FIG. 3. EQUIVALENT LENGTH OF FITTINGS (Concluded)

GROUP 7. REGISTERS (INCLUDING LOSSES IN STACKHEAD AND VELOCITY PRESSURE).

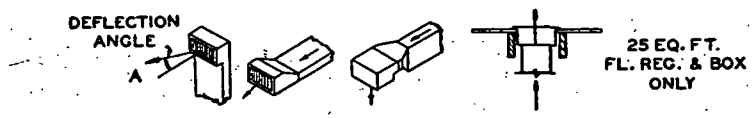

TABLE 4A. EQUIVALENT LENGTH FOR REGISTERS

Deflection Angle A	0°	15°	22°	30°	45°
Baseboard, High or Low Sidewall Registers	Eq. Ft. 35	40	45	60	115
Floor Registers with Box only	25				

For 2-way deflection registers, add the vertical and horizontal deflection angles together and multiply by 0.7. Select closest angle A in Table 4A.

b. Proceed in sizing return air branches by the same method described for the warm air branches.

C. *Trunk ducts for warm air and return air sides of system.*

a. Add air volumes of branches to be handled by each trunk duct.

b. The friction loss per 100 ft of trunk duct is determined by taking the smaller of the two values for friction loss for the two ducts meeting at the junction.

c. Determine trunk duct size by using an air friction chart, volume (cfm), and pressure drop per 100 ft of trunk duct.

8. Selection of Blower.

A. Determine total cfm air delivery (the sum of all branch cfm values).

B. Determine static pressure requirement.

a. For furnace-blower combination units it is the sum of bonnet pressure and suction pressure.

b. For blowers separately selected from the furnace it is the sum of bonnet pressure, filter loss, casing loss, losses through air washers, coils, and other devices.

9. Selection of Furnace.

A. Determine register delivery (the sum of room Btu losses).

B. Determine bonnet capacity.
Bonnet capacity = (total cfm) × (temperature rise) × 1.089.

C. Determine allowance for pick-up load. For buildings which are heated intermittently, such as churches and auditoriums, it is customary to add from 10 to 25 percent extra furnace capacity for warming of the structure.

AUTOMATIC CONTROLS

Air stratification, high bonnet temperatures, excessive flue gas temperatures, and heat overrun or lag in a properly designed system, can be largely eliminated through proper care in the planning and installation of the control system;[6] desirable controls usually employed are:

1. A *thermostat* located in a living room where maximum fluctuation in temperature can be expected, in order to secure frequent operation of fans, drafts, and burners. The thermostat location should not be on an outside wall, in a bedroom, bathroom, or sun room, or in a location where it will be affected by direct radiant heat from

TABLE 5. SELECTION OF BONNET TEMPERATURE, REGISTER TEMPERATURE AND REGISTER DELIVERY (CFM)[a, b]
(For Buildings Having a Heat Loss between 120,000 and 360,000 BTU/Hr.)
Register Delivery Volume in CFM per 1000 BTU per Hr.

Temp. of Bonnet °F	Linear Distance from Bonnet to Register, in Feet																							
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	200	210	220	230	240
110	108[a] 23.1[b]	107 23.6	106 24.2	104 25.4	103 26.0	102 26.6	101 27.3	100 28.0	99 28.8	98 29.6	97 30.5	96 31.5	95 32.3	94 33.3	93 34.6	92 35.9	91 37.3	90 38.6	89 39.9	89 39.9	88 41.3	88 41.3	87 42.7
120	118 19.0	116 19.6	114 20.3	112 21.1	111 21.6	109 22.5	108 23.1	106 24.2	105 24.8	103 26.0	102 26.6	101 27.3	100 28.0	99 28.8	98 29.6	97 30.5	96 31.5	95 32.3	93 34.6	92 35.9	91 37.3	90 38.6	90 38.6
130	128 16.4	126 16.9	123 17.6	121 18.1	119 18.7	117 19.3	115 20.0	113 20.7	111 21.6	110 22.1	108 23.1	107 23.6	105 24.8	104 25.4	103 28.0	102 26.6	101 27.3	99 28.8	97 30.5	96 31.5	95 32.3	94 33.3	93 34.6
140	137 14.6	134 15.1	131 15.7	129 16.2	126 16.9	124 17.3	122 17.9	120 18.4	118 19.0	116 19.6	114 20.3	112 21.1	110 22.1	109 22.5	107 23.6	106 24.8	105 24.8	103 26.0	101 27.3	100 28.0	99 28.8	98 29.6	97 30.5
150	147 12.9	143 13.5	140 14.0	137 14.6	134 15.1	131 15.7	129 16.2	127 16.6	124 17.3	122 17.9	120 18.5	118 18.4	116 19.6	114 20.3	112 21.1	110 22.1	109 22.5	107 23.6	105 24.8	103 26.0	102 26.6	101 27.3	100 28.0
160	156 11.4	152 12.3	149 12.7	145 13.2	142 13.7	139 14.2	136 14.8	133 15.3	130 15.9	128 16.4	126 16.9	123 17.6	121 18.1	119 18.7	117 19.3	115 20.0	113 20.7	112 21.1	110 22.1	108 23.1	107 23.6	106 24.2	103 26.0
170	166 10.5	161 11.3	157 11.7	153 12.2	150 12.6	146 13.1	143 13.5	140 14.0	137 14.6	134 15.1	131 15.7	128 16.4	126 16.9	124 17.3	122 17.9	120 18.4	118 19.0	116 19.6	114 20.3	112 21.1	110 22.1	109 22.5	106 24.2
180	175 9.7	170 10.5	166 10.8	161 11.3	157 11.7	153 12.2	150 12.6	146 13.1	143 13.5	140 14.0	137 14.6	135 14.9	131 15.7	128 16.4	126 16.9	124 17.3	122 17.9	120 18.4	118 19.0	116 19.6	115 20.0	113 20.7	110 22.1
190	184 9.4	179 9.8	174 10.1	169 10.6	165 10.9	160 11.4	156 11.8	153 12.2	149 12.7	145 13.2	142 13.7	139 14.2	136 14.7	133 15.3	130 15.9	128 16.4	126 16.9	124 17.3	121 18.1	119 18.7	117 19.3	115 20.0	112 21.1
200	193 8.9	187 9.2	182 9.6	176 9.9	171 10.4	167 10.7	163 11.1	158 11.6	154 12.1	151 12.4	147 12.9	144 13.4	140 14.0	138 14.4	135 14.9	132 15.5	129 16.2	127 16.6	125 17.2	122 17.9	120 18.4	118 19.0	114 20.3

[a] Register temperature, Fahrenheit. (Use upper value in each group).
[b] Register delivery volume in cubic feet per minute per 1000 Btu. (Use lower value in each group).
[c] Register delivery volumes in column 1 for zero length of duct.