

the temperature of air leaving the heater, as well as upon its velocity. (See discussion under heading of Inlet, Outlet, and Space Temperatures with Unit Heaters.) Recommended coverage and mounting heights should be obtained from the manufacturer.

Air Outlets

In order to obtain the desired air distribution and heat diffusion, unit heaters are commonly equipped with directional outlets, adjustable louvers, or fixed types of diffusers.

Ratings of Unit Heaters

It is standard practice to rate unit heaters on the basis of the amount of heat delivered by the air in Btu per hour above an entering air temperature of 60 F. This applies to all types of unit heaters, the steam or hot water type, the electric type and the direct fired type. There are, however, other factors which must be taken into account, especially when an attempt is made to compare one type of heater with another. These are the temperature of the heating element and the velocity of air through it. Consideration is given to these factors in the discussion of ratings for each type of unit heater in the following paragraphs.

Steam. Rating of steam unit heaters has been standardized by a code¹ in which the following items are the basis of rating: dry saturated steam at 2 psig pressure at the heater coil; air at 60 F (29.92 in. Hg barometric pressure) entering the heater; and heater operating free of external resistance to air flow.

The capacity of a heater increases as the steam pressure increases, and decreases as the entering air temperature increases. The heating capacity for any condition of steam pressure and entering air temperature other than standard may be calculated approximately from any given rating by the use of factors in Table 1 for the blow-through or draw-through types.

Hot Water. A standard for the rating of hot water type unit heaters has also been established by code¹ in which the following items are the basis of rating: entering water at 200 F; entering air at 60 F (29.92 in. Hg barometric pressure); and heater operating free of external resistance to air flow. This code also prescribes a method of translating the output in Btu and the temperature rise as obtained under test conditions to standard conditions of air and water temperature.

Electric. Electric type unit heaters are available in sizes up to at least 60 kw capacity. They consist of resistance type heating elements combined with fan and motor, together with a suitable casing. Electric unit heaters are rated on the energy input to the heater, expressed in terms of kilowatts, Btuh or EDR (Equivalent Direct Radiation).

Gas-Fired. Gas-fired unit heaters are built in both suspended and floor models, with either propeller or centrifugal type fans. They are rated in terms of both input and output in accordance with the approval requirements of the American Gas Association.

Oil-Fired. The oil-fired unit heater is usually equipped with a centrifugal fan or fans and is available in either the floor-mounted or in smaller sizes in the suspended type. Ratings are based on heat delivered at heater outlet in Btu per hour.

Stoker-Fired. The stoker-fired unit heater can be obtained in a wide range of capacities. Ratings are based on heat delivered at the heater outlet in Btu per hour.

Unit Heaters and Unit Ventilators

TABLE 1. CONSTANTS FOR DETERMINING THE CAPACITY OF UNIT HEATERS FOR VARIOUS STEAM PRESSURES AND TEMPERATURES OF ENTERING AIR
(Based on Steam Pressure of 2 psig and Entering Air Temperature of 60 F)

		TEMPERATURE OF ENTERING AIR											
		-10°	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°
BLOW-THROUGH TYPE	0	1.54	1.45	1.37	1.27	1.19	1.11	1.03	0.96	0.88	0.81	0.74	0.67
	2	1.59	1.50	1.41	1.32	1.24	1.16	1.08	1.00	0.93	0.85	0.78	0.71
	5	1.64	1.55	1.46	1.37	1.29	1.21	1.13	1.05	0.97	0.90	0.83	0.76
	10	1.73	1.64	1.55	1.46	1.38	1.29	1.21	1.13	1.06	0.98	0.91	0.84
	15	1.80	1.71	1.61	1.53	1.44	1.34	1.28	1.19	1.12	1.04	0.97	0.90
	20	1.86	1.77	1.68	1.58	1.50	1.42	1.33	1.25	1.17	1.10	1.02	0.95
	30	1.97	1.87	1.78	1.68	1.60	1.51	1.43	1.35	1.27	1.19	1.12	1.04
	40	2.06	1.96	1.86	1.77	1.68	1.60	1.51	1.43	1.35	1.27	1.19	1.12
	50	2.13	2.04	1.94	1.85	1.76	1.67	1.58	1.50	1.42	1.34	1.26	1.19
	60	2.20	2.09	2.00	1.90	1.81	1.73	1.64	1.56	1.47	1.39	1.31	1.24
	70	2.26	2.16	2.06	1.96	1.87	1.78	1.70	1.61	1.53	1.45	1.37	1.29
	75	2.28	2.18	2.09	1.99	1.90	1.81	1.72	1.64	1.55	1.47	1.40	1.32
	80	2.31	2.21	2.11	2.02	1.93	1.84	1.75	1.66	1.58	1.50	1.42	1.34
	90	2.36	2.26	2.16	2.06	1.97	1.88	1.79	1.71	1.62	1.54	1.46	1.38
	100	2.41	2.31	2.20	2.11	2.02	1.93	1.84	1.75	1.66	1.58	1.50	1.42
125	2.51	2.41	2.31	2.21	2.11	2.02	1.93	1.84	1.76	1.68	1.59	1.51	
150	2.60	2.50	2.40	2.30	2.20	2.11	2.02	1.93	1.84	1.76	1.67	1.59	
DRAW-THROUGH TYPE	0	1.48	1.41	1.33	1.25	1.18	1.11	1.03	0.96	0.89	0.82	0.75	0.69
	2	1.52	1.44	1.36	1.29	1.22	1.14	1.07	1.00	0.93	0.86	0.79	0.73
	5	1.57	1.49	1.41	1.33	1.26	1.19	1.11	1.05	0.98	0.91	0.84	0.77
	10	1.64	1.56	1.48	1.40	1.33	1.25	1.18	1.11	1.04	0.97	0.90	0.84
	15	1.69	1.61	1.53	1.46	1.38	1.31	1.24	1.17	1.10	1.03	0.96	0.90
	20	1.73	1.65	1.57	1.50	1.42	1.35	1.28	1.21	1.14	1.07	1.00	0.94
	30	1.80	1.73	1.65	1.57	1.50	1.42	1.35	1.28	1.21	1.15	1.08	1.01
	40	1.86	1.79	1.71	1.64	1.56	1.49	1.42	1.35	1.28	1.22	1.15	1.08
	50	1.93	1.85	1.77	1.70	1.63	1.55	1.48	1.42	1.35	1.28	1.21	1.15
	60	1.97	1.90	1.82	1.75	1.67	1.60	1.53	1.46	1.40	1.33	1.26	1.19
	70	2.02	1.94	1.87	1.80	1.72	1.65	1.58	1.51	1.44	1.38	1.31	1.24
	75	2.04	1.97	1.90	1.82	1.75	1.68	1.61	1.54	1.47	1.40	1.33	1.27
	80	2.06	1.99	1.91	1.84	1.77	1.70	1.63	1.56	1.49	1.42	1.35	1.29
	90	2.10	2.03	1.95	1.88	1.80	1.73	1.66	1.59	1.52	1.46	1.39	1.32
	100	2.15	2.07	1.99	1.92	1.85	1.77	1.70	1.63	1.56	1.49	1.43	1.36
125	2.21	2.14	2.06	1.99	1.91	1.84	1.77	1.70	1.63	1.56	1.49	1.43	
150	2.28	2.20	2.13	2.05	1.98	1.91	1.84	1.77	1.70	1.63	1.56	1.50	

Note: To determine capacity at any steam pressure and entering temperature, multiply rated capacity at 60 F entering air and 2 psig by constant from table.

When increasing steam pressure it is important to determine whether the heater is suitable for the increased pressure application, and whether the resulting increased outlet temperature is satisfactory.

Effect of Resistance Upon Capacity

Unit heaters are customarily rated as free delivery type units. If outside air intakes, air filters, or ducts on the inlet or discharge are used, a reduction in air and heating capacity will result because of this added resistance to air flow. The percentage of this reduction in capacity will depend upon the characteristics of the heater, and on the type, design, and