9,630	9,290	8,950
5	4		15,770	15,320	14,880	14,420	13,990	13,540	13,100	12,650	12,200	11,750
1	5		5,240	5,090	4,940	4,790	4,640	4,500	4,350	4,200	4,050	3,910
2	5		6,630	6,440	6,250	6,060	5,880	5,690	5,500	5,320	5,130	4,940
3	5		8,180	7,950	7,720	7,490	7,260	7,030	6,800	6,560	6,330	6,100
4	5		11,610	11,290	10,950	10,620	10,300	9,970	9,640	9,320	8,990	8,660
5	5		15,250	14,800	14,380	13,950	13,520	13,090	12,650	12,230	11,800	11,370

Notes: Carrying capacity and length of run increased with basement depth.
Length of trunk and carrying capacity of gravity extended plenum installations should be based on the 6 ft basement depth capacities.

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 9, 11 and 12.

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

3. Indicate on each warm-air leader (using symbols shown in Fig. 6): (*a*) whether the room to be heated is on first or second story; (*b*) the approximate length of leader pipe in the basement; (*c*) the number of right angle elbows and equivalent elbows (Table 5) required, including the elbow at the boot connection (see Fig. 2); (*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. 5).

5. From Table 6, for first story, or from Table 7 for second story, select the combination 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 combination number as found, read directly in Tables 1, 2, or 3 the leader, stack, and register sizes required.

6. From Table 8 select the combination number for the return-air system to correspond with the Btu per hour serviced and the type of return-air system. Then from Table 4 select the duct and grille sizes, etc., corresponding this number.

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