TABLE 1. HEAT TRANSFER INFORMATION ON TYPICAL COPPER CIRCULAR FIN COILS

Dipped Metal Bond or Integral Fins

TEST No.	DATA SOURCE	WORKING FLUID	No. OF ROWS	IN-LINE OR STAGGERED	TUBE DIAM IN.	O.D. FINS IN.	FINS PER IN.	PER CENT FACE AREA	U AT 500 FPM FACE	n
	Air Heating Service									
1	Reported	Steam 2-100 lb	4	Stag	0.375	0.87	6	57	13.0	0.62
2	Research Tests	Steam 2 lb gage	2	In-line	0.625	1.37	7	42	10.8	0.61
3	Commercial	Steam 5-150 lb	1-6	Stag	0.625	1.44	8	50	10.7	0.52
4	Commercial	Steam 5-150 lb	1-6	Stag	0.625	1.37	7	50	10.5	0.57
5	Commercial	Steam 5-100 lb	1-6	....	0.625	....	7	....	10.5	0.60
6	Research Tests	Steam 5 lb gage	4	Stag	0.625	1.47	7	53	10.5	0.65
7	Commercial	Steam 5-150 lb	1	Cast-Iron Sec	....	....	..	44	10.2	0.62
8	Research Tests	Steam 2 lb gage	2	In-line	0.625	1.12	6	37	10.1	0.55
9	Research Tests	Steam 5 lb gage	1	....	0.625	1.47	7	52	9.3	0.52
10	Research Tests	Steam 5 lb gage	1	....	0.625	1.37	7	56	9.1	0.49
11	Commercial	Steam 5-150 lb	6	Cast-Iron Sec	....	....	..	44	9.1	0.62
12	Research Tests	Steam 2 lb gage	1	....	0.625	1.37	7	49	9.0	0.48
13	Research Tests	Steam 2 lb gage	1	....	0.625	1.12	6	37	9.0	0.46
14	Commercial	Steam 5 lb gage	1	Cast-Iron Sec	....	....	..	....	7.0	0.50
15	Commercial	Steam 5 lb gage	6	Cast-Iron Sec	....	....	..	....	6.5	0.60
	Air Cooling Without Dehumidification									
16	Commercial	Water 2 fps	1-6	Stag	0.625	1.37	7	50	8.9	0.47
17	Commercial	Water 2 fps	1-6	Stag	0.625	1.44	8	50	8.6	0.45
18	Reported	Water 2 fps	....	....	0.625	1.44	8	50	8.5	....
19	Research Tests	Water 2 fps	2	Stag	0.75	1.75	7	55	7.2	0.45
20	Research Tests	Water 2 fps	6	Stag	0.75	1.75	7	55	7.1	0.64
21	Commercial	Direct Expansion	1	....	0.75	1.62	4-6	....	5.8	0.62
22	Commercial	Direct Expansion	6	....	0.75	1.62	4-6	....	*4.7*	*0.61*
23	Research Tests	Direct Expansion	4	Stag	0.75	1.75	7	44	*6.2*	*0.51*

empirical presentations of test data. Information is given, usually in the form of tables or curves to determine the total cooling capacity, with supplementary devices to ascertain the proportions of sensible and latent. Sometimes the presentation of data is simplified, often at the expense of flexibility and coverage, by setting up tables covering limited and specific air and refrigerant conditions, in which total, sensible and latent capacities are set forth directly. Some of the methods now used require trial and error solutions and others are of very questionable accuracy, although the error may be small when applied within narrow limits of the several variables. It is hoped that investigations now in progress will lead to a convenient and reasonably accurate method of rating which can be widely adopted.

In rating dehumidifying coils, there are two requirements. The total capacity must be determined and the proportion of sensible and latent heat transfer ascertained. These determinations often involve an average coil surface temperature. This may be determined experimentally by the use of thermocouples or calculated theoretically from other test data. Sometimes, a fictitious temperature is used, determined by the point of intersection between the saturation curve on the psychrometric chart and a straight line drawn through points representing the entering and leaving air conditions.

The total cooling capacity is determined in a variety of ways, of which the following are the most usual:

1. The use of surface or overall heat transfer coefficients in conjunction with dry-bulb mean temperature differences. The result is corrected for dehumidification by means of functions for: (1) the temperatures differences, (2) the expected total to sensible load ratio, and (3) empirical factors determined from test.

2. The use of surface or overall coefficients for combined sensible and latent heat removal with a wet coil, using as the driving force the difference between heat content of the entering air and that of saturated air at either the surface or the refrigerant temperature.

3. The calculation of sensible and latent capacities separately. The sensible is based on dry-bulb mean temperature difference and heat transfer while the latent is determined using a dew-point mean difference and a corresponding latent heat transfer value.

4. The use of a *contact factor* or ratio of heat removed to heat removable. This factor is a function of coil depth and air velocity, is experimentally determined for each design and used in conjunction with a so-called *surface temperature*.

The total capacity is influenced by the factors already enumerated and, as with dry cooling or heating coils, the air velocity correction is an exponential function of the mass air velocity.

Unless the sensible and latent capacities have been separately calculated as in item 3 above, various means are used to determine these.

The slope of a straight line on the psychrometric chart connecting points representing the entering and leaving air conditions gives a direct means of fixing the proportions of sensible and latent heat removal. Such a line is termed the *load-ratio* line. For given entering air conditions and a required proportion of sensible and latent cooling, the load ratio line may therefore be drawn, its slope being determined by the temperature and moisture content coordinates of the psychrometric chart used.

To satisfy the performance requirements, the point representing the leaving air conditions for a coil chosen to give the necessary total cooling capacity must also fall on this line.