

HEAT EQUIVALENTS OF ELECTRICITY

The relation between electrical energy and heat and power is given by the following equations:

1 horsepower	= 746 watts.
	= 33,000 ft lb per min
1 Btu	= 777.64 ft lb
1 horsepower-hour	= $\frac{33,000 \times 60}{777.64} = 2,546$ Btu per hour.
1 watt-hour	= $\frac{2,546}{746} = 3.415$ Btu per hour.
1 kilowatt (kw)	= 1,000 watts.
	= $\frac{3,415}{160} = 21.3$ sq ft of hot water radiation based on a heat emission of 160 Btu per square foot.
	= $\frac{3,415}{240} = 14.2$ sq ft equivalent of steam radiation, based on a heat emission of 240 Btu per square foot.

Chapter 21

HEATING WITH EXHAUST STEAM

Adjustment Between Heating Loads and Exhaust Steam; Heating Load and Amount of Exhaust Steam Available; Procedure for Making Analysis; Re-Heated Exhaust Steam.

LARGE industrial plants, hotels and office buildings still find it profitable to maintain their individual power plants if care is taken in the utilization of the exhaust steam, especially for heating purposes.

The exhaust steam may be circulated directly through the radiators, heaters, air heaters, humidifiers or other elements of a heating, or of a heating and ventilating system or it may be used for heating water which in turn may be circulated through similar elements of a hot water heating system. It may also be used for domestic hot water heating.

Frequently there is a fluctuating load on the power or electric generating apparatus which in turn produces fluctuating quantities of exhaust steam. The quantity of steam required for heating is also variable. These two variables do not, as a rule, coincide so that the total quantity of exhaust steam produced may be either a certain percentage less or a certain percentage more than the total quantity of steam required for heating, or for heating and ventilating either during the heating season or throughout the year. These relations change throughout the day and night and throughout the seasons of the year.

There are also wide variations in the heating requirements due to changes in weather conditions and wide variations in the exhaust produced due to such changes as in the demands for lighting on dark or light days, for elevator power during rush or slack periods, for air conditioning on good or bad days and for many other variables in the demands for power or light, depending on the character of building and its operating requirements.

ADJUSTMENT BETWEEN HEATING LOADS AND EXHAUST STEAM

The way in which the quantities of exhaust steam produced and the quantities of steam required during the various intervals of time throughout the year coincide will determine how much may be used, how much must be thrown away and how much live steam must be used to supplement the exhaust steam deficit, unless some means is adopted for adjusting the supply to the demand.

One method of making this adjustment is to store exhaust steam or its equivalent in heat, when it is in excess of the demand and feed this to the system when the exhaust being produced is below the demand. Hot