

When the estimated heat emission of the piping (connecting radiation, and other apparatus to the boiler) is not known the net load to be considered for the boiler may be determined from Table 4.

Selection of Gas-Fired Boilers

Gas-heating appliances should be selected in accordance with the percentage allowances given in Fig. 3. These factors are for thermostatically-controlled systems; in case manual operation is desired, a warming-up allowance of 100 per cent is recommended by the A.G.A. A gas boiler selected by the use of the A.G.A. factors will be the minimum

TABLE 4. BOILER RATINGS BASED ON NET LOAD^a

HAND FIRED RATINGS		MECHANICALLY FIRED RATINGS	
Steam Radiation Sq Ft	Net Load ^b Steam Radiation Sq Ft	Steam Radiation Sq Ft	Net Load ^b Steam Radiation Sq Ft
1,800	1,389	2,190	1,695
2,200	1,702	2,680	2,089
2,600	2,020	3,160	2,461
3,000	2,335	3,650	2,853
3,500	2,732	4,250	3,335
4,000	3,135	4,860	3,830
4,500	3,540	5,470	4,330
5,000	3,945	6,080	4,834
6,000	4,770	7,290	5,850
7,000	5,608	8,500	6,885
8,500	6,885	10,330	8,490
10,000	8,197	12,150	10,125
12,500	10,417	15,180	12,650
15,000	12,500	18,220	15,183
17,500	14,584	21,250	17,708
20,000	16,667	24,290	20,242
25,000	20,834	30,360	25,300
30,000	25,000	36,430	30,359
35,000	29,167	42,500	35,417

^aAdopted by the Steel Heating Boiler Institute in cooperation with the Bureau of Standards, United States Department of Commerce Simplified Practice Recommendation R 187-36.

^bThe net load is made up by the sum of the estimated design load, items 1 and 2 (pages 257 and 258). All net loads are expressed in 70 F. For hand-fired boiler ratings less than 1800 sq ft of steam or 2880 sq ft of water and mechanically-fired boiler ratings of 2190 sq ft of steam or 3500 sq ft of water, apply the factor 1.3 to the net load to determine the boiler size. For water boilers use the equivalent net load for steam boilers of similar physical size.

size boiler which can carry the load. From a fuel economy standpoint, it may be advisable to select a somewhat larger boiler and then throttle the gas and air adjustments as required. This will tend to give a low stack temperature with high efficiency and at the same time provide reserve capacity in case the load is under-estimated or more is added in the future.

Conversions

The conversion of a coal or oil boiler to gas burning is simpler than the reverse since little furnace volume need be provided for the proper combustion of gas. When a solid fuel boiler of 500 sq ft (or less) capacity is converted to gas burning, the necessary gas heat units should be approximately double the connected load. The presumption for a conversion job is that the boiler is installed and probably will not be made larger;

therefore, it is a matter of setting a gas-burning rate to obtain best results with the available surface. Assuming a combustion efficiency of 75 per cent for a conversion installation the boiler output would be $2 \times 0.75 = 1.5$ times the connected load, which allows 50 per cent for piping tax and pickup. In converting large boilers, the determination of the required Btu input should not be done by an arbitrary figure or factor but should be based on a detailed consideration of the requirements and characteristics of the connected load.

An efficient conversion installation depends upon the proper size of flue connection. Often the original smoke breeching between the boiler and chimney is too large for gas firing, and in this case, flue orifices can be used. They are discs provided with an opening of the size for the gas input used in this boiler. The size should be based on 1 sq in. of flue area for each 7500 hourly Btu input.

If dampers are found in the breeching they should be locked in position so that they will not interfere with the normal operation of the gas burners at maximum flow. In the case of large boiler conversions, automatic damper regulators proportion the position of the flue dampers to the amount of gas flowing and may be substituted for existing dampers. Generally in residence conversions automatic dampers are not of the proportioning type but close the flue during the off periods of the gas burners. Automatic shutoff dampers should be located between the back draft diverter and the chimney flue. Automatic dampers are usually designed to operate with electric contact mechanism, but frequently an arrangement is utilized which functions with mechanical fluid or gas pressure.

Physical Limitations

As it will usually be found that several boilers will meet the specifications, the final selection of the boiler may be influenced by other considerations, some of which are:

1. Dimensions of boiler.
2. Durability under service.
3. Convenience in firing and cleaning.
4. Adaptability to changes in fuel and kind of attention.
5. Height of water line.

In large installations, the use of several smaller boiler units instead of one larger one will obtain greater flexibility and economy by permitting the operation, at the best efficiency, of the required number of units according to the heat requirements.

Space Limitations

Boiler rooms should, if possible, be situated at a central point with respect to the building and should be designed for a maximum of natural light. The space in front of the boilers should be sufficient for firing, stoking, ash removal and cleaning or renewal of flues, and should be at least 3 ft greater than the length of the boiler firebox.

A space of at least 3 ft should be allowed on at least one side of every boiler for convenience of erection and for accessibility to the various