

TABLE 9. TYPICAL OPERATING CONDITIONS FOR TWO TYPES OF LOAD

TYPE OF ENCLOSURE	LOAD, BTU PER HOUR			RATIO SENSIBLE TO TOTAL	AIR ENTERING COIL		OPERATING BALANCE POINT		
	Sensible	Latent	Total		F Deg	Per Cent R.H.	Evaporator Temp F Deg	Condenser Pressure Lb per Sq In.	Per Cent Sensible Heat
Restaurant.....	103,000	45,000	148,000	0.695	82	45	34.4	123	69.9
Office.....	121,000	27,000	148,000	0.820	82	45	42.2	100	82.1

where the indirect system is required. The driving mechanism can be a steam turbine or electric motor. The steam jet system is used where steam is available and cooling water can be had in large quantities.

It will be noted by referring to Fig. 14 that all systems using compressors have a common characteristic and that is that the capacity varies with the evaporating temperature. Not only can the equipment be selected to produce a given result, but the performance can be predicted under varying load conditions by the simple expedient of using the variable of evaporating temperature as the abscissa and the load or capacity as the ordinate in a series of curves.

Manufacturers of compressors and cooling coils furnish performance data for apparatus that can be plotted in the form of curves similar to those shown in Fig. 16. The performance of a compressor is plotted as a series of curves, each curve being drawn for a given condensing pressure. The performance of a direct expansion coil at two different air velocities is plotted on the same graph. The operating point will be, of course, where the two curves cross.

Data given in Table 9 illustrate two types of conditioned enclosures having the same total load of 148,000 Btu per hour, but with two different ratios of sensible to total heat. In the case of the office with a ratio of

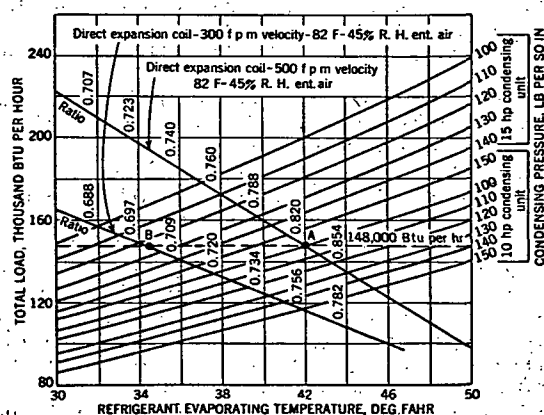


FIG. 16. COMPRESSOR AND COIL PERFORMANCE

82 per cent sensible to total heat, the operating point A in Fig. 16 is found to be 42.2 F evaporating temperature with a face velocity of 500 fpm. In the case of the restaurant, with a ratio of 69.5 per cent sensible to total heat, the air velocity is lowered to 300 fpm and the evaporating temperature is lowered to 34.4 F as shown in point B of Fig. 16. In order to obtain the same capacity, a larger condensing unit is used. This illustration assumes zero pressure drop through the suction line. The pressure drop can be taken into account by shifting the compressor performance curves by the amount of pressure drop expressed in Fahrenheit degrees.

ABBREVIATIONS AND SYMBOLS IN CHAPTER

- (CP) = coefficient of performance, ratio of refrigerating effect to the heat equivalent of the compressor work.
- (CVE) = clearance volumetric efficiency.
- d = internal diameter in inches.
- H_i = cooling load in tons.
- h_d = enthalpy of vapor at condition of discharge from compressor.
- h_{to} = enthalpy of liquid at discharge from compressor.
- h_{td} = enthalpy of liquid at discharge of expansion valve.
- h_{te} = enthalpy of liquid at entrance to expansion valve.
- h_m = enthalpy of mixture.
- h_v = enthalpy of saturated vapor.
- h_{vd} = enthalpy of saturated vapor at discharge of valve or compressor.
- h_{ve} = enthalpy of saturated vapor at state s entering compressor.
- hp = horsepower.
- p_d = pressure of saturated liquid and vapor at discharge of compressor.
- p_s = pressure of saturated liquid.
- psig = pressure pounds per square inch, gage.
- psia = pressure pounds per square inch, absolute.
- Q = quantity of heat, Btu.
- Q_c = heat loss from condenser, Btu per pound refrigerant.
- Q_i = heat dissipated in cooling water, Btu per hour.
- s = entropy.
- Δs = entropy change between suction and discharge.
- T = absolute temperature, Fahrenheit degrees.
- T_{ave} = average temperature, Fahrenheit degrees, absolute, of gas passing through compressor.
- T_c = condenser temperature, Fahrenheit degrees, absolute.
- T_s = evaporator temperature, Fahrenheit degrees, absolute.
- (TVE) = total volumetric efficiency.
- t_{sd} = degrees superheat at discharge condition of vapor leaving compressor.
- t_d = discharge temperature, Fahrenheit degrees.
- V_c = clearance, percentage of volume, swept by piston, which is contained in spaces at end of cylinder when piston is at end of stroke (clearance includes valve spaces, etc.).
- v_s = specific volume of gas at suction, cubic feet per pound.
- v_d = specific volume of gas at discharge, cubic feet per pound.
- W_r = refrigerant rate, pounds per minute.
- x = proportion of liquid in mixture of vapor and liquid.

REFERENCES

- Application and Economy of Steam Jet Refrigeration to Air Conditioning, by A. R. Mumford and A. A. Markson (A.S.H.V.E. TRANSACTIONS, Vol. 44, 1933, p. 33).
- The Application of Storage Refrigeration to Air Conditioning, by C. F. Boester (A.S.H.V.E. TRANSACTIONS, Vol. 45, 1933, p. 675).