

In the selection of unit heaters it is important to ascertain that the throw is sufficient. The throw is dependent to a marked degree on 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.

Air Outlets

In order to direct the air to points desired and to diffuse the air to avoid drafts, 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 tem-

TABLE 1. OUTLET VELOCITIES, DISTANCE OF BLOW AND DECIBEL RATINGS FOR VARIOUS TYPES OF UNIT HEATERS

TYPE OF UNIT HEATER	OUTLET VELOCITIES FPM	DISTANCES OF BLOW—Ft*	DECIBEL RATING
Centrifugal Fan	1500-2500	20-200	34-90
Horizontal Propeller Fan	400-1000	30-100	26-84
Vertical Propeller Fan	1200-2200	70	50-82

* Refer to manufacturers' tables for limits of blow and decibel ratings. Values in this table are maxima and do not apply to all makes of units.

perature 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 code³ 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 2 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 code³ 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

TABLE 2. 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)

	STEAM PRESSURE PSI	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	0.95	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
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

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

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.

are made in the built-in-wall model, suspension model, and free-standing or portable model.

Electric unit heaters are rated on the energy input to the heater, expressed in terms of kilowatts, Btu or EDR. . . Quite often all three ratings are given in parallel columns in the catalogs.

Gas-Fired. Gas-fired unit heaters are built in both suspended and floor models, with either propeller or centrifugal type fans. They are available in a wide range of sizes from about 24,000 to over 4,000,000 Btu per hr capacity, and are usually rated in terms of both input and output according to the approval requirements of the *American Standards Association*. Any gas-fired unit which is thermostatically controlled and has a pilot must have an element in the pilot flame which will automatically close the gas valve on pilot failure.

Oil-Fired. The oil-fired unit heater is usually equipped with a centrifugal fan, and can be obtained in sizes ranging from 125,000 to 1,650,000 Btu per hr output capacity in standard units. It is furnished in either the floor-mounted or in smaller sizes in the suspended type.