

HEATING VENTILATING AIR CONDITIONING GUIDE 1939

TABLE 7. DEW-POINT OF AIR IN EQUILIBRIUM WITH LITHIUM CHLORIDE SOLUTIONS
CONCENTRATION IN GRAM MOLES OF LITHIUM CHLORIDE PER 1000 GRAINS WATER

DEW-POINT AT ZERO CONC.	CONCENTRATION OF LITHIUM CHLORIDE														
	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	26.0	28.0	30.0
320	315.2	308.7	299.9	290.2	279.7	269.4	259.6	251.5	244.1	236.5	230.0	223.8	218.6	214.5	210.3
300	295.4	289.1	280.5	270.9	260.6	250.5	240.8	232.6	225.4	218.0	211.8	205.8	200.8	196.9	192.8
280	275.6	269.5	261.1	251.7	241.5	231.6	222.2	214.0	206.7	199.7	193.5	187.8	183.2	179.3	175.2
260	255.8	250.0	241.9	232.6	222.7	212.8	203.5	195.5	188.4	181.7	175.4	170.0	165.6	162.0	158.4
240	236.0	230.4	222.5	213.5	203.8	194.2	185.0	177.1	170.0	163.6	157.5	152.2	148.3	144.6	140.5
220	216.2	210.8	203.2	194.4	184.9	175.5	166.4	158.6	151.6	145.3	139.6	134.6	130.7	127.3	124.2
200	196.4	191.2	183.9	175.4	166.1	156.7	148.0	140.3	133.5	127.3	121.9	117.0	113.3	110.1	
180	176.6	171.6	164.7	156.4	147.3	138.1	129.6	122.1	115.5	109.4	104.2	99.6	96.0		
160	156.8	152.1	145.4	137.4	128.6	119.7	111.3	103.9	97.4	91.6	86.6	82.2			
140	137.0	132.6	126.1	118.4	109.9	101.3	93.1	85.9	79.5	73.8	69.0				
120	117.2	113.0	106.8	99.4	91.1	82.7	74.7	67.8	61.5	56.0					
100	97.4	93.4	87.5	80.5	72.7	64.4	56.6	49.8	43.7	38.2					
80	77.6	73.8	68.4	61.6	54.0	46.1	38.5	31.8	25.9	20.6					
60	57.8	54.3	49.1	42.7	35.5	27.9	20.5	14.0	8.3						
40	38.0	34.7	29.9	23.9	16.9	9.6	2.4	-3.9							
20		15.1	10.7	5.0	-1.7	-8.7	-15.4								
0		-4.5	-8.6	-13.9	-20.2	-27.0	-33.3								

reduced to a suitable level by governing the concentration of the solution. In addition to having a suitable low vapor pressure, a practical absorbent must also be widely available at economical cost, be non-corrosive, odorless, non-toxic, chemically inert against any impurities in the air stream, stable over the range of use and especially it must not precipitate out at the lowest temperature to which the apparatus is exposed. It must have low viscosity and be capable of being economically regenerated or concentrated after having been diluted by absorbing moisture.

TABLE 8. DENSITY OF LITHIUM CHLORIDE SOLUTIONS

CONCENTRATION MOLES LiCl PER 1000 GRAINS WATER	TEMPERATURE DEG F						
	0	50	100	150	200	250	300
0							
2		1.045	1.037	1.026	1.012		
4	1.090	1.085	1.076	1.064	1.052		
6	1.124	1.119	1.111	1.100	1.087		
8	1.156	1.150	1.143	1.132	1.122		
10	1.188	1.181	1.172	1.162	1.152	1.142	
12	1.217	1.209	1.199	1.188	1.178	1.168	
14	1.242	1.235	1.225	1.214	1.203	1.192	
16		1.257	1.248	1.236	1.226	1.215	
18		1.279	1.270	1.259	1.248	1.237	
20			1.291	1.280	1.279	1.268	
22				1.310	1.289	1.278	1.267
24					1.307	1.296	1.286
26					1.313	1.312	1.302
28					1.338	1.327	1.318
30						1.34	1.33
32							1.35

CHAPTER 2. REFRIGERANTS AND AIR DRYING AGENTS

TABLE 9. VISCOSITY OF LITHIUM CHLORIDE SOLUTIONS (MILLIPOISE)

TEMP. DEG F	CONCENTRATION IN MOLAL												
	0	2	4	6	8	10	12	14	16	18	20	22	24
0			56.75	72.44	97.05	136.8	199.5						
20		28.91	37.07	47.42	63.09	84.94	123.3	178.6					
40	15.45	19.91	25.53	32.58	43.05	58.48	81.10	116.1	165.6				
60	11.02	14.26	18.37	23.55	30.90	41.40	56.62	79.80	111.2	156.3			
80	8.61	11.19	14.42	18.62	24.32	32.28	43.45	60.26	82.04	113.8			
100	6.82	8.89	11.48	14.94	19.36	25.59	33.96	46.13	61.52	84.72	118.3		
120	5.60	7.31	9.51	12.30	15.92	20.99	27.67	36.64	48.31	65.77	89.95		
140	4.70	6.15	8.07	10.42	13.43	17.66	22.96	30.06	38.99	52.48	71.12	95.94	
160	4.01	5.25	6.92	8.93	11.51	15.00	19.36	25.06	32.14	42.76	56.89	75.86	106.2
180	3.48	4.56	6.01	7.78	10.00	12.91	16.56	21.28	27.10	35.48	46.45	60.67	84.33
200	3.05	4.01	5.28	6.86	8.79	11.22	14.32	18.28	23.12	29.92	38.55	50.70	67.92
220	2.72	3.58	4.72	6.14	7.83	9.93	12.59	16.00	20.14	25.64	32.96	43.05	56.49
240	2.43	3.21	4.25	5.50	7.02	8.83	11.12	14.09	17.62	22.18	28.31	36.98	47.42
260	2.19	2.90	3.84	4.94	6.46	7.91	9.91	12.47	15.50	19.36	24.60	31.92	40.55
280	2.00	2.66	3.52	4.51	5.75	7.19	8.97	11.27	14.00	17.22	21.78	28.05	35.56
300	1.86	2.48	3.28	4.17	5.32	6.67	8.28	10.38	12.82	15.70	19.68	25.12	31.92
320	1.74	2.32	3.08	3.89	4.94	6.19	7.73	9.64	11.86	14.45	18.03	22.80	29.11

Water solutions, or brines, of the chlorides of various inorganic elements such as calcium chloride and lithium chloride are the absorbents most frequently used in connection with air conditioning applications and detailed attention is confined to these two in this chapter.

Nature of Absorption Process

The application consists of bringing the air-vapor stream into intimate contact with the absorbent, permissibly by passing the air stream through a finely divided spray of the brine but more generally by passing the air over a metal surface coil where the liquid absorbent presents a large surface to the air stream. The difference in vapor pressure causes some

TABLE 10. PROPERTIES OF LITHIUM CHLORIDE SOLUTIONS

CONCENTRATION MOLES LiCl PER 1000 GRAINS WATER	PARTIAL HEAT OF MIXING AT 0 F BTU PER LB	TEMPERATURE COEF. OF PARTIAL HEAT OF MIXING BTU PER LB PER F	SPECIFIC HEAT AT 70 F	BOILING POINT F (AT 760 MM Hg)	FREEZING POINT	SUBSTANCE THAT FIRST SEPARATES OUT ON FREEZING
0	0.0	0.0	0.998	212.0	32	Ice
2	2.04	-0.014	0.901	215.8	16.3	Ice
4	7.24	-0.036	0.831	221.5	-5.8	Ice
6	16.7	-0.069	0.778	228.9	-34.2	Ice
8	31.9	-0.109	0.739	238.1	-69	Ice
10	51.1	-0.143	0.710	248.4	-90	Ice
12	75.7	-0.160	0.687	258.8	-40	LiCl-3H ₂ O
14	90.8	-0.167	0.666	268.9	1	LiCl-3H ₂ O
16	124.8	-0.176	0.647	277.9	36.5	LiCl-2H ₂ O
18	145	-0.186	0.631	285.8	58.1	LiCl-2H ₂ O
20	162	-0.194	0.617	293.2	86.4	LiCl-H ₂ O
22	171	-0.20	0.604	300.2	133	LiCl-H ₂ O
24	177	-0.20	0.59	307	156	LiCl-H ₂ O
26	182	-0.21	0.58	313	180	LiCl-H ₂ O
28	191	-0.21	0.575	318	190	LiCl-H ₂ O
30	194	-0.21	0.57	323	195	LiCl-H ₂ O
32	198	-0.22	0.56	328	280	LiCl