

Individual cases may deviate widely, but the tabulation given herewith will serve as a guide to usual heating practice:

- Air Face Velocity—500 to 800 fpm face, 500 being a common figure.
- Delivered Air Temperature—varies from about 72 F for ventilation only to about 150 F for complete heating.
- Steam Pressure—2 to 10 lb, 5 lb being common.
- Hot Water Temperature—150 to 225 F.
- Water Velocity—2 to 6 fps.
- Water Quantity—Based on about 20 F temperature drop through a hot-water coil.
- Air Resistance—The total resistance through heating coils is usually limited to from $\frac{1}{8}$ to $\frac{1}{4}$ in. of water gage for public buildings, to about 1 in. for factories.

The selection of heating coils is relatively simple as it involves dry-bulb temperatures and sensible heat only, without the complication of simultaneous latent heat loads, as in cooling coils. For a given duty, entering air temperature, and steam pressure, it is possible to select several arrangements of the same design of coil depending upon the relative importance of space, cross-sectional area, and air resistance.

Cooling Coils

The usual range of ratings for cooling and dehumidifying coils is enumerated herewith:

- Entering Air Dry-Bulb—60 to 100 F.
- Entering Air Wet-Bulb—50 to 80 F.
- Air Face Velocities—300 to 800 fpm, (sometimes as low as 200 and as high as 1200).
- Volatile Refrigerant Temperatures—25 to 55 F, at coil suction outlet.
- Water Temperatures—40 to 65 F.
- Water Quantities—2 to 6 gpm per ton, or equivalent to a water temperature range of from 4 to 12 F.
- Water Velocity—2 to 6 fps.

The ratio of total to sensible heat removed varies in practice from 1.00 to about 1.65, *i.e.*, sensible heat is from 60 to 100 per cent of total, depending on the application. (See Chapter 21.) Required ratios may demand wide variations in air velocities, refrigerant temperatures, and coil depth, so that general rules as to these values may be misleading. On usual comfort installations air face velocities between 400 and 600 fpm are frequent, 500 being a common value. Refrigerant temperatures will ordinarily vary between 40 and 50 F where cooling is accompanied with dehumidification. Water velocities will range from 2 to about 6 fps.

When no dehumidification is desired, for which condition the dew-point of the entering air will be equal to or lower than the cooling coil temperature, the coil selection is made on the basis of dry-bulb temperatures and sensible heat transfers only, the same as with heating coils. It is possible also to choose various arrangements of face area, depth, air velocity, etc., for the same duty.

Dehumidifying Coils

The selection of coils for combined cooling and dehumidifying duty is more involved than for heating or sensible cooling and requires consideration of both dry- and wet-bulb air temperatures. It is further complicated by the fact that the proportional amount of dehumidification

TABLE 1. VARIOUS COOLING COIL ARRANGEMENTS

SELECTION	1	2	3	4
Total cooling capacity, tons.....	100	100	100	100
Sensible cooling capacity, tons.....	69	69	69	69
Latent cooling capacity, tons.....	31	31	31	31
Ratio total to sensible heat.....	1.45	1.45	1.45	1.45
Air quantity, cfm.....	47,800	41,700	37,100	46,800
Cfm per total ton.....	478	417	371	468
Face velocity, fpm.....	325	423	500	600
Resistance, in. water.....	0.11	0.27	0.51	0.37
Coil face area, sq ft.....	147	99.0	74.2	78.1
Coil rows deep.....	4	6	8	4
Coil evaporator temp. deg F.....	45	45	45	38

required is also highly variable. The methods outlined previously under Heat Transfer and Resistance may be used to determine whether it is possible for a coil to perform the duty required. If entering and leaving air conditions are arbitrarily specified, the corresponding duty sometimes cannot be obtained at all without the use of reheat. As with heating and sensible cooling coils, there are combinations of face areas, depth, air velocity and refrigerant temperatures which will give the required performance. This is illustrated in Table 1.

It is possible as shown in Table 1 to perform approximately the same duty at a given refrigerant temperature with small face area and large thickness or vice versa. The large face area coil will give low air velocity and resistance but high air quantities per ton. The coil of small face area and great depth will require small air quantities per ton of refrigeration, high resistance and high air velocities. As shown also in Table 1 the same sensible, latent and total cooling capacity may be obtained with various refrigerant temperatures by proper choice of coil. This makes it possible to keep the evaporating temperature high enough to carry the load with a chosen size of condensing unit. High evaporating temperatures with correspondingly small compressor operating expense can be attained but at the expense of coil surface, air quantity or both. The choice will be determined by the necessities of individual installations.

For a given quantity and condition of entering air the evaporating temperature of a volatile refrigerant coil will be determined by a balance between the condensing unit and the coil. The total, sensible and latent cooling capacity can then be determined from the coil rating information.

TABLE 2. CAPACITY BALANCES FOR MAXIMUM AND MINIMUM LOAD CONDITIONS

CONDITIONS	CAPACITY IN TONS			RATIO TOTAL SENSIBLE
	Total	Sensible	Latent	
Required at peak load conditions.....	10.90	7.90	3.00	1.38
Required at minimum load conditions.....	6.62	3.36	3.26	1.98
Peak load equipment balance.....	10.90	7.90	3.00	1.38
Same equipment balanced at minimum load conditions.....	9.85	6.58	3.26	1.50
Same equipment balanced at maximum load conditions with 40 per cent by-pass.....	8.38	5.05	3.33	1.66
Same equipment balanced at minimum load conditions with 38,800 Btu per hour reheat.....	6.62	3.36	3.26	1.98