

INSTALLATION

The two most important considerations involved in the installation of a space heater are safety and chimney draft.

A thorough examination should be made of the chimney prior to connecting the heater, as too often chimney faults, such as loose brick, broken tile, cracks, and open cleanouts, are the cause of poor performance rather than the heater itself. Some installation procedures for obtaining the most available chimney draft are:

1. Repair the chimney before installing the heater by replacing all broken brick or tile, sealing cracks and open cleanouts.
2. Place the heater as close as possible to the chimney outlet to avoid long horizontal runs of stovepipe.
3. Seal the joints between each length of stovepipe, and slope the horizontal sections approximately one inch per foot upward toward the chimney.
4. Do not have any section of stovepipe higher than the point of entry into the chimney.
5. If external factors such as trees or buildings overhanging the top of the chimney might create a downdraft condition, use a downdraft header of suitable design if necessary.
6. A barometric type check damper should be used where excessive or fluctuating drafts are encountered.

The following are some necessary installation safety precautions that should be observed:

1. If the stovepipe must pass through a combustible partition a suitable insulating thimble should be provided.
2. The heater should be placed at distances from combustible partitions as stipulated by the manufacturer, and a noncombustible floor board should be provided.
3. Safe provision for storage of fuel oil should be assured, and all oil lines should be tested for tightness.
4. All gas lines and connections should be tested for tightness.

REFERENCES

- ¹ See A.S.H.V.E. TRANSACTIONS, Vol. 35, 1929, pp. 322 and 332.
- ² See A.S.H.V.E. TRANSACTIONS, Vol. 36, 1930, p. 42.
- ³ See A.S.H.V.E. TRANSACTIONS, Vol. 37, 1931, p. 23.
- ⁴ See A.S.H.V.E. TRANSACTIONS, Vol. 44, 1933, p. 366.
- ⁵ *I = B = R Testing and Rating Code for Low Pressure Heating Boilers (Institute of Boiler and Radiator Manufacturers).*
- ⁶ *I = B = R Ratings for Cast-Iron Boilers (Institute of Boiler and Radiator Manufacturers).*
- ⁷ Engineering Standards, Part II, Net Square Feet Radiation Loads in 70 Deg Fahr., Recommended for Low Pressure Heating Boilers, 1943 (*Heating, Piping and Air Conditioning Contractors National Association*).
- ⁸ Comfort Heating, 1938, pp. 35 to 39 (*American Gas Association*).
- ⁹ Gravity Code and Manual for the Design and Installation of Gravity Warm Air Heating Systems, Section No. 5, Second Edition, Jan. 1945, (*National Warm Air Heating and Air Conditioning Association*).
- ¹⁰ Recommended forms for municipal installation and fire codes are included in Manual 7—Code and Manual for the Design and Installation of Warm Air Winter Air Conditioning Systems, Second Edition, 1947, (*National Warm Air Heating and Air Conditioning Association*).
- ¹¹ American Standard Approval Requirements for Gas Space Heaters, A.S.A. Z21.11, 1942 (*American Standards Association*).
- ¹² American Standard Listing Requirements for: Automatic Pilots, Z21.20, 1940, Gas Appliance Thermostats Z21.23, 1940, Domestic Gas Appliance Regulators, Z21.18, 1934, Automatic Main Gas-Control Valves, Z21.22, 1935, (*American Standards Association*).

CHAPTER 19

CHIMNEYS AND DRAFT CALCULATIONS

Theoretical and Available Draft, Determining Chimney Sizes, Factors Affecting Required Draft, Domestic Chimneys, Observed Test Performance, Draft Requirements of Domestic Appliances, Chimneys for Gas Heating, Construction Details, General Considerations

A DRAFT, in the older sense, is a current of air and the draft of a furnace or boiler is that air current which flows through the fire-box and furnishes the oxygen for combustion. In engineering, however, the word *draft* has come to mean that pressure difference which causes this air current to flow and the word will be used in this sense in this chapter.

Draft is usually measured in inches of water and it is proper to speak of the draft in the fire-box or in the smoke breeching, etc., meaning the difference in pressure between the gases within and the air without those parts of a system. Draft is called positive when the pressure within such a part is less than that outside.

Draft is classified as natural and mechanical, depending on whether it is produced by a chimney or by a blower, and mechanical draft is further classified as induced or forced, depending on whether the air is drawn through or forced through the combustion chamber.

Chimneys can serve both to create a draft and to dispose of combustion products at a desirable height. For the latter purpose, chimneys, stacks, or, in the case of ships, funnels, are used in conjunction with mechanical-draft systems.

THEORETICAL DRAFT

If the air in one of two equal chimneys is heated while that in the other is not, the air in the heated chimney will be less heavy than that in the other chimney and a manometer or other pressure gage connecting the two at the bottom will indicate a pressure difference, called natural draft. The pressure of the air at the tops of the two chimneys will be equal, so that the pressure difference between them at the bottom will depend only on their height and the difference in density of the air they contain. The density of the air in either chimney is inversely proportional to its absolute temperature, so that the difference in pressure between them at the bottom will be proportional to their height and to the difference between the reciprocals of the absolute temperatures within them.

The pressure at the bottom of an unheated (and uncooled) chimney will be the same as that of the air outside, so that the unheated chimney can be dropped from the foregoing illustration. The manometer reading will be the same if its free connection is left open to the atmosphere.

These considerations in conjunction with those of barometric pressure and the difference in density of flue gases from that of air lead to the following formula:

$$D_t = 2.96 HB_o \left(\frac{W_o}{T_o} - \frac{W_e}{T_e} \right) \quad (1)$$