TABLE 2. CAPACITY AND SIZING TABLE—SECOND STORY
For Warm Air and Return Air Stack, Branch, and Registers

Equiv. Length of Fittings and Registers	Horizontal Length Furnace to Register		Second Story Room Heat Loss—Btuh						
	Ducts[a]	Insulated Attic Ducts							
Col. a	Col. b	Col. c.	Col. d	Col. e	Col. f	Col. g	Col. h	Col. i	Col. j
Up to 70 Eq. Ft.	Up to 7	Up to 5	6,300	10,900	14,000	17,000	21,800	28,000	70,000
	8–12	6–9	5,700	10,000	13,000	15,900	20,000	26,000	65,000
	13–17	10–13	5,200	9,200	12,100	14,900	18,400	24,200	60,500
	18–25	14–18	4,800	8,500	11,400	13,900	17,000	22,400	57,000
	26–35	19–25	4,100	7,300	10,000	12,400	14,600	20,000	50,000
	36–45	26–35	3,500	6,400	8,800	11,100	12,800	17,600	44,000
	46–55	36–45	3,100	5,600	7,800	9,900	11,200	15,600	39,000
	.....	46–55	2,800	5,000	6,800	9,000	10,000	13,600	34,000
71 to 100 Eq. Ft.	Up to 7	Up to 5	5,000	9,000	11,900	14,800	18,000	23,900	59,500
	8–12	6–9	4,600	8,200	11,000	13,900	16,400	22,000	55,000
	13–17	10–13	4,300	7,600	10,300	13,000	15,200	20,600	51,500
	18–25	14–18	4,000	7,100	9,600	12,200	14,200	19,200	48,000
	26–35	19–25	3,400	6,200	8,400	10,800	12,400	16,800	42,000
	36–45	26–35	3,000	5,400	7,500	9,600	10,800	15,000	37,500
	46–55	36–45	2,700	4,700	6,700	8,500	9,400	13,400	33,500
	.....	46–55	2,300	4,200	6,000	7,500	8,400	12,000	30,000
101 to 130 Eq. Ft.	Up to 7	Up to 5	4,200	7,700	10,400	13,000	15,400	21,700	52,200
	8–12	6–9	3,900	7,200	9,700	12,100	14,400	19,400	48,400
	13–17	10–13	3,700	6,700	9,000	11,300	13,400	18,000	45,300
	18–25	14–18	3,500	6,200	8,400	10,600	12,400	16,800	42,300
	26–35	19–25	3,000	5,400	7,400	9,400	10,800	14,800	37,000
	36–45	26–35	2,600	4,700	6,500	8,300	9,400	13,000	32,500
	46–55	36–45	2,400	4,100	5,800	7,400	8,200	11,600	29,000
	.....	46–55	2,000	3,600	4,800	6,500	7,200	9,600	24,000
131 to 165 Eq. Ft.	Up to 7	Up to 5	3,800	6,800	9,100	11,400	13,600	18,200	45,500
	8–12	6–9	3,500	6,300	8,400	10,500	12,600	16,800	42,000
	13–17	10–13	3,200	5,800	7,900	9,800	11,600	15,800	39,600
	18–25	14–18	3,000	5,500	7,400	9,200	11,000	14,800	36,800
	26–35	19–25	2,700	4,800	6,300	8,100	9,600	12,600	32,200
	36–45	26–35	2,300	4,200	5,700	7,200	8,400	11,400	28,200
	46–55	36–45	1,900	3,400	4,500	5,800	6,800	9,000	22,800
	.....	46–55	1,800	3,300	4,300	5,400	6,600	8,600	21,500
166 to 200 Eq. Ft.	Up to 7	Up to 5	3,500	6,100	8,200	10,300	12,200	16,400	41,000
	8–12	6–9	3,200	5,700	7,600	9,500	11,400	15,200	38,200
	13–17	10–13	2,900	5,300	7,100	8,900	10,600	14,200	35,800
	18–25	14–18	2,700	5,000	6,700	8,300	10,000	13,400	33,400
	26–35	19–25	2,500	4,400	5,700	7,400	8,800	11,400	29,000
	36–45	26–35	2,100	3,900	5,100	6,500	7,800	10,200	25,800
	46–55	36–45	1,900	3,400	4,500	5,800	6,800	9,000	22,800
	.....	46–55	1,500	2,800	3,500	4,700	5,600	7,000	17,500
Combination Number			41	42	43	44	45	46	47
Stacks[b] No. Size			1 10x3¼	1 10x3¼	1 12x3¼	1 14x3¼	2 10x3¼	2 12x3¼	—
Rectangular Branch Size			3x8	4x8	5x8	6x8	8x8	10x8	15x8
Round Branch Size (Diam)			5	6	7	8	9	10	12
Number of Joist Spaces and Minimum Depth-Return Air			1 at 3	1 at 3	1 at 4	1 at 5	1 at 6 or 2 at 3	1 at 7 or 2 at 4	1 at 9 or 2 at 5
Registers: Low Wall, High Wall or Baseboard:			10x6	10x6	12x6	14x6	(2)10x6 or (1)24x6	(2)12x6 or (1)30x6	—
Registers: Floor, Warm Air			8x10	8x10	9x12	9x12 or longer	10x12	12x14	—
Registers: Floor, Return Air			6x10 or 4x14	6x10 or 4x14	6x12 or 6x14	6x14	6x30	6x30	8x30
Trunk Duct Increase, Inches			1	2	3	4	5	7	12

[a] Uninsulated ducts in heated spaces and insulated ducts in unheated spaces.

[b] Note: For return air a 14x3⅝ in. stud space may be used instead of 10x3¼ in. stack. Where 12x3¼ in. or 14x3¼ in. stack is required, a 14x3⅝ in. stud space may be used only when inside of stud space is smooth and without protruding plaster keys. The number of joist spaces for combination 47 is based on 2x8 joists. One space may be used with 2x10 joists.

The limiting factor for a duct combination is the stack capacity.

This simplified method is applicable to structures having heat losses not in excess of approximately 120,000 Btu per hour. The capacities shown in Tables 1 and 2 are based upon the most reliable data pertaining to friction losses and temperature drops in ducts. They are also based upon a 100 deg temperature rise of the air, and a static pressure available for overcoming friction losses in the external duct system alone of 0.20 in. water gage. The use of this method assumes that the fan in the fan-furnace assembly will be capable not only of overcoming the resistance of the external duct system alone, but also the resistances imposed by the blower inlet, the filter, and the furnace casing.

Tables 1 and 2 are applicable for the selection of both warm air and return air branches. A depth of 8 in. has been adopted as the standard for trunk ducts, and where a branch joins the trunk the required increase shown in the last line of Table 1 or Table 2 refers to an 8-in. trunk duct.

Where two branches form a trunk the farthest branch is considered to be the trunk and its equivalent width (for 8-in. depth) is increased as required.

DESIGN PROCEDURE FOR LARGE SYSTEMS[4]

For buildings having a heat loss in excess of 120,000 Btu per hour, the design procedure[5] given in Manual 9 of the *NWAH & ACA*, may be used. Work sheets 9a, 9b, and 9c are available to simplify calculations.[4] The procedure consists of:

1. Calculation of design heat losses from individual spaces in the structure. The calculation of these losses is explained in Chapter 12.

2. Location of registers and return intakes on floor plan, showing types of registers, with distance from register to opposite wall and deflection of registers desired.

3. Laying out a proposed duct system for both warm air and return air sides of the system, and including details of types of fittings and the actual and equivalent lengths of each branch line from bonnet to register, without sizes. (See Fig. 4, Groups 1 through 6, for equivalent length of fittings.)

4. Determination of bonnet temperature.

If the rating sheet for a furnace-blower unit specifies a *fixed value of bonnet temperature*, locate this temperature in the left-hand column of Table 3. If not specified, use the following procedure: Use Table 3 for buildings having a heat loss between 120,000 and 350,000 Btu per hr, or Table 4 for buildings having a heat loss greater than 350,000 Btu per hr. Select *shortest actual length*, including vertical risers and read downward in nearest column in Tables 3 or 4 until lower heavy diagonal line is reached, but do not cross line. Run horizontally to first column of table and note *bonnet temperature*. Also select *longest actual length* including vertical risers, and read downward in nearest column in Tables 3 or 4 until upper heavy diagonal line is just crossed. Run horizontally to left to obtain value for *bonnet temperature* in first column. Select as the design bonnet temperature any value between these two limits.

5. Determination of air volume to be delivered through each register and the respective register air temperatures.

Using Tables 3 or 4 and the design bonnet temperature selected, find the values of cfm per 1000 Btu for each duct length, and the corresponding register temperature.

6. Selection of register sizes and pressure losses to produce necessary throw, for the air volumes handled.

Use Tables 5 or 6 to obtain required free area and pressure loss of register.