The formula allows 1.75 sq. in. of warm-air pipe area for each square inch of grate area, for the furnace having a ratio of heating surface to grate surface of 20 to 1. For furnaces having other ratios of heating surfaces to grate surface, it adds 2 per cent or deducts 2 per cent for each unit above or below a ratio of 20.

Application:

		No. 1 Positive Correction	No. 2 No Correction	No. 3 Negative Correction
Grate area, square inch.	=	346	346	346
Heating surface area, square inch.	=	7540	6920	5665
Ratio heating surface area to grate area	=	21.8 to 1	20.0 to 1	16.4 to 1
R − 20	=	1.8	0.0	−3.6
Correction per cent	=	3.6	0.0	−7.2
1.75 *G*	=	606	606	606
L = 1.75 *G* + correction	=	628	606	562

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.

b. In second floor duplex, flats or apartments where separate heating plants are used, add 50 per cent to the total net *calculated* areas as determined in Art. 3, Sec. 5. This represents the required warm-air pipe capacity in square inches of the furnace for the second floor.

c. Every warm-air furnace shall be equipped with a water pan or other humidifying device.

d. In the application of any gas or oil fired furnace to any warm-air heating system, any deviation from the Standard Code shall apply only to the furnace itself.

ARTICLE No. 4.—Installation—Location of Furnace

Section 1. The location of the furnace shall equalize the length of warm-air runs as far as possible, yet give necessary preference to pipes supplying living rooms, dining rooms and main halls.

Foundation

Section 2. a. Furnace foundation of brick, cement, or other incombustible material must be provided. Said foundation to extend at least fifteen inches (15″) at rear and sides of furnace casing and at least thirty-six inches (36″) in front of furnace casing. Foundation to be level.

b. Where it is necessary to place a heater on a combustible floor, not less than 4 in. (4″) of hollow tile shall be used in every instance, having joints matched in such a way that air passage will be free from side to side, so that at no time will the removal of ashes or the handling of coal close up these openings. Such foundation shall be constructed upon, and covered with continuous sheet metal plates, of not less than No. 24 gauge metal, having all joints substantially riveted or double seamed and the bottom sheet to have the edges turned up at least one inch. This floor covering shall extend under the whole of the firebox and ashpit of the furnace and outwardly not less than two feet on all sides.

Setting or Assembling of Furnace

Section 3. a. The base ring of any portable warm-air furnace shall be cemented to the foundation, and cement flushed in around the back of the base ring, making an air-tight joint. The furnace parts shall be assembled plumb and level, and in a workmanlike manner.

b. All sections and joints shall be properly fitted. Joints requiring cement shall be well filled and all bolts shall be drawn up tightly.

Casings

Section 4. a. Warm-air furnaces shall be enclosed in metal casings or walls of brick, tile or concrete.

b. Portable. Sheet metal casings including casing tops or bonnets shall be made of galvanized sheets, not lighter than 26 U. S. standard gauge. They shall fit the castings and casing rings closely, so as to be dust-tight, and shall be securely fastened to the front. The casing shall be lined from the upper casing ring down to a line on a level with the grate.

c. When side collars are used the casing top or bonnet must be of sufficient height so that the largest warm-air pipe can be taken from side without ovaling. In no case shall a distance less than eight inches (8″) be maintained between the top of any furnace and the bonnet.

d. Any furnace, the casing top of which shall come within twelve inches (12″) of a combustible floor, ceiling or joist, shall be protected by a metal shield, extending not less than eighteen inches (18″) beyond the casing of said furnace. This shield shall be suspended at least 2 in. below woodwork, allowing free air space between shield and woodwork. No furnace casing or top, coming nearer than six inches (6″) of ceiling or joists shall be allowed in any case.

e. Openings for side casing collars shall be cut into the casing top or bonnets, so that the tops of all openings are on a level. Casing collars shall be fitted into place with a proper flange, or bead on the outside and drawn up on the inside, making a dust-tight joint. All collars shall be of same size as the warm-air pipes to which they are to be connected.

f. Brick, cement or hollow tile casings shall be constructed as follows: Walls shall be not less than eight inches (8″) in thickness, and shall be constructed air-tight. The least inside dimension of rectangular casings shall be the same as that of the portable casing of a corresponding size of furnace. Walls shall be carried to the same height as the portable walls, allowing not less than eight inches (8″) between the top of the furnace and the bottom of the top cover. After placing the collars for the warm-air pipes, continue the masonry up two inches (2″) above the top of the collars, lay single or tee irons across the furnace top, spaced eight inches (8″), cover these with sheet metal not less than 26 U. S. standard gauge, cover the sheet metal with masonry or sand and run the side walls four inches (4″) above the roof of the furnace. A galvanized iron casing bonnet may be used on a brick set furnace.

Provision shall be made in the walls for a manhole to give ingress to heater.

Warm Air Pipes in Basement

Section 5. a. All warm-air pipes shall be made of bright tin not lighter than IC, or galvanized iron. Side seams shall be locked seams. All joints shall be either double seamed or lapped not less than one and one-quarter inches (1¼″) and such joints shall be match-beaded, or beaded and soldered, or riveted. All pipes and fittings shall be properly secured to ceiling or joist. No solder or riveted joint is required where round pipe slips over the casing collar or enters boot or box. Any pipe twelve inches (12″) or greater in diameter shall not be made of material lighter than IX tin or No. 26 U. S. standard gauge galvanized iron.

b. All warm-air pipes in the basement shall have an upward pitch of not less than one inch (1″) per running foot.

c. No warm-air pipe shall run within one inch (1″) of any woodwork unless such woodwork is covered with asbestos paper and the paper covered with tin or iron.

d. All warm-air pipes in the basement shall be provided with dampers supported on both sides not more than two feet (2′) from the casing.

e. Where warm-air pipes pass through a masonry wall, a metal thimble shall be provided, having a diameter at least 1 in. greater than the pipe, and pipe supported in such a manner that the air space is uniform on all sides.

Wall Stacks

Section 6. a. Single Stacks. All single wall stacks or wall pipes, heads, boots, ells, tees, angles and other connections shall be made of bright tin or galvanized iron and shall be covered with not less than one thickness of 12 lb. per one hundred (100 sq. ft.) square feet of asbestos paper. All studding and other woodwork facing said pipe shall be lined with metal and metal lath used in place of wood lath. An air space of not less than five-sixteenths (5/16″) of an inch shall be allowed on the two sides nearest the vertical studs.