

total coil capacity and entering air wet-bulb temperature are chosen.

The saturation temperatures of points *C* and *F* are then used in Equation 16, in conjunction with the test values of t_r and q , so as to evaluate the constants m and n by solving two simultaneous equations. The resulting equation is plotted as shown in Fig. 15, or can be plotted as a straight line on logarithmic paper.

Having determined the surface temperature, the test data can be used to evaluate coil efficiency, from the ratio $(t_1 - t_2) \div (t_1 - t_b)$. Then constants of Equation 11 can be evaluated and a group of curves constructed as in Fig. 12.

Use of Graphs for Predicting Performance

Coil performance under any dehumidifying condition can be predicted

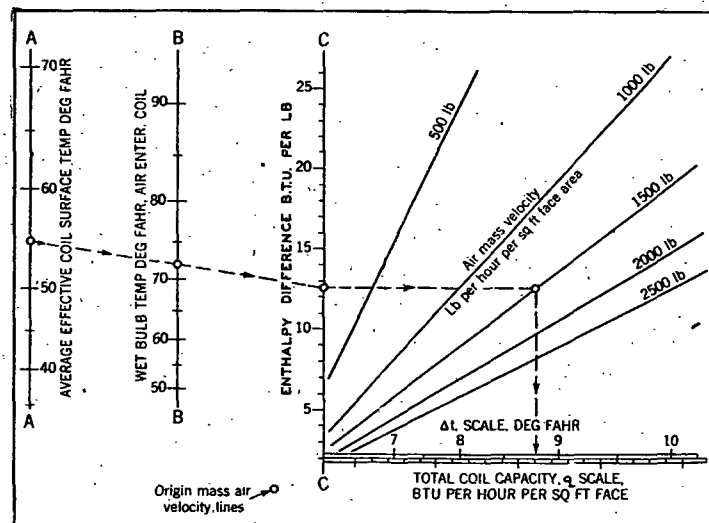


FIG. 16. TYPICAL COIL PERFORMANCE CHART

as shown in the following example, using Figs. 12, 13 and 15.

Example 2. Given: Total heat to be removed, 18,000 Btu per hour per square foot of coil face area; ratio of latent to total heat, 35 per cent; dry-bulb temperature of air entering coil, 83 F; dew-point temperature of air entering coil, 65 F. **Required:** Coil depth, air velocity and refrigerant temperature.

Solution. (1) Plot the entering air conditions at point *C* on Fig. 13. (2) Draw line *C-E*, parallel to the 35 per cent line *N-O* of the index chart, and obtain the required surface temperature, 55 F. (3) In Fig. 15, assume a coil depth of 4 rows, and obtain $\Delta t = 16$ F. Subtracting 16 deg from 55 deg gives a required refrigerant temperature of 39 F. (4) In Fig. 12, assume an air velocity of 2000 lb per hour and obtain a coil efficiency of 0.8. (5) Solving for q in Equation 12, a capacity of 17,400 Btu per hour is obtained, which is not the required capacity. It is necessary to try a higher air velocity until a balanced condition is found at an air velocity of 2080 pounds per hour. (6) By assuming a coil depth of 6 rows and repeating the same procedure, another solution can be obtained at a refrigerant temperature of 43.5 F and an air velocity of 1760.

The foregoing cut-and-try calculations can be eliminated by the use of

the type of graph shown in Fig. 16, which may be constructed as outlined herewith:

1. The three axes of the nomogram on the left side of the chart are drawn in such a manner that the *C* axis represents the differences in enthalpy between the air at wet-bulb temperature along *B* axis and air at wet-bulb temperature along *A* axis. Thus, the *C* axis represents the total heat (Btu per pound of air, sensible and latent) which could be removed from the air at some inlet wet-bulb temperature on *B* axis if the coil heat transfer efficiency were 100 per cent and the wet-bulb temperature of the air could be reduced to some average (effective) external coil temperature on *A* axis. For example if a straight line is drawn through 72 F wet-bulb temperature of entering air on axis *B* and the 55 F average effective coil (external surface) temperature on axis *B*, then this straight line will intersect the *C* axis at 12.6, which figure represents the difference in enthalpy of air between 72 and 55 F wet-bulb temperature.

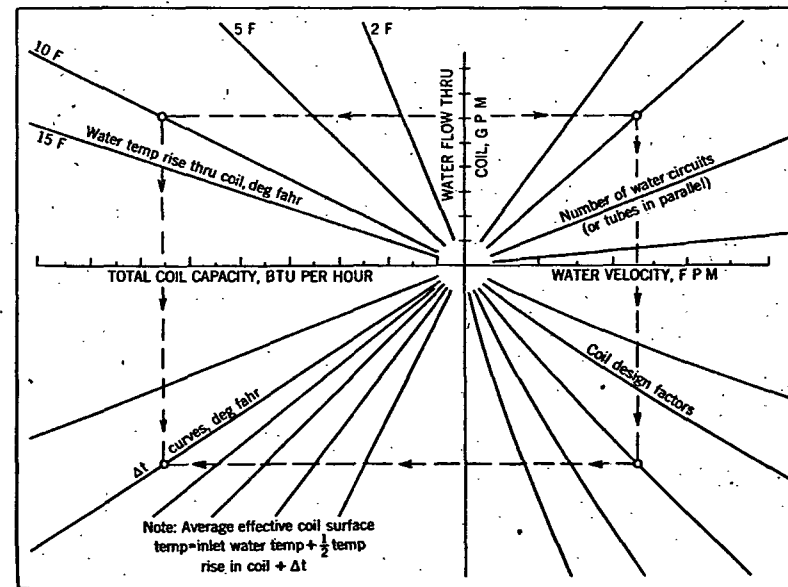


FIG. 17. WATER COIL PERFORMANCE CHART

2. Next scale q is drawn to cover the range of the likely practical loading for the given coil in Btu per hour per square foot coil face area.

3. Lastly, the diagonal mass air velocity lines are drawn in at the intersection of various values on *C* axis and the corresponding values on the q scale. The values on the q scale corresponding to various values on *C* axis are obtained by multiplying the values on *C* axis by mass air velocity and coil efficiency. In this way the calculations required by Equation 12 are performed.

4. Parallel to the q scale is drawn the Δt scale, so that the difference between average surface temperature and refrigerant temperature can be read directly, eliminating the use of Equation 16.

For coils using water as a cooling medium, the chart shown in Fig. 17 can be used for the purpose of eliminating calculations. Such a chart can embrace all sizes of coils of a particular design, but requires an index which gives the coil design factor for each size. The coil design factor is the number of square feet of internal tube surface of the entire coil. The curves shown in the lower right hand quarter of the chart perform