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

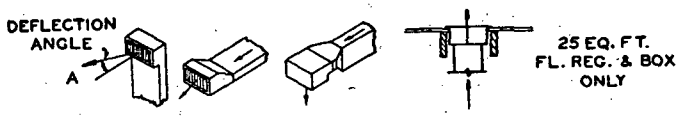


TABLE 4A. EQUIVALENT LENGTH FOR REGISTERS

| 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. For diffuser type registers see manufactures' catalogs.

FIG. 4. EQUIVALENT LENGTH OF FITTINGS (Concluded)

bonnet pressure is not high enough to accommodate the pressure loss through the registers, use a higher bonnet pressure. If the register pressure is critically large, it may be necessary to reduce it by either using two registers in place of one, or using smaller deflection angles.

b. Obtain actual duct loss by subtracting total register pressure loss, as determined from Tables 5 or 6, from maximum bonnet pressure.

c. Obtain the pressure drop in each duct per 100 ft by use of Table 8.

d. Determine duct size by means of air friction chart (such as Fig. 1, or Fig. 2, Chapter 32), volume (cfm), and pressure drop per 100 ft of duct.

B. *Return air branches.*

a. Select a low value of actual duct loss obtained from step b under item A for the suction loss of return duct system.

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, suction 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.



TABLE 3. SELECTION OF BONNET TEMPERATURE, REGISTER TEMPERATURE AND REGISTER DELIVERY (CFM).[a, b]
*(For Buildings Having a Heat Loss between 120,000 and 350,000 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 | 190 | 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 | 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 | 94 33.3 | 93 34.6 | 92 35.9 | 91 37.3 | 90 38.6 | 90 38.6 |
| 130 | 126 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 26.0 | 102 26.6 | 101 27.3 | 99 28.8 | 98 29.6 | 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 | 128 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 24.2 | 105 24.8 | 103 26.0 | 102 26.6 | 101 27.3 | 100 28.0 | 99 28.8 | 98 29.6 | 97 30.5 |
| 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 | 106 24.2 | 105 24.8 | 103 26.0 | 102 26.6 | 101 27.3 | 100 28.0 |
| 160 | 156 11.8 | 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 | 104 25.4 | 103 28.0 |
| 170 | 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 | 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 | 107 23.6 | 106 24.2 |
| 180 | 175 10.0 | 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 | 111 21.6 | 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 | 113 20.7 | 112 21.1 |
| 200 | 193 8.6 | 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 | 116 19.8 | 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.