to increase the calculated heat loss or the equivalent direct radiation load by an appropriate amount for starting and piping, and to select the boiler or furnace with the proper rating.

The rating given by the *American Gas Association* Laboratory is not only a conservative rating when considered from the standpoint of capacity and efficiency, but is also a safe rating when considered from the standpoint of physical safety to the owner or caretaker. The rating that is placed upon an appliance is limited by the amount of gas that can be burned without the production of harmful amounts of carbon monoxide. Gas boilers are available with ratings up to 14,000 sq ft of steam, while furnaces with ratings up to about 500,000 Btu per hour are available.

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Chapter 12

HEAT AND FUEL UTILIZATION

Fuel Consumption Records, Calculated Heat Loss Estimation Method, Maximum Rate of Fuel Burning, Degree-Day Method, Unit Fuel Consumption per Degree-Day, Maximum Demands and Load Factors

MANY methods are in use for estimating in advance of actual operation the anticipated heat or fuel consumption of heating plants over long or short periods. With suitable modification in procedure these same general methods are frequently useful in checking the degree of effectiveness with which heat or fuel is utilized during plant operation.

In applying any of these estimating methods to the consumption of a particular building plant it should be noted that (a) reliable records of past heat or fuel consumptions of *this* building will usually produce more trustworthy estimates of future consumptions than will any data obtained by averages or from other similar buildings; (b) where no past records exist useful data can sometimes be obtained from records of similar buildings with similar plants *in the same locality;* (c) records of consumption which are averages from *many types of plants in many* types of buildings in various localities, can produce no better than an average estimate which may be far from accurate; (d) estimates based on computed heat losses without the benefit of operating data are wholly dependent on how well the computation represents the actual facts.

Where records of past consumptions are available they should be examined for reliability to be sure that the records show fuel or heat for the heating plant only, or else make a suitable allowance for fuel used for other purposes, such as heating service water. Weights and measures shown on invoices may not always agree with fuel used, for residues left in bins or tanks may represent a considerable fraction of the fuel charged to a building. Generally, plant operating records of fuel used are to be preferred to those obtained from accounting or bookkeeping offices from fuel invoices.

Records from similar buildings even in the same locality should be examined with care before being used as the basis of estimates. The type of heating system, the quality of supervision in manual plants, the kind of control in automatic plants, and the attention given to the plant operation are all factors in fixing the consumption in any building. Many times these factors do not show up in superficial examination and are even difficult to evaluate when known to be present. Especially check the