



## Calculating Condensate Load for Process Air Heaters

$$Q = \frac{F \times Cp \times d \times 60 \text{ min/hr} \times \Delta T}{H}$$

Where:

Q = Condensate Load in lbs/hr  
 F = Cubic feet of air per minute  
 Cp = Specific heat of air in btu/lb--°F  
 d = Density of air--.075 lbs/cu ft  
 ΔT = Temperature rise in °F  
 H = Latent heat of steam in btu/lb

EXAMPLE:

10 PSIG STEAM

Heating indoor 70° air to 180°F = 110°ΔF

F = Cubic feet of air per minute	3000
Cp = Specific heat of air in btu/lb--°F	.24
d = Density of air--.075 lbs/cu ft	.075
ΔT = Temperature rise in °F	110
H = Latent heat of steam in btu/lb	953

$$Q = \frac{3000\text{CFM} \times 0.24 \times .075 \times 60 \text{ min/hr} \times 110}{953}$$

Q = 374 lbs/hr

SAFETY FACTOR:   Using Outdoor Air   3  
                           Using Indoor Air     2



	sp. gr. @ 60-70°F	sp. ht. @ 60°F Btu/lb-°F
Air	1.00	0.24
Ammonia	0.60	0.54
<b>Benzene</b>		<b>0.325</b>
Butane	2.00	0.455
Carbon dioxide	1.50	0.21
<b>Carbon monoxide</b>	<b>0.97</b>	<b>0.255</b>
Chlorine	2.50	0.118
Ethane	1.10	0.50
<b>Ethylene</b>	<b>0.97</b>	<b>0.45</b>
Freon - 12		0.16
Hydrogen	0.069	3.42
<b>Hydrogen sulfide</b>	<b>1.20</b>	<b>0.25</b>
Methane	0.55	0.60
Nitrogen	0.97	0.253
<b>Oxygen</b>	<b>1.10</b>	<b>0.225</b>
Propane	1.50	0.46
Sulfur dioxide		0.162
Water vapor (steam)	2.30	0.453



## Properties of Saturated Steam

Gauge Pressure PSIG	Temp °F	Sensible	Heat in BTU/lb			Specific Volume Cu. Ft./lb						Heat in BTU/lb			Specific Volume Cu. Ft./lb
			Latent	Total								Gauge Pressure PSIG	Temp °F	Sensible	
25	134	102	1017	1119	142					150	366	339	857	1196	2.74
20	162	129	1001	1130	73.9					155	368	341	855	1196	2.68
15	179	147	990	1137	51.3					160	371	344	853	1197	2.60
10	192	160	982	1142	39.4					165	373	346	851	1197	2.54
5	203	171	976	1147	31.8					170	375	348	849	1197	2.47
0	212	180	970	1150	26.8					175	377	351	847	1198	2.41
1	215	183	968	1151	25.2					180	380	353	845	1198	2.34
2	219	187	966	1153	23.5					185	382	355	843	1198	2.29
3	222	190	964	1154	22.3					190	384	358	841	1199	2.29
4	224	192	962	1154	21.4					195	386	360	839	1199	2.19
5	227	195	960	1155	20.1					200	388	362	837	1199	2.14
6	230	198	959	1157	19.4					205	390	364	836	1200	2.09
7	232	200	957	1157	18.7					210	392	366	834	1200	2.05
8	233	201	956	1157	18.4					215	394	368	832	1200	2.00
9	237	205	954	1159	17.1					220	396	370	830	1200	1.96
10	239	207	953	1160	16.5					225	397	372	828	1200	1.92
12	244	212	949	1161	15.3					230	399	374	827	1201	1.89
14	248	216	947	1163	14.3					235	401	376	825	1201	1.85
16	252	220	944	1164	13.4					240	403	378	823	1201	1.81
18	256	224	941	1165	12.6					245	404	380	822	1202	1.78
20	259	227	939	1166	11.9					250	406	382	820	1202	1.75
22	262	230	937	1167	11.3					255	408	383	819	1202	1.72
24	265	233	934	1167	10.8					260	409	385	817	1202	1.69
26	268	236	933	1169	10.3					265	411	387	815	1202	1.66
28	271	239	930	1169	9.85					270	413	389	814	1203	1.63
30	274	243	929	1272	9.46					275	414	391	812	1203	1.60
32	277	246	927	1273	9.10					280	416	392	811	1203	1.57
34	279	248	925	1173	8.75					285	417	394	809	1203	1.55
36	282	251	923	1174	8.42					290	418	395	808	1203	1.53
38	284	253	922	1175	8.08					295	420	397	806	1203	1.49
40	286	256	920	1176	7.82					300	421	398	805	1203	1.47
42	289	258	918	1176	7.57					305	423	400	803	1203	1.45
44	291	260	917	1177	7.31					310	425	402	802	1204	1.43
46	293	262	915	1177	7.14					315	426	404	800	1204	1.41
48	295	264	914	1178	6.94					320	427	405	799	1204	1.38
50	298	267	912	1179	6.68					325	429	407	797	1204	1.36
55	300	271	909	1180	6.27					330	430	408	796	1204	1.34
60	307	277	903	1180	5.84					335	432	410	794	1204	1.33
65	312	282	901	1183	5.49					340	433	411	793	1204	1.31
70	316	286	898	1184	5.18					345	434	413	791	1204	1.29
75	320	290	895	1185	4.91					350	435	414	790	1204	1.28
80	324	294	891	1185	4.67					355	437	416	789	1205	1.26
85	328	298	889	1187	4.44					360	438	417	788	1205	1.24
90	331	302	886	1188	4.24					365	440	419	786	1205	1.22
95	335	305	883	1188	4.05					370	441	420	785	1205	1.20
100	338	309	880	1189	3.89					375	442	421	784	1205	1.19
105	341	312	878	1190	3.74					380	443	422	783	1205	1.18
110	344	316	875	1191	3.59					385	445	424	781	1205	1.16
115	347	319	873	1192	3.46					390	446	425	780	1205	1.14
120	350	322	871	1193	3.34					395	447	427	778	1205	1.13
125	353	325	868	1193	3.23					400	448	428	777	1205	1.12
130	356	328	866	1194	3.12					450	460	439	766	1205	1.00
140	361	333	861	1194	2.92					500	470	453	751	1204	.89
145	363	336	859	1195	2.98					550	479	464	740	1204	.82
										600	489	475	728	1203	.74