d. All partition walls (or sections of these walls) in which heat stacks to second or third floor rooms are to be installed, shall be of sufficient size to accommodate stacks required to heat said rooms.

Chimneys

Section 2. a. The owner shall provide a chimney for the furnace constructed in a manner to comply with the following specifications.

b. The chimney must be absolutely smoke tight throughout its entire length, and must extend at least three feet (3′) above a flat roof or two feet (2′) above the ridges of peak roofs.

c. If built of a single thickness of brick or of cement blocks, it shall be lined throughout its entire length with fire clay flue lining, having not less than three-fourths inch (¾″) thickness. Flue lining to be laid in mortar and made air tight.

d. The furnace flue must have no other opening for attaching any fireplace, furnace, stove, range, water heater, gas or ventilating connection.

e. If necessary to offset the flue, it must be done in such a manner as not to reduce the cross sectional area or create a ledge or obstruction, where loose material may lodge.

f. Its narrowest internal dimension shall not be less than eight inches (8″) and no flue smaller than 8″ x 8″ rectangular or eight inch (8″) diameter round will be considered suitable when hard coal is to be burned, or 8″ x 12″ rectangular or ten inch (10″) round for soft coal or wood.

g. It is strongly recommended that nothing less than 8″ x 12″ internal dimensions be used in any case.

Note 2.—It is recommended that the height above the furnace grate be not less than twenty-six feet (26′).

Note 3.—It is strongly recommended that all new chimneys be built in strict accordance with the ordinance recommended by the *National Board of Fire Underwriters.*

ARTICLE No. 3.—Method for Determining Sizes 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 60,
(See Table A)
Divide cubic contents by 800,
Add together the above and multiply by 9.
The result is the area of the basement pipe.

{The sum of:
Glass (sq. ft.) (*Note 4*) ÷ 12
Net Wall (sq. ft.) (*Note 5*) ÷ 60
Cubic Contents ÷ 800} × 9 = 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 60,
(See Table A)
Divide cubic contents by 800,
Add together the above and multiply by 6.
The result is the area of the basement pipe.
(See Section 9, *b*)

{The sum of:
Glass (sq. ft.) (*Note 4*) ÷ 12
Net Wall (sq. ft.) (*Note 5*) ÷ 60
Cubic Contents ÷ 800} × 6 = Area of Basement Pipe

Section 3. Each Third Floor Room.

Divide square feet of glass by 12,
Divide square feet of net outside wall by 60,
(See Table A)
Divide cubic contents by 800,
Add together the above and multiply by 5.
The result is the area of the basement pipe.

{The sum of:
Glass (sq. ft.) (*Note 4*) ÷ 12
Net Wall (sq. ft.) (*Note 5*) ÷ 60
Cubic Contents ÷ 800} × 5 = Area of Basement Pipe

Basis of Working Rules for Pipes

a. These formulae are for 70 deg. temperature difference (outside temperature zero, inside temperature 70 deg. fahr.). When temperature difference is more than 70 deg., add 1½ per cent per deg. to final figures. When temperature difference is less than 70 deg., deduct 1½ per cent per deg. room final figures.

b. The values as given in Table A for use in the working rules, Article 3, Section 1, 2 and 3 are derived as follows:

Example.—The factor 60 in Table A, Item No. 1, is based upon a coefficient of heat transmission of 0.23 B.t.u. per square foot per degree difference per hour, thus:

$W \times 0.23 \times 70 \div 111 =$ sq. in. first floor leader to compensate for the heat loss through walls only.

In this,
W = net area of exposed wall in sq. ft.
0.23 = coefficient of transmission in B.t.u. per sq. ft. per degree difference per hr.
70 = difference in temperature of air on inside and outside of wall.
111 = heat delivering capacity of 1 sq. in. of first floor leader pipe for a register temperature of 175 deg. fahr.

Reduced to its simplest approximate form this is

$$\frac{W \times 9}{60}$$

Likewise substitute 167 for second floor and 200 for third floor in place of 111.

The values in Table A for the different types of walls were obtained by substitution of proper coefficient of heat transmission instead of 0.23 in the above formula.

TABLE A

(The factor 60 used in Art. 3, Secs 1, 2 and 3 is for buildings constructed as in item No. 1. When other types of walls are used substitute the appropriate factor as given below)

No. 1.—Frame wall constructed of siding, paper, sheathing, studding, lath and plaster	60
No. 2.—Frame wall constructed of siding or stucco direct to sheathing (no paper), lath and plaster	52
No. 3.—9 in. Brick Wall (no plaster)	40
No. 4.—9 in. Brick Wall, plastered one side	48
No. 5.—9 in. Brick Wall, air space, furred and plastered	65
No. 6.—13 in. Brick Wall, no plaster	53
No. 7.—13 in. Brick Wall, plastered one side	57
No. 8.—13 in. Brick Wall, air space, furred and plastered	75
No. 9.—4 in. Brick, 4 in. hollow tile, plastered	55
No. 10.—4 in. Brick, paper, sheathing, studding, lath and plaster (brick veneer)	68
No. 11.—8 in. Hollow tile stucco and plaster	67
No. 12.—8 in. Hollow tile, stucco furred and plastered	90
Roofs	
No. 13.—1 in. T & G. Sheeting, Tar and Gravel	48
No. 14.—1 in. T & G. Sheeting and Composition roof	40
No. 15.—1 in. T & G. Sheeting and Tin	24
No. 16.—Corrugated Iron on strips	9.3
Ceilings	
No. 17.—Lath and plaster without floor above	50
No. 18.—Lath and plaster with tight floor above	90
No. 19.—Metal without floor above	40
No. 20.—Metal with tight floor above	70

Method for Determining Size of Wall Stacks

Section 4. First Floor Rooms.

Same as Section 1.

Section 5. Second Floor Rooms.

Not less than 70 per cent of basement pipe area as determined in Section 2.

Where one stack is used to convey heat to two rooms, its net area shall be determined by adding together the areas of the two single stacks, which would be required to take care of the heat losses for each room where single stacks used.

Section 6. Third Floor Rooms.

Not less than 70 per cent of basement pipe area as determined in Section 3.

Explanatory Notes

Note 4.—In obtaining glass surface use full casement opening. An outside door is figured as glass.

Note 5.—To obtain net outside wall multiply height by width and deduct the glass in all windows and outside doors. For all rooms with attic spaces immediately above full ceiling areas shall be taken into account, using Table A.

Note 6.—For rooms having unusual exposure, ordinarily north, northeast and northwest, add 15 per cent to pipe area. For east and west exposure, add 10 per cent.