Table 3. Minimum Round Chimney Diameters for Gas Appliances (Inches)

Height of Chimney Feet	Gas Consumption in Thousands of Btu per Hour								
	100	200	300	400	500	750	1000	1500	2000
20	4.50	5.70	6.60	7.30	8.00	9.40	10.50	12.35	13.85
40	4.25	5.50	6.40	7.10	7.80	9.15	10.25	12.10	13.55
60	4.10	5.35	6.20	6.90	7.60	8.90	10.00	11.85	13.25
80	4.00	5.20	6.00	6.70	7.35	8.65	9.75	11.50	12.85
100	3.90	5.00	5.90	6.50	7.20	8.40	9.40	11.00	12.40

but should resist the corrosion of dilute solutions of sulphur trioxide in water. Sheet aluminum, as well as some other materials, seems to serve this purpose very well.

When condensation in a chimney proves troublesome, it may be necessary to provide a drain to a dry well or sewer. The cause of the excessive condensation should be investigated and remedied if possible. This may be done by raising the flue temperature slightly or increasing the size of the back-draft diverter. The protection of unlined chimneys has been investigated and the results indicate that after the loose material has been removed, the spraying with a water emulsion of asphalt-chromate provides an excellent protection.

A chimney for a gas-fired boiler or furnace should be constructed in accordance with the principles applicable to other boilers. Where the wall forming a smoke flue is made up of less than an 8-in. thickness of brick, concrete, or stone, a burnt fire clay flue tile lining should be used. Care should be used that the lengths of flue tile meet properly with no openings at the joints. Cement mortar should be used for the entire chimney.

Table 3 gives the minimum cross-sectional diameters of round chimneys (in inches) for various amounts of heat supplied to the appliance, and for various chimney heights. This is in accordance with *American Gas Association* recommendations.

PROBLEMS IN PRACTICE

1 ● What are the principle factors influencing the intensity of natural draft?

The intensity of natural draft depends largely upon the height of chimney above the grate bar level and the temperature difference between the chimney gases and the atmosphere.

2 ● What two kinds of draft need be considered?

Natural draft caused by temperature differences, and artificial draft caused by mechanical forcing.

3 ● What is the effective height of a chimney?

The height from the grate level to the top of the chimney is the effective height in producing natural draft.

4 ● What dual purpose does a tall chimney fulfill?

A tall chimney primarily creates the necessary draft to move the air required for the combustion process and to move the products of combustion, and secondarily it discharges the gases at a high elevation to prevent them from becoming a nuisance.

5 ● a. Name the principal advantages of natural draft.
b. Name the principal disadvantages of natural draft.

a. Simplicity, reliability, freedom from mechanical parts, low cost of maintenance, relatively long life, relatively low depreciation, operation with no power requirement.

b. Lack of flexibility, irregularity, dependence on surroundings, susceptibility to temperature changes.

6 ● How is mechanical draft created?

By forced draft, by induced-draft fans, or by a Venturi chimney.

7 ● Distinguish between theoretical and available draft.

Theoretical draft is the difference in pressure inside and outside the base of a chimney when it is under operating temperatures but when there are no gases flowing. Available draft is less than theoretical draft by the friction loss due to the flow of gases through the chimney.

8 ● Explain the term efficiency of a natural draft chimney.

The efficiency of a chimney is the ratio of the work it does in moving gases to the theoretical amount of power it generates.

9 ● How is the available draft used in a heating plant?

The available draft at the base of the chimney is used to overcome the loss in pressure through the grate, the fuel bed, the boiler passes, the breeching.

10 ● What are some of the factors that influence the draft loss through the fuel bed?

Uniformity and size of coal, the amount of ash mixed with the fuel on the grate, thickness of fuel bed, rate of combustion, amount of air supply as related to the coal burning rate.

11 ● How does the volatile matter content affect the draft loss through the fuel bed?

The higher the volatile content and the lower the fixed carbon content, the lower the draft loss.

12 ● In what cases will there be no fuel bed draft loss?

In oil, gas, and powdered fuel firing the fuel is mixed and burned in suspension; consequently, no measurable resistance is encountered in the combustion zone.

13 ● Is it possible to state an average value for the draft loss through a boiler and its setting?

No. The draft loss varies widely and depends on many factors such as the size and type of gas passageways. The manufacturer is usually able to supply such information.

14 ● Of what significance is the CO_2 content of stack gases in establishing draft loss?

The CO_2 content of the exit gases is a measure of the completeness of the combustion and the amount of excess air supplied. Low CO_2 indicates a high excess of air and hence a high draft loss.