

Leader diameter = 11.4, say 12 in.

Stack area = $0.7 \times 90 = 63$ sq. in. = say 5×12 in.

Register area = 90 sq. in. net area. Gross area = $1.6 \times$ net area = 12×12 or 12×14 in.

In like manner the leaders, stacks and registers are calculated for each room in the house.

Leaders, Stacks and Registers. (Code Method. See Art. 3, Sec. 1, 2, 3)

Living Room (Glass = 90, Net wall = 405, Cubic contents = 2405)

$$\text{Leader} = \left(\frac{90}{12} + \frac{405}{60} + \frac{2405}{800} \right) 9 = 155 \text{ sq. in.}$$

Register, same as Direct Method.

Owner's Room (Glass = 68, Net wall = 394, Cubic contents = 2275)

$$\text{Leader} = \left(\frac{68}{12} + \frac{394}{60} + \frac{2275}{800} \right) 6 = 90 \text{ sq. in.}$$

Stack and Register, same as Direct Method.

Assuming all air recirculated, the minimum furnace for the plant will be:

Grate Area = $0.0034 \times 132,370 = 450$ sq. in. = 24 in. diam. at 175 deg. register temperature. (7)

Grate Area = $0.0040 \times 132,370 = 530$ sq. in. = 26 in. diam. at 160 deg. register temperature. (8) (10)

If provision shall be made for certain outside air circulation, then increase the building heat loss by, say 25 per cent and obtain by equation (7) a 27-in. grate and by equations (8) and (10) a 29-in. grate.

TABLE 1. SUMMARY OF DATA APPLIED TO WARM AIR RESEARCH RESIDENCE

Rooms	From Chapter 2 on Heat Losses from Buildings B.t.u. Heat Losses <i>H</i>	Leader Area Sq. In.	Stack Area Sq. In. $0.7 \times LA$	Leader Diameter Inches	Stack Size Net	Register Size Gross
First Floor		$= 0.009H$				
Living.....	17250	155	---	14	-----	14×18
Dining.....	6810	61	---	9	-----	8×12
Breakfast.....	2300	21	---	8	-----	8×10
Kitchen.....	9210	83	---	11 or 12	-----	12×14
Sun.....	25710	230	---	Two 12	-----	Two 12×14
Hall and stair	12570	113	---	12	-----	12×14
Second Floor		$= 0.006H$				
Owners.....	15030	90	63	11 or 12	5×12	12×14
S. W. Bed.....	9800	59	41	9	$3\frac{1}{2} \times 12$	8×12
Bath.....	2450	15	10	8	3×10	8×10
N. Bed.....	14800	89	62	11 or 12	5×12	12×14
Third Floor		$= 0.005H$				
E. Bed.....	8220	41	29	8	3×10	8×10
W. Bed.....	8220	41	29	8	3×10	8×10

STANDARD CODE REGULATING THE INSTALLATION OF GRAVITY WARM AIR FURNACES IN RESIDENCES³

SIXTH EDITION

March 1, 1929

ARTICLE No. 1.—Meaning of the Term "Gravity Warm Air Furnace Heating System"

Gravity Warm Air Heating Systems, to which this code refers, shall consist of one or more warm-air furnaces, enclosed within casings, together with necessary appurtenances thereto, consisting of warm-air pipes and fittings; cold air or recirculating pipes; ducts, boxes and fittings; smoke-pipes and fittings; registers, borders, faces and grilles; the same being intended for heating buildings in which they may be installed.

ARTICLE No. 2.—Certified Measurements

Certified measurements on warm-air furnaces together with the name and number of that furnace, will be issued by authority of the *National Warm Air Heating Association*, when, if and as, the grate areas and heating surfaces have been accurately measured and approved by the Research Advisory Committee.

ARTICLE No. 3.—Method for Determining Size of Warm Air Pipes, Wall Stacks and Furnaces for Use in Residences

Method for Determining Sizes of Basement Warm Air Pipes

Section 1. Each First-Floor Room:

Divide square feet of glass by 12
Divide square feet of net outside wall by factor in Table A
Divide cubic contents by 800
Add together the above and multiply by 9
The result is the area of the basement pipe in sq. in.

Stated as an equation, this is:

$$\left\{ \begin{array}{l} \text{The sum of:} \\ \text{Glass (sq. ft.) (Note 1) } \div 12 \\ \text{Net Wall (sq. ft.) (Note 2) } \div \text{factor in Table A} \\ \text{Cubic Contents } \div 800 \end{array} \right\} \times 9 = \text{area of basement pipe}$$

Section 2. Each Second-Floor Room:

Divide square feet of glass by 12
Divide square feet of net outside wall by factor in Table A
Divide cubic contents by 800
Add together the above and multiply by 6
The result is the area of the basement pipe in sq. in.
(See Section 9. c)

Stated as an equation, this is:

$$\left\{ \begin{array}{l} \text{The sum of:} \\ \text{Glass (sq. ft.) (Note 1) } \div 12 \\ \text{Net Wall (sq. ft.) (Note 2) } \div \text{factor in Table A} \\ \text{Cubic Contents } \div 800 \end{array} \right\} \times 6 = \text{area of basement duct}$$

Section 3. Each Third-Floor Room:

Divide square feet of glass by 12
Divide square feet of net outside wall by factor in Table A
Divide cubic contents by 800
Add together the above and multiply by 5
The result is the area of the basement pipe in sq. in.

Stated as an equation, this is:

$$\left\{ \begin{array}{l} \text{The sum of:} \\ \text{Glass (sq. ft.) (Note 1) } \div 12 \\ \text{Net Wall (sq. ft.) (Note 2) } \div \text{factor in Table A} \\ \text{Cubic Contents } \div 800 \end{array} \right\} \times 5 = \text{area of basement duct}$$

³This Code is approved and issued by authority of the *National Warm Air Heating Association*, THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS and the *National Association Sheet Metal Contractors*. First edition, October 1, 1922; 2nd edition, February 1, 1923; 3rd edition, June 1, 1924; 4th edition, May 1, 1927; 5th edition, March 1, 1928; 6th edition, March 1, 1929.