

liberated by the fuel. Under such conditions no manual attention to the fuel bed should be required, other than the removal of clinker in stokers which operate on this principle of ash removal.

As in all combustion processes, the maintenance of the correct proportions of air and fuel is essential. It is desirable to supply the minimum amount of air required to properly burn the fuel at the rate of feed.

While there may be only slight variations in the rate at which the coal is being fed due to variations in the size or density of the coal, there may be wide variations in the rate of air flow as the result of changes in fuel bed resistance. These changes in resistance may be caused by changes

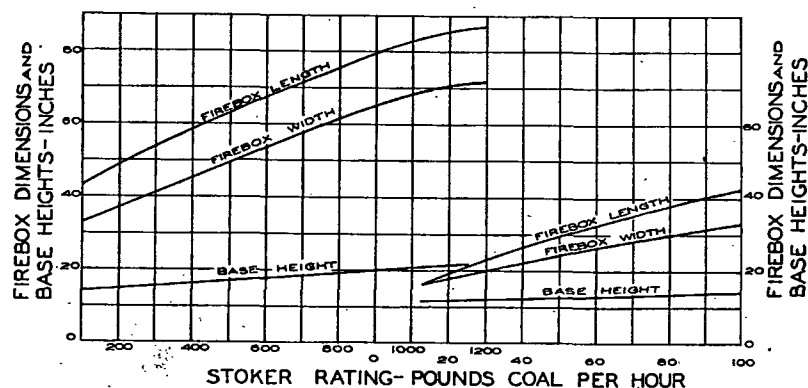


FIG. 11. SUGGESTED MINIMUM FIREBOX DIMENSIONS AND BASE HEIGHTS^a.

^aFor reference in selecting or designing boilers and furnaces for stoker firing. Dimensions shown are for net inside clearance at grate level using coal with heating value of not less than 12,000 Btu per pound. Under certain conditions smaller fireboxes will permit satisfactory performance but these dimensions are preferred normal minimums.

in the porosity of the fuel bed due to variations in size or friability of the coal, ash and clinker accumulation, and variations in depth of the fuel bed. Because of this variable fuel bed resistance, many bituminous stokers, even in the smaller domestic sizes, incorporate air controls which automatically compensate for these changes in resistance and maintain a constant air fuel ratio.

It is desirable on most stoker installations to provide automatic draft regulation in order to reduce air infiltration and provide better control during the banking or off periods of the stoker. The efficiency of combustion may be determined by analyzing the flue gases as explained in Chapter 8.

Furnace Design

Although there is considerable variation in stoker, boiler, and furnace design, the stoker industry, from long-time experience, has established certain rules for the proportioning of furnaces for domestic, and com-

CHAPTER 10. AUTOMATIC FUEL BURNING EQUIPMENT

mercial stokers. The stoker installer, and designer of stoker-fired equipment should give careful consideration to these factors.

The *Stoker Manufacturers Association* has published standard recommendations on setting heights for stokers having capacities up to 1200 lb of coal per hour².

The empirical formulas for determining these setting heights are:

For burning rates up to 100 lb coal per hour

$$H = 0.1125 B + 15.75 \quad (1)$$

For burning rates from 100 to 1200 lb coal per hour

$$H = 0.03 B + 24 \quad (2)$$

where

H = minimum setting height, inches, for steel boilers. For cast-iron boilers height may be $\frac{1}{8} H$.

B = burning rate coal per hour, pounds.

Standards for minimum firebox dimensions and base heights also have been formulated by the *Stoker Manufacturers Association* as shown in Fig. 11³.

In considering these recommendations, it should be understood that they show the average recommended minimum. There are many factors affecting the proper application of stokers to various types of boilers and furnaces, and, in certain instances, setting height or firebox dimensions shown in the standards may be modified without impairing performance. Such modification rests with the experience of the installer, or designer, with a particular stoker, the type of fuel used, and the construction of the boiler or furnace.

Sizing Stokers and Stoker Ratings

The capacity or rating of small underfeed stokers is usually stated as the burning rate in pounds of coal per hour. The *Stoker Manufacturers Association* has adopted a uniform method of rating stokers which is published in convenient tables and charts for selecting the size of stoker⁴. The required capacity of the stoker is calculated as follows:

$$\frac{\text{Load (Btu per hour)}}{\text{Heating value of coal (Btu per pound)} \times \text{over-all efficiency of stoker and boiler or furnace}} = \text{Stoker burning rate required (pounds of coal per hour)}$$

In determining the total load placed on a stoker-fired boiler by a steam or hot water heating system, a piping and pick-up factor of 1.33 is commonly used in sizing the stoker, but this factor should be increased at times due to unusual conditions.

²Minimum Setting Heights. Copies of this standard may be obtained from the *Stoker Manufacturers Association*, 307 N. Michigan Ave., Chicago 1, Ill.

³Suggested Minimum Firebox Dimensions and Base Heights. Copies of this standard may be obtained from the *Stoker Manufacturers Association*, 307 N. Michigan Ave., Chicago 1, Ill.

⁴Uniform Stoker Rating Code. Copies of this standard may be obtained from the *Stoker Manufacturers Association*, 307 N. Michigan Ave., Chicago 1, Ill.