

Thermodynamic Tables

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Table C.1a Saturated Water, Temperature Table (English Units)

T, °F	p, psia	Volume, ft ³ /lbm		Energy, Btu/lbm		Enthalpy, Btu/lbm			Entropy, Btu/(lbm · R)		
		v _f	v _g	u _f	u _g	h _f	h _{fg}	h _g	s _f	s _{fg}	s _g
32.018	0.08866	0.01602	3302	0.0	1021.2	0.0	1075.4	1075.4	0.0000	2.1871	2.1871
35	0.09992	0.01602	2948	3.0	1022.2	3.0	1073.7	1076.7	0.0061	2.1705	2.1766
40	0.1217	0.01602	2445	8.0	1023.8	8.0	1070.9	1078.9	0.0162	2.1432	2.1594
45	0.1475	0.01602	2037	13.0	1025.5	13.0	1068.1	1081.1	0.0262	2.1163	2.1425
50	0.1780	0.01602	1704	18.1	1027.2	18.1	1065.2	1083.3	0.0361	2.0900	2.1261
55	0.2140	0.01603	1431	23.1	1028.8	23.1	1062.4	1085.5	0.0458	2.0643	2.1101
60	0.2563	0.01603	1207	28.1	1030.4	28.1	1059.6	1087.7	0.0555	2.0390	2.0945
65	0.3057	0.01604	1021	33.1	1032.1	33.1	1056.8	1089.9	0.0651	2.0142	2.0793
70	0.3632	0.01605	867.6	38.1	1033.7	38.1	1053.9	1092.0	0.0746	1.9898	2.0644
75	0.4300	0.01606	739.7	43.1	1035.4	43.1	1051.1	1094.2	0.0840	1.9659	2.0499
80	0.5073	0.01607	632.7	48.1	1037.0	48.1	1048.3	1096.4	0.0933	1.9425	2.0358
85	0.5964	0.01609	543.1	53.1	1038.6	53.1	1045.5	1098.6	0.1025	1.9195	2.0220
90	0.6989	0.01610	467.6	58.1	1040.2	58.1	1042.6	1100.7	0.1116	1.8969	2.0085
95	0.8162	0.01611	403.9	63.0	1041.9	63.1	1039.8	1102.9	0.1206	1.8747	1.9953
100	0.9503	0.01613	350.0	68.0	1043.5	68.0	1037.0	1105.0	0.1296	1.8528	1.9824
110	1.276	0.01617	265.1	78.0	1046.7	78.0	1031.3	1109.3	0.1473	1.8103	1.9576
120	1.695	0.01621	203.0	88.0	1049.9	88.0	1025.5	1113.5	0.1646	1.7692	1.9338
130	2.225	0.01625	157.2	98.0	1053.0	98.0	1019.7	1117.7	0.1817	1.7294	1.9111
140	2.892	0.01629	122.9	107.9	1056.2	108.0	1013.9	1121.9	0.1985	1.6909	1.8894
150	3.722	0.01634	96.98	117.9	1059.3	117.9	1008.2	1126.1	0.2150	1.6535	1.8685
160	4.745	0.01640	77.23	127.9	1062.3	128.0	1002.1	1130.1	0.2313	1.6173	1.8486
180	7.515	0.01651	50.20	148.0	1068.3	148.0	990.2	1138.2	0.2631	1.5480	1.8111
200	11.53	0.01663	33.63	168.0	1074.2	168.1	977.8	1145.9	0.2941	1.4823	1.7764
212	14.696	0.01672	26.80	180.1	1077.6	180.1	970.4	1150.5	0.3122	1.4447	1.7569
220	17.19	0.01677	23.15	188.2	1079.8	188.2	965.3	1153.5	0.3241	1.4202	1.7443
240	24.97	0.01692	16.33	208.4	1085.3	208.4	952.3	1160.7	0.3534	1.3611	1.7145
260	35.42	0.01708	11.77	228.6	1090.5	228.7	938.9	1167.6	0.3820	1.3046	1.6866

$T, ^\circ\text{F}$	p, psia	Volume, ft^3/lbm		Energy, Btu/lbm		Enthalpy, Btu/lbm			Entropy, $\text{Btu}/(\text{lbm} \cdot \text{R})$		
		v_f	v_g	u_f	u_g	h_f	h_{fg}	h_g	s_f	s_{fg}	s_g
280	49.19	0.01726	8.650	249.0	1095.4	249.2	924.9	1174.1	0.4100	1.2504	1.6604
300	66.98	0.01745	6.472	269.5	1100.0	269.7	910.5	1180.2	0.4373	1.1985	1.6358
320	89.60	0.01765	4.919	290.1	1104.2	290.4	895.4	1185.8	0.4641	1.1484	1.6125
340	117.9	0.01787	3.792	310.9	1108.0	311.3	879.5	1190.8	0.4904	1.0998	1.5902
360	152.9	0.01811	2.961	331.8	1111.4	332.3	862.9	1195.2	0.5163	1.0527	1.5690
380	195.6	0.01836	2.339	352.9	1114.3	353.6	845.4	1199.0	0.5417	1.0068	1.5485
400	247.1	0.01864	1.866	374.3	1116.6	375.1	826.9	1202.0	0.5668	0.9618	1.5286
420	308.5	0.01894	1.502	395.8	1118.3	396.9	807.2	1204.1	0.5916	0.9177	1.5093
440	381.2	0.01926	1.219	417.6	1119.3	419.0	786.3	1205.3	0.6162	0.8740	1.4902
460	466.3	0.01961	0.9961	439.7	1119.6	441.4	764.1	1205.5	0.6405	0.8309	1.4714
480	565.5	0.02000	0.8187	462.2	1118.9	464.3	740.3	1204.6	0.6647	0.7879	1.4526
500	680.0	0.02043	0.6761	485.1	1117.4	487.7	714.8	1202.5	0.6889	0.7448	1.4337
520	811.4	0.02091	0.5605	508.5	1114.8	511.7	687.2	1198.9	0.7132	0.7015	1.4147
540	961.4	0.02145	0.4658	532.6	1111.0	536.4	657.4	1193.8	0.7375	0.6577	1.3952
560	1132	0.02207	0.3877	557.3	1105.8	562.0	625.0	1187.0	0.7622	0.6129	1.3751
580	1324	0.02278	0.3225	583.0	1098.9	588.6	589.4	1178.0	0.7873	0.5669	1.3542
600	1541	0.02363	0.2677	609.9	1090.0	616.6	549.8	1166.4	0.8131	0.5188	1.3319
620	1784	0.02465	0.2209	638.3	1078.5	646.4	505.0	1151.4	0.8399	0.4678	1.3077
640	2057	0.02593	0.1805	668.7	1063.2	678.6	453.3	1131.9	0.8683	0.4122	1.2805
660	2362	0.02767	0.1446	702.0	1042.3	714.3	391.2	1105.5	0.8992	0.3493	1.2485
680	2705	0.03032	0.1113	741.7	1011.0	756.9	309.8	1066.7	0.9352	0.2718	1.2070
700	3090	0.03666	0.07444	801.7	947.7	822.7	167.7	990.4	0.9903	0.1447	1.1350
705.445	3203.8	0.05053	0.05053	872.6	872.6	902.5	0.0	902.5	1.0582	0.0000	1.0582

Note: Saturated liquid entropies have been adjusted to make the Gibbs functions of the liquid and vapor phases exactly equal. For this reason, there are some small differences between values presented here and the original tables.

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Table C.1b Saturated Water, Temperature Table (Metric Units)

$T, ^\circ\text{C}$	ρ, MPa	Volume, m^3/kg		Energy, kJ/kg		Enthalpy, kJ/kg			Entropy, $\text{kJ}/(\text{kg} \cdot \text{K})$		
		v_f	v_g	u_f	u_g	h_f	h_{fg}	h_g	S_f	S_{fg}	S_g
0.010	0.0006113	0.001000	206.1	0.0	2375.3	0.0	2501.3	2501.3	0.0000	9.1571	9.1571
2	0.0007056	0.001000	179.9	8.4	2378.1	8.4	2496.6	2505.0	0.0305	9.0738	9.1043
5	0.0008721	0.001000	147.1	21.0	2382.2	21.0	2489.5	2510.5	0.0761	8.9505	9.0266
10	0.001228	0.001000	106.4	42.0	2389.2	42.0	2477.7	2519.7	0.1510	8.7506	8.9016
15	0.001705	0.001001	77.93	63.0	2396.0	63.0	2465.9	2528.9	0.2244	8.5578	8.7822
20	0.002338	0.001002	57.79	83.9	2402.9	83.9	2454.2	2538.1	0.2965	8.3715	8.6680
25	0.003169	0.001003	43.36	104.9	2409.8	104.9	2442.3	2547.2	0.3672	8.1916	8.5588
30	0.004246	0.001004	32.90	125.8	2416.6	125.8	2430.4	2556.2	0.4367	8.0174	8.4541
35	0.005628	0.001006	25.22	146.7	2423.4	146.7	2418.6	2565.3	0.5051	7.8488	8.3539
40	0.007383	0.001008	19.52	167.5	2430.1	167.5	2406.8	2574.3	0.5723	7.6855	8.2578
45	0.009593	0.001010	15.26	188.4	2436.8	188.4	2394.8	2583.2	0.6385	7.5271	8.1656
50	0.01235	0.001012	12.03	209.3	2443.5	209.3	2382.8	2592.1	0.7036	7.3735	8.0771
55	0.01576	0.001015	9.569	230.2	2450.1	230.2	2370.7	2600.9	0.7678	7.2243	7.9921
60	0.01994	0.001017	7.671	251.1	2456.6	251.1	2358.5	2609.6	0.8310	7.0794	7.9104
65	0.02503	0.001020	6.197	272.0	2463.1	272.0	2346.2	2618.2	0.8934	6.9384	7.8318
70	0.03119	0.001023	5.042	292.9	2469.5	293.0	2333.8	2626.8	0.9549	6.8012	7.7561
75	0.03858	0.001026	4.131	313.9	2475.9	313.9	2321.4	2635.3	1.0155	6.6678	7.6833
80	0.04739	0.001029	3.407	334.8	2482.2	334.9	2308.8	2643.7	1.0754	6.5376	7.6130
85	0.05783	0.001032	2.828	355.8	2488.4	355.9	2296.0	2651.9	1.1344	6.4109	7.5453
90	0.07013	0.001036	2.361	376.8	2494.5	376.9	2283.2	2660.1	1.1927	6.2872	7.4799
95	0.08455	0.001040	1.982	397.9	2500.6	397.9	2270.2	2668.1	1.2503	6.1664	7.4167
100	0.1013	0.001044	1.673	418.9	2506.5	419.0	2257.0	2676.0	1.3071	6.0486	7.3557
110	0.1433	0.001052	1.210	461.1	2518.1	461.3	2230.2	2691.5	1.4188	5.8207	7.2395
120	0.1985	0.001060	0.8919	503.5	2529.2	503.7	2202.6	2706.3	1.5280	5.6024	7.1304
130	0.2701	0.001070	0.6685	546.0	2539.9	546.3	2174.2	2720.5	1.6348	5.3929	7.0277
140	0.3613	0.001080	0.5089	588.7	2550.0	589.1	2144.8	2733.9	1.7395	5.1912	6.9307
150	0.4758	0.001090	0.3928	631.7	2559.5	632.2	2114.2	2746.4	1.8422	4.9965	6.8387

$T, ^\circ\text{C}$	p, MPa	Volume, m^3/kg		Energy, kJ/kg		Enthalpy, kJ/kg			Entropy, $\text{kJ}/(\text{kg} \cdot \text{K})$		
		v_f	v_g	u_f	u_g	h_f	h_{fg}	h_g	S_f	S_{fg}	S_g
160	0.6178	0.001102	0.3071	674.9	2568.4	675.5	2082.6	2758.1	1.9431	4.8079	6.7510
170	0.7916	0.001114	0.2428	718.3	2576.5	719.2	2049.5	2768.7	2.0423	4.6249	6.6672
180	1.002	0.001127	0.1941	762.1	2583.7	763.2	2015.0	2778.2	2.1400	4.4466	6.5866
190	1.254	0.001141	0.1565	806.2	2590.0	807.5	1978.8	2786.4	2.2363	4.2724	6.5087
200	1.554	0.001156	0.1274	850.6	2595.3	852.4	1940.8	2793.2	2.3313	4.1018	6.4331
210	1.906	0.001173	0.1044	895.5	2599.4	897.7	1900.8	2798.5	2.4253	3.9340	6.3593
220	2.318	0.001190	0.08620	940.9	2602.4	943.6	1858.5	2802.1	2.5183	3.7686	6.2869
230	2.795	0.001209	0.07159	986.7	2603.9	990.1	1813.9	2804.0	2.6105	3.6050	6.2155
240	3.344	0.001229	0.05977	1033.2	2604.0	1037.3	1766.5	2803.8	2.7021	3.4425	6.1446
250	3.973	0.001251	0.05013	1080.4	2602.4	1085.3	1716.2	2801.5	2.7933	3.2805	6.0738
260	4.688	0.001276	0.04221	1128.4	2599.0	1134.4	1662.5	2796.9	2.8844	3.1184	6.0028
270	5.498	0.001302	0.03565	1177.3	2593.7	1184.5	1605.2	2789.7	2.9757	2.9553	5.9310
280	6.411	0.001332	0.03017	1227.4	2586.1	1236.0	1543.6	2779.6	3.0674	2.7905	5.8579
290	7.436	0.001366	0.02557	1278.9	2576.0	1289.0	1477.2	2766.2	3.1600	2.6230	5.7830
300	8.580	0.001404	0.02168	1332.0	2563.0	1344.0	1405.0	2749.0	3.2540	2.4513	5.7053
310	9.856	0.001447	0.01835	1387.0	2546.4	1401.3	1326.0	2727.3	3.3500	2.2739	5.6239
320	11.27	0.001499	0.01549	1444.6	2525.5	1461.4	1238.7	2700.1	3.4487	2.0883	5.5370
330	12.84	0.001561	0.01300	1505.2	2499.0	1525.3	1140.6	2665.9	3.5514	1.8911	5.4425
340	14.59	0.001638	0.01080	1570.3	2464.6	1594.2	1027.9	2622.1	3.6601	1.6765	5.3366
350	16.51	0.001740	0.008815	1641.8	2418.5	1670.6	893.4	2564.0	3.7784	1.4338	5.2122
360	18.65	0.001892	0.006947	1725.2	2351.6	1760.5	720.7	2481.2	3.9154	1.1382	5.0536
370	21.03	0.002213	0.004931	1844.0	2229.0	1890.5	442.2	2332.7	4.1114	0.6876	4.7990
374.136	22.088	0.003155	0.003155	2029.6	2029.6	2099.3	0.0	2099.3	4.4305	0.0000	4.4305

Note: Saturated liquid entropies have been adjusted to make the Gibbs functions of the liquid and vapor phases exactly equal. For this reason, there are some small differences between values presented here and the original tables.

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Table C.2a Saturated Water, Pressure Table (English Units)

p , psia	T , °F	Volume, ft ³ /lbm		Energy, Btu/lbm		Enthalpy, Btu/lbm			Entropy, Btu/(lbm · R)		
		v_f	v_g	u_f	u_g	h_f	h_{fg}	h_g	s_f	s_{fg}	s_g
0.0887	32.018	0.01602	3302.0	0.0	1021.2	0.0	1075.4	1075.4	0.0000	2.1871	2.1871
0.1	35.0	0.01602	2946.0	3.0	1022.2	3.0	1073.7	1076.7	0.0061	2.1705	2.1768
0.12	39.6	0.01602	2477.0	7.7	1023.7	7.7	1071.0	1078.7	0.0155	2.1451	2.1606
0.14	43.6	0.01602	2140.0	11.7	1025.0	11.7	1068.8	1080.5	0.0234	2.1237	2.1471
0.16	47.1	0.01602	1886.0	15.2	1026.2	15.2	1066.8	1082.0	0.0304	2.1050	2.1354
0.18	50.3	0.01602	1686.0	18.3	1027.2	18.3	1065.1	1083.4	0.0366	2.0886	2.1252
0.2	53.1	0.01603	1526.0	21.2	1028.2	21.2	1063.5	1084.7	0.0422	2.0738	2.1160
0.25	59.3	0.01603	1235.0	27.4	1030.2	27.4	1060.0	1087.4	0.0542	2.0425	2.0967
0.3	64.5	0.01604	1040.0	32.5	1031.9	32.5	1057.1	1089.6	0.0641	2.0168	2.0809
0.4	72.8	0.01606	792.0	40.9	1034.7	40.9	1052.4	1093.3	0.0799	1.9762	2.0561
0.6	85.2	0.01609	540.0	53.3	1038.7	53.3	1045.3	1098.6	0.1028	1.9187	2.0215
0.8	94.3	0.01611	411.7	62.4	1041.6	62.4	1040.2	1102.6	0.1195	1.8775	1.9970
1	101.7	0.01614	333.6	69.7	1044.0	69.7	1036.0	1105.7	0.1326	1.8455	1.9781
1.2	107.9	0.01616	280.9	75.9	1046.0	75.9	1032.5	1108.4	0.1435	1.8193	1.9628
1.4	113.2	0.01618	243.0	81.2	1047.7	81.2	1029.5	1110.7	0.1529	1.7969	1.9498
1.6	117.9	0.01620	214.3	85.9	1049.2	85.9	1026.8	1112.7	0.1611	1.7775	1.9386
1.8	122.2	0.01621	191.8	90.2	1050.6	90.2	1024.3	1114.5	0.1684	1.7604	1.9288
2	126.0	0.01623	173.8	94.0	1051.8	94.0	1022.1	1116.1	0.1750	1.7450	1.9200
3	141.4	0.01630	118.7	109.4	1056.6	109.4	1013.1	1122.5	0.2009	1.6854	1.8863
4	152.9	0.01636	90.64	120.9	1060.2	120.9	1006.4	1127.3	0.2198	1.6428	1.8626
6	170.0	0.01645	61.98	138.0	1065.4	138.0	996.2	1134.2	0.2474	1.5820	1.8294
8	182.8	0.01653	47.35	150.8	1069.2	150.8	988.5	1139.3	0.2676	1.5384	1.8060
10	193.2	0.01659	38.42	161.2	1072.2	161.2	982.1	1143.3	0.2836	1.5043	1.7879
12	201.9	0.01665	32.40	170.0	1074.7	170.0	976.7	1146.7	0.2970	1.4762	1.7732
14	209.6	0.01670	28.05	177.6	1076.9	177.7	971.9	1149.6	0.3085	1.4523	1.7608
14.696	212.0	0.01672	26.80	180.1	1077.6	180.1	970.4	1150.5	0.3122	1.4447	1.7569
16	216.3	0.01675	24.75	184.4	1078.8	184.5	967.6	1152.1	0.3186	1.4315	1.7501

p , psia	T , °F	Volume, ft ³ /lbm		Energy, Btu/lbm		Enthalpy, Btu/lbm			Entropy, Btu/(lbm · R)		
		v_f	v_g	u_f	u_g	h_f	h_{fg}	h_g	s_f	s_{fg}	s_g
18	222.4	0.01679	22.17	190.6	1080.5	190.6	963.8	1154.4	0.3277	1.4129	1.7406
20	228.0	0.01683	20.09	196.2	1082.0	196.2	960.2	1156.4	0.3359	1.3963	1.7322
30	250.3	0.01700	13.75	218.8	1088.0	218.9	945.4	1164.3	0.3683	1.3315	1.6998
40	267.3	0.01715	10.50	236.0	1092.3	236.2	933.8	1170.0	0.3922	1.2847	1.6769
60	292.7	0.01738	7.177	262.0	1098.3	262.2	915.8	1178.0	0.4274	1.2172	1.6446
80	312.1	0.01757	5.474	281.9	1102.6	282.2	901.4	1183.6	0.4535	1.1681	1.6216
100	327.9	0.01774	4.434	298.3	1105.8	298.6	889.2	1187.8	0.4745	1.1291	1.6036
120	341.3	0.01789	3.730	312.3	1108.3	312.7	878.4	1191.1	0.4921	1.0967	1.5888
140	353.1	0.01802	3.221	324.6	1110.3	325.0	868.8	1193.8	0.5074	1.0688	1.5762
160	363.6	0.01815	2.836	335.6	1112.0	336.2	859.8	1196.0	0.5209	1.0443	1.5652
180	373.1	0.01827	2.533	345.7	1113.4	346.3	851.5	1197.8	0.5330	1.0225	1.5555
200	381.9	0.01839	2.289	354.9	1114.6	355.6	843.7	1199.3	0.5441	1.0025	1.5466
300	417.4	0.01890	1.544	393.0	1118.1	394.1	809.8	1203.9	0.5885	0.9232	1.5117
400	444.7	0.01934	1.162	422.8	1119.4	424.2	781.3	1205.5	0.6219	0.8639	1.4858
600	486.3	0.02013	0.7702	469.4	1118.5	471.6	732.5	1204.1	0.6724	0.7742	1.4466
800	518.4	0.02087	0.5691	506.6	1115.0	509.7	689.6	1199.3	0.7112	0.7050	1.4162
1000	544.8	0.02159	0.4459	538.4	1109.9	542.4	650.0	1192.4	0.7434	0.6471	1.3905
1200	567.4	0.02232	0.3623	566.7	1103.5	571.7	612.2	1183.9	0.7714	0.5961	1.3675
1400	587.3	0.02307	0.3016	592.6	1096.0	598.6	575.5	1174.1	0.7966	0.5497	1.3463
1600	605.1	0.02386	0.2552	616.9	1087.4	624.0	538.9	1162.9	0.8198	0.5062	1.3260
2000	636.0	0.02565	0.1881	662.4	1066.6	671.9	464.4	1136.3	0.8624	0.4239	1.2863
2600	674.1	0.02938	0.1210	729.2	1021.8	743.3	336.8	1080.1	0.9237	0.2971	1.2208
3203.8	705.445	0.05053	0.05053	872.6	872.6	902.5	0.0	902.5	1.0582	0.0000	1.0582

Note: Saturated liquid entropies have been adjusted to make the Gibbs functions of the liquid and vapor phases exactly equal. For this reason, there are some small differences between values presented here and the original tables.

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Table C.2b Saturated Water, Pressure Table (Metric Units)

p , Mpa	T , °C	Volume, m ³ /kg		Energy, kJ/kg		Enthalpy, kJ/kg			Entropy, kJ/(kg · K)		
		v_f	v_g	u_f	u_g	h_f	h_{fg}	h_g	s_f	s_{fg}	s_g
0.000611	0.01	0.001000	206.1	0.0	2375.3	0.0	2501.3	2501.3	0.0000	9.1571	9.1571
0.0008	3.8	0.001000	159.7	15.8	2380.5	15.8	2492.5	2508.3	0.0575	9.0007	9.0582
0.001	7.0	0.001000	129.2	29.3	2385.0	29.3	2484.9	2514.2	0.1059	8.8706	8.9765
0.0012	9.7	0.001000	108.7	40.6	2388.7	40.6	2478.5	2519.1	0.1460	8.7639	8.9099
0.0014	12.0	0.001001	93.92	50.3	2391.9	50.3	2473.1	2523.4	0.1802	8.6736	8.8538
0.0016	14.0	0.001001	82.76	58.9	2394.7	58.9	2468.2	2527.1	0.2101	8.5952	8.8053
0.0018	15.8	0.001001	74.03	66.5	2397.2	66.5	2464.0	2530.5	0.2367	8.5259	8.7626
0.002	17.5	0.001001	67.00	73.5	2399.5	73.5	2460.0	2533.5	0.2606	8.4639	8.7245
0.003	24.1	0.001003	45.67	101.0	2408.5	101.0	2444.5	2545.5	0.3544	8.2240	8.5784
0.004	29.0	0.001004	34.80	121.4	2415.2	121.4	2433.0	2554.4	0.4225	8.0529	8.4754
0.006	36.2	0.001006	23.74	151.5	2424.9	151.5	2415.9	2567.4	0.5208	7.8104	8.3312
0.008	41.5	0.001008	18.10	173.9	2432.1	173.9	2403.1	2577.0	0.5924	7.6371	8.2295
0.01	45.8	0.001010	14.67	191.8	2437.9	191.8	2392.8	2584.6	0.6491	7.5019	8.1510
0.012	49.4	0.001012	12.36	206.9	2442.7	206.9	2384.1	2591.0	0.6961	7.3910	8.0871
0.014	52.6	0.001013	10.69	220.0	2446.9	220.0	2376.6	2596.6	0.7365	7.2968	8.0333
0.016	55.3	0.001015	9.433	231.5	2450.5	231.5	2369.9	2601.4	0.7719	7.2149	7.9868
0.018	57.8	0.001016	8.445	241.9	2453.8	241.9	2363.9	2605.8	0.8034	7.1425	7.9459
0.02	60.1	0.001017	7.649	251.4	2456.7	251.4	2358.3	2609.7	0.8319	7.0774	7.9093
0.03	69.1	0.001022	5.229	289.2	2468.4	289.2	2336.1	2625.3	0.9439	6.8256	7.7695
0.04	75.9	0.001026	3.993	317.5	2477.0	317.6	2319.1	2636.7	1.0260	6.6449	7.6709
0.06	85.9	0.001033	2.732	359.8	2489.6	359.8	2293.7	2653.5	1.1455	6.3873	7.5328
0.08	93.5	0.001039	2.087	391.6	2498.8	391.6	2274.1	2665.7	1.2331	6.2023	7.4354
0.1	99.6	0.001043	1.694	417.3	2506.1	417.4	2258.1	2675.5	1.3029	6.0573	7.3602
0.12	104.8	0.001047	1.428	439.2	2512.1	439.3	2244.2	2683.5	1.3611	5.9378	7.2989
0.14	109.3	0.001051	1.237	458.2	2517.3	458.4	2232.0	2690.4	1.4112	5.8360	7.2472
0.16	113.3	0.001054	1.091	475.2	2521.8	475.3	2221.2	2696.5	1.4553	5.7472	7.2025
0.18	116.9	0.001058	0.9775	490.5	2525.9	490.7	2211.1	2701.8	1.4948	5.6683	7.1631

ρ , Mpa	T , °C	Volume, m ³ /kg		Energy, kJ/kg		Enthalpy, kJ/kg			Entropy, kJ/(kg · K)		
		v_f	v_g	u_f	u_g	h_f	h_{fg}	h_g	s_f	s_{fg}	s_g
0.2	120.2	0.001061	0.8857	504.5	2529.5	504.7	2201.9	2706.6	1.5305	5.5975	7.1280
0.3	133.5	0.001073	0.6058	561.1	2543.6	561.5	2163.8	2725.3	1.6722	5.3205	6.9927
0.4	143.6	0.001084	0.4625	604.3	2553.6	604.7	2133.8	2738.5	1.7770	5.1197	6.8967
0.6	158.9	0.001101	0.3157	669.9	2567.4	670.6	2086.2	2756.8	1.9316	4.8293	6.7609
0.8	170.4	0.001115	0.2404	720.2	2576.8	721.1	2048.0	2769.1	2.0466	4.6170	6.6636
1	179.9	0.001127	0.1944	761.7	2583.6	762.8	2015.3	2778.1	2.1391	4.4482	6.5873
1.2	188.0	0.001139	0.1633	797.3	2588.8	798.6	1986.2	2784.8	2.2170	4.3072	6.5242
1.4	195.1	0.001149	0.1408	828.7	2592.8	830.3	1959.7	2790.0	2.2847	4.1854	6.4701
1.6	201.4	0.001159	0.1238	856.9	2596.0	858.8	1935.2	2794.0	2.3446	4.0780	6.4226
1.8	207.2	0.001168	0.1104	882.7	2598.4	884.8	1912.3	2797.1	2.3986	3.9816	6.3802
2	212.4	0.001177	0.09963	906.4	2600.3	908.8	1890.7	2799.5	2.4478	3.8939	6.3417
3	233.9	0.001216	0.06668	1004.8	2604.1	1008.4	1795.7	2804.1	2.6462	3.5416	6.1878
4	250.4	0.001252	0.04978	1082.3	2602.3	1087.3	1714.1	2801.4	2.7970	3.2739	6.0709
6	275.6	0.001319	0.03244	1205.4	2589.7	1213.3	1571.0	2784.3	3.0273	2.8627	5.8900
8	295.1	0.001384	0.02352	1305.6	2569.8	1316.6	1441.4	2758.0	3.2075	2.5365	5.7440
9	303.4	0.001418	0.02048	1350.5	2557.8	1363.3	1378.8	2742.1	3.2865	2.3916	5.6781
10	311.1	0.001452	0.01803	1393.0	2544.4	1407.6	1317.1	2724.7	3.3603	2.2546	5.6149
12	324.8	0.001527	0.01426	1472.9	2513.7	1491.3	1193.6	2684.9	3.4970	1.9963	5.4933
14	336.8	0.001611	0.01149	1548.6	2476.8	1571.1	1066.5	2637.6	3.6240	1.7486	5.3726
16	347.4	0.001711	0.009307	1622.7	2431.8	1650.0	930.7	2580.7	3.7468	1.4996	5.2464
18	357.1	0.001840	0.007491	1698.9	2374.4	1732.0	777.2	2509.2	3.8722	1.2332	5.1054
20	365.8	0.002036	0.005836	1785.6	2293.2	1826.3	583.7	2410.0	4.0146	0.9135	4.9281
22.088	374.136	0.003155	0.003155	2029.6	2029.6	2099.3	0.0	2099.3	4.4305	0.0000	4.4305

Note: Saturated liquid entropies have been adjusted to make the Gibbs functions of the liquid and vapor phases exactly equal. For this reason, there are some small differences between values presented here and the original tables.

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Table C.3a Superheated Water Vapor (English Units)

p , psia (T_{sat} °F)		Temperature, °F												
		100	200	300	400	500	600	700	800	900	1000	1100	1200	1300
0.2 (53.1)	v , ft ³ /lbm	1666.0	1964.0	2262.0	2560.0	2858.0	3156.0	3454.0	3752.0	4050.0	4347.0	4645.0	4943.0	5241.0
	u , Btu/lbm	1043.9	1077.7	1112.1	1147.1	1182.8	1219.3	1256.7	1294.9	1334.0	1373.9	1414.8	1456.7	1499.4
	h , Btu/lbm	1105.6	1150.4	1195.8	1241.9	1288.6	1336.1	1384.5	1433.7	1483.8	1534.8	1586.8	1639.6	1693.4
	s , Btu/(lbm · R)	2.1550	2.2287	2.2928	2.3497	2.4011	2.4483	2.4919	2.5326	2.5708	2.607	2.6414	2.6743	2.7058
0.5 (79.5)	v , ft ³ /lbm	665.9	785.5	904.8	1024.0	1143.0	1262.0	1382.0	1501.0	1620.0	1739.0	1858.0	1977.0	2096.0
	u , Btu/lbm	1043.7	1077.6	1112.0	1147.1	1182.8	1219.3	1256.7	1294.9	1334.0	1373.9	1414.8	1456.7	1499.4
	h , Btu/lbm	1105.3	1150.3	1195.8	1241.8	1288.6	1336.1	1384.5	1433.7	1483.8	1534.8	1586.8	1639.6	1693.4
	s , Btu/(lbm · R)	2.0537	2.1276	2.1917	2.2487	2.3001	2.3472	2.3909	2.4316	2.4698	2.506	2.5404	2.5733	2.6048
1 (101.7)	v , ft ³ /lbm	–	392.5	452.3	511.9	571.5	631.1	690.7	750.3	809.9	869.5	929.0	988.6	1048.0
	u , Btu/lbm	–	1077.5	1112.0	1147.0	1182.8	1219.3	1256.7	1294.9	1333.9	1373.9	1414.8	1456.7	1499.4
	h , Btu/lbm	–	1150.1	1195.6	1241.7	1288.5	1336.1	1384.5	1433.7	1483.8	1534.8	1586.8	1639.6	1693.4
	s , Btu/(lbm · R)	–	2.0510	2.1152	2.1722	2.2237	2.2708	2.3144	2.3551	2.3934	2.4296	2.4640	2.4969	2.5283
2 (126.0)	v , ft ³ /lbm	–	196.0	226.0	255.9	285.7	315.5	345.3	375.1	404.9	434.7	464.5	494.3	524.1
	u , Btu/lbm	–	1077.2	1111.8	1146.9	1182.7	1219.3	1256.6	1294.8	1333.9	1373.9	1414.8	1456.7	1499.4
	h , Btu/lbm	–	1149.7	1195.4	1241.6	1288.4	1336.0	1384.4	1433.7	1483.8	1534.8	1586.7	1639.6	1693.4
	s , Btu/(lbm · R)	–	1.9741	2.0386	2.0957	2.1472	2.1944	2.2380	2.2787	2.3170	2.3532	2.3876	2.4205	2.4519
5 (162.2)	v , ft ³ /lbm	–	78.15	90.24	102.2	114.2	126.1	138.1	150.0	161.9	173.9	185.8	197.7	209.6
	u , Btu/lbm	–	1076.2	1111.3	1146.6	1182.5	1219.1	1256.5	1294.7	1333.8	1373.8	1414.8	1456.6	1499.4
	h , Btu/lbm	–	1148.6	1194.8	1241.2	1288.2	1335.8	1384.3	1433.5	1483.7	1534.7	1586.7	1639.5	1693.3
	s , Btu/(lbm · R)	–	1.8717	1.9369	1.9943	2.0460	2.0932	2.1369	2.1776	2.2159	2.2522	2.2866	2.3194	2.3509
10 (193.2)	v , ft ³ /lbm	–	38.85	44.99	51.03	57.04	63.03	69.01	74.98	80.95	86.91	92.88	98.84	104.8
	u , Btu/lbm	–	1074.7	1110.4	1146.1	1182.2	1218.8	1256.3	1294.6	1333.7	1373.7	1414.7	1456.5	1499.3
	h , Btu/lbm	–	1146.6	1193.7	1240.5	1287.7	1335.5	1384.0	1433.3	1483.5	1534.6	1586.5	1639.4	1693.2
	s , Btu/(lbm · R)	–	1.7929	1.8594	1.9173	1.9692	2.0166	2.0603	2.1011	2.1394	2.1757	2.2101	2.2430	2.2745
14.7 (212.0)	v , ft ³ /lbm	–	–	30.52	34.67	38.77	42.86	46.93	51.00	55.07	59.13	63.19	67.25	71.30
	u , Btu/lbm	–	–	1109.6	1145.6	1181.8	1218.6	1256.1	1294.4	1333.6	1373.6	1414.6	1456.5	1499.3
	h , Btu/lbm	–	–	1192.6	1239.9	1287.3	1335.2	1383.8	1433.1	1483.3	1534.4	1586.4	1639.3	1693.2
	s , Btu/(lbm · R)	–	–	1.8159	1.8743	1.9264	1.9739	2.0177	2.0586	2.0969	2.1332	2.1676	2.2005	2.2320

p , psia (T_{sat} , °F)	Temperature, °F													
	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	
20 (227.9)	v , ft ³ /lbm	22.36	25.43	28.46	31.47	34.47	37.46	40.45	43.44	46.42	49.41	52.39	55.37	58.35
	u , Btu/lbm	1108.7	1145.1	1181.5	1218.3	1255.9	1294.3	1333.5	1373.5	1414.5	1456.4	1499.2	1542.9	1587.6
	h , Btu/lbm	1191.4	1239.2	1286.8	1334.8	1383.5	1432.2	1483.2	1534.3	1586.3	1639.2	1693.1	1747.8	1803.5
	s , Btu/(lbm · R)	1.7807	1.8397	1.8921	1.9397	1.9836	2.0245	2.0629	2.0991	2.1336	2.1665	2.1980	2.2283	2.2574
40 (267.2)	v , ft ³ /lbm	11.04	12.62	14.16	15.69	17.20	18.70	20.20	21.70	23.20	24.69	26.18	27.68	29.17
	u , Btu/lbm	1105.1	1143.0	1180.1	1217.3	1255.1	1293.7	1333.0	1373.1	1414.2	1456.1	1498.9	1542.7	1587.4
	h , Btu/lbm	1186.8	1236.4	1284.9	1333.4	1382.4	1432.1	1482.5	1533.7	1585.9	1638.9	1692.8	1747.6	1803.3
	s , Btu/(lbm · R)	1.6995	1.7608	1.8142	1.8623	1.9065	1.9476	1.9861	2.0224	2.0570	2.0899	2.1214	2.1517	2.1809
60 (292.7)	v , ft ³ /lbm	7.260	8.353	9.399	10.42	11.44	12.45	13.45	14.45	15.45	16.45	17.45	18.45	19.44
	u , Btu/lbm	1101.3	1140.8	1178.6	1216.3	1254.4	1293.0	1332.5	1372.7	1413.8	1455.8	1498.7	1542.5	1587.2
	h , Btu/lbm	1181.9	1233.5	1283.0	1332.1	1381.4	1431.2	1481.8	1533.2	1585.4	1638.5	1692.4	1747.3	1803.0
	s , Btu/(lbm · R)	1.6497	1.7136	1.7680	1.8167	1.8611	1.9024	1.9410	1.9775	2.0121	2.0450	2.0766	2.1069	2.1361
80 (312.0)	v , ft ³ /lbm	–	6.217	7.017	7.794	8.561	9.321	10.08	10.83	11.58	12.33	13.08	13.83	14.58
	u , Btu/lbm	–	1138.5	1177.2	1215.3	1253.6	1292.4	1332.0	1372.3	1413.5	1455.5	1498.4	1542.3	1587.0
	h , Btu/lbm	–	1230.6	1281.1	1330.7	1380.3	1430.4	1481.1	1532.6	1584.9	1638.1	1692.1	1747.0	1802.8
	s , Btu/(lbm · R)	–	1.6792	1.7348	1.7840	1.8287	1.8702	1.9089	1.9455	1.9801	2.0131	2.0447	2.0751	2.1043
100 (327.8)	v , ft ³ /lbm	–	4.934	5.587	6.216	6.834	7.445	8.053	8.657	9.260	9.861	10.46	11.06	11.66
	u , Btu/lbm	–	1136.2	1175.7	1214.2	1252.8	1291.8	1331.4	1371.9	1413.1	1455.2	1498.2	1542.0	1586.8
	h , Btu/lbm	–	1227.5	1279.1	1329.3	1379.2	1429.6	1480.5	1532.1	1584.5	1637.7	1691.8	1746.7	1802.5
	s , Btu/(lbm · R)	–	1.6519	1.7087	1.7584	1.8035	1.8451	1.8840	1.9206	1.9553	1.9884	2.0200	2.0504	2.0796
140 (353.1)	v , ft ³ /lbm	–	3.466	3.952	4.412	4.860	5.301	5.739	6.173	6.605	7.036	7.466	7.895	8.324
	u , Btu/lbm	–	1131.4	1172.7	1212.1	1251.2	1290.5	1330.4	1371.0	1412.4	1454.6	1497.7	1541.6	1586.4
	h , Btu/lbm	–	1221.2	1275.1	1326.4	1377.1	1427.9	1479.1	1531.0	1583.5	1636.9	1691.1	1746.1	1802.0
	s , Btu/(lbm · R)	–	1.6090	1.6684	1.7193	1.7650	1.8070	1.8461	1.8829	1.9178	1.9509	1.9826	2.0130	2.0423
180 (373.1)	v , ft ³ /lbm	–	2.648	3.042	3.409	3.763	4.110	4.453	4.793	5.131	5.467	5.802	6.137	6.471
	u , Btu/lbm	–	1126.2	1169.6	1210.0	1249.6	1289.3	1329.4	1370.2	1411.7	1454.0	1497.2	1541.2	1586.0
	h , Btu/lbm	–	1214.4	1270.9	1323.5	1374.9	1426.2	1477.7	1529.8	1582.6	1636.1	1690.4	1745.6	1801.5
	s , Btu/(lbm · R)	–	1.5751	1.6374	1.6895	1.7359	1.7783	1.8177	1.8546	1.8896	1.9229	1.9546	1.9851	2.0144

(Continued)

Table C.3a Superheated Water Vapor (English Units) *continued*

$p, \text{psia } (T_{\text{sat}}, \text{°F})$		Temperature, °F												
		400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600
200 (381.8)	$v, \text{ft}^3/\text{lbm}$	2.361	2.724	3.058	3.379	3.693	4.003	4.310	4.615	4.918	5.220	5.521	5.822	6.123
	$u, \text{Btu}/\text{lbm}$	1123.5	1168.0	1208.9	1248.8	1288.6	1328.9	1369.8	1411.4	1453.7	1496.9	1540.9	1585.8	1631.6
	$h, \text{Btu}/\text{lbm}$	1210.8	1268.8	1322.0	1373.8	1425.3	1477.0	1529.3	1581.8	1635.7	1690.1	1745.3	1801.3	1858.1
	$s, \text{Btu}/(\text{lbm} \cdot \text{R})$	1.5602	1.6240	1.6769	1.7236	1.7662	1.8057	1.8427	1.8778	1.9111	1.9429	1.9734	2.0027	2.0310
250 (401.0)	$v, \text{ft}^3/\text{lbm}$	–	2.150	2.426	2.688	2.943	3.193	3.440	3.685	3.929	4.172	4.414	4.655	4.896
	$u, \text{Btu}/\text{lbm}$	–	1163.8	1206.1	1246.7	1287.0	1327.6	1368.7	1410.5	1453.0	1496.3	1540.4	1585.3	1631.1
	$h, \text{Btu}/\text{lbm}$	–	1263.3	1318.3	1371.1	1423.2	1475.3	1527.9	1581.0	1634.8	1689.3	1744.6	1800.7	1857.6
	$s, \text{Btu}/(\text{lbm} \cdot \text{R})$	–	1.5950	1.6496	1.6972	1.7403	1.7801	1.8174	1.8526	1.8860	1.9179	1.9485	1.9779	2.0062
300 (417.4)	$v, \text{ft}^3/\text{lbm}$	–	1.766	2.004	2.227	2.442	2.653	2.860	3.066	3.270	3.473	3.675	3.877	4.078
	$u, \text{Btu}/\text{lbm}$	–	1159.5	1203.2	1244.6	1285.4	1326.3	1367.7	1409.6	1452.2	1495.6	1539.8	1584.8	1630.7
	$h, \text{Btu}/\text{lbm}$	–	1257.5	1314.5	1368.3	1421.0	1473.6	1526.4	1579.8	1633.8	1688.4	1743.8	1800.0	1857.0
	$s, \text{Btu}/(\text{lbm} \cdot \text{R})$	–	1.5703	1.6268	1.6753	1.7189	1.7591	1.7966	1.8319	1.8655	1.8975	1.9281	1.9575	1.9859
400 (444.7)	$v, \text{ft}^3/\text{lbm}$	–	1.284	1.476	1.650	1.816	1.978	2.136	2.292	2.446	2.599	2.752	2.904	3.055
	$u, \text{Btu}/\text{lbm}$	–	1150.1	1197.3	1240.4	1282.1	1323.7	1365.5	1407.8	1450.7	1494.3	1538.7	1583.8	1629.8
	$h, \text{Btu}/\text{lbm}$	–	1245.2	1306.6	1362.5	1416.6	1470.1	1523.6	1577.4	1631.8	1686.8	1742.4	1798.8	1855.9
	$s, \text{Btu}/(\text{lbm} \cdot \text{R})$	–	1.5284	1.5894	1.6398	1.6846	1.7254	1.7634	1.7991	1.8329	1.8650	1.8958	1.9253	1.9537
600 (486.3)	$v, \text{ft}^3/\text{lbm}$	–	0.7947	0.9456	1.073	1.190	1.302	1.411	1.517	1.622	1.726	1.829	1.931	2.033
	$u, \text{Btu}/\text{lbm}$	–	1128.0	1184.5	1231.5	1275.4	1318.4	1361.2	1404.2	1447.7	1491.7	1536.4	1581.8	1628.0
	$h, \text{Btu}/\text{lbm}$	–	1216.2	1289.5	1350.6	1407.6	1462.9	1517.8	1572.7	1627.8	1683.4	1739.5	1796.3	1853.7
	$s, \text{Btu}/(\text{lbm} \cdot \text{R})$	–	1.4594	1.5322	1.5874	1.6345	1.6768	1.7157	1.7521	1.7863	1.8188	1.8499	1.8796	1.9082
800 (518.3)	$v, \text{ft}^3/\text{lbm}$	–	–	0.6776	0.7829	0.8764	0.9640	1.048	1.130	1.210	1.289	1.367	1.445	1.522
	$u, \text{Btu}/\text{lbm}$	–	–	1170.1	1222.1	1268.4	1312.9	1356.7	1400.5	1444.6	1489.1	1534.2	1579.8	1626.2
	$h, \text{Btu}/\text{lbm}$	–	–	1270.4	1338.0	1398.2	1455.6	1511.9	1567.8	1623.8	1680.0	1736.6	1793.7	1851.5
	$s, \text{Btu}/(\text{lbm} \cdot \text{R})$	–	–	1.4863	1.5473	1.5971	1.6410	1.6809	1.7180	1.7527	1.7856	1.8169	1.8469	1.8756
1000 (544.7)	$v, \text{ft}^3/\text{lbm}$	–	–	0.5140	0.6080	0.6878	0.7610	0.8305	0.8976	0.9630	1.027	1.090	1.153	1.215
	$u, \text{Btu}/\text{lbm}$	–	–	1153.7	1212.0	1261.2	1307.3	1352.2	1396.8	1441.5	1486.4	1531.9	1577.8	1624.4
	$h, \text{Btu}/\text{lbm}$	–	–	1248.8	1324.5	1388.5	1448.1	1505.9	1562.9	1619.7	1676.5	1733.7	1791.2	1849.3
	$s, \text{Btu}/(\text{lbm} \cdot \text{R})$	–	–	1.4452	1.5137	1.5666	1.6122	1.6532	1.6910	1.7263	1.7595	1.7911	1.8212	1.8501

$p, \text{psia } (T_{\text{sat}}, \text{ } ^\circ\text{F})$	Temperature, $^\circ\text{F}$													
	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	
2000 (636.0)	$v, \text{ft}^3/\text{lbm}$	0.3071	0.3534	0.3945	0.4325	0.4685	0.5031	0.5368	0.5697	0.6020	0.6340	0.6656	0.6971	0.7284
	$u, \text{Btu}/\text{lbm}$	1220.1	1276.8	1328.1	1377.2	1425.2	1472.7	1520.2	1567.6	1615.4	1663.5	1712.0	1761.0	1810.6
	$h, \text{Btu}/\text{lbm}$	1333.8	1407.6	1474.1	1537.2	1598.6	1659.0	1718.8	1778.5	1838.2	1898.1	1958.3	2019.0	2080.1
	$s, \text{Btu}/(\text{lbm} \cdot \text{R})$	1.4564	1.5128	1.5600	1.6019	1.6400	1.6753	1.7084	1.7397	1.7694	1.7978	1.8251	1.8513	1.8767
3000 (695.5)	$v, \text{ft}^3/\text{lbm}$	0.1757	0.2160	0.2485	0.2772	0.3036	0.3285	0.3524	0.3754	0.3978	0.4198	0.4416	0.4631	0.4844
	$u, \text{Btu}/\text{lbm}$	1167.6	1241.8	1301.7	1356.2	1408.0	1458.5	1508.1	1557.3	1606.3	1655.3	1704.5	1754.0	1803.9
	$h, \text{Btu}/\text{lbm}$	1265.2	1361.7	1439.6	1510.0	1576.6	1640.8	1703.7	1765.6	1827.1	1888.4	1949.6	2011.1	2072.8
	$s, \text{Btu}/(\text{lbm} \cdot \text{R})$	1.3677	1.4416	1.4969	1.5436	1.5850	1.6226	1.6573	1.6897	1.7203	1.7494	1.7771	1.8037	1.8293
4000	$v, \text{ft}^3/\text{lbm}$	0.1052	0.1462	0.1752	0.1995	0.2213	0.2414	0.2603	0.2784	0.2959	0.3129	0.3296	0.3462	0.3625
	$u, \text{Btu}/\text{lbm}$	1095.0	1201.5	1272.9	1333.9	1390.1	1443.7	1495.7	1546.7	1597.1	1647.2	1697.1	1747.1	1797.3
	$h, \text{Btu}/\text{lbm}$	1172.9	1309.7	1402.6	1481.6	1553.9	1622.4	1688.4	1752.8	1816.1	1878.8	1941.1	2003.3	2065.6
	$s, \text{Btu}/(\text{lbm} \cdot \text{R})$	1.2742	1.3791	1.4451	1.4975	1.5425	1.5825	1.6190	1.6528	1.6843	1.7140	1.7422	1.7691	1.7950
5000	$v, \text{ft}^3/\text{lbm}$	0.05933	0.1038	0.1312	0.1530	0.1720	0.1892	0.2052	0.2203	0.2348	0.2489	0.2626	0.2761	0.2895
	$u, \text{Btu}/\text{lbm}$	987.2	1155.1	1242.0	1310.6	1371.6	1428.6	1483.2	1536.1	1587.9	1639.0	1689.7	1740.3	1790.8
	$h, \text{Btu}/\text{lbm}$	1042.1	1251.1	1363.4	1452.2	1530.8	1603.7	1673.0	1739.9	1805.2	1869.3	1932.7	1995.7	2058.6
	$s, \text{Btu}/(\text{lbm} \cdot \text{R})$	1.1586	1.3192	1.3990	1.4579	1.5068	1.5495	1.5878	1.6228	1.6553	1.6857	1.7144	1.7417	1.7678
6000	$v, \text{ft}^3/\text{lbm}$	0.03942	0.07588	0.1021	0.1222	0.1393	0.1545	0.1685	0.1817	0.1942	0.2063	0.2180	0.2295	0.2409
	$u, \text{Btu}/\text{lbm}$	896.9	1102.9	1209.1	1286.4	1352.7	1413.3	1470.5	1525.4	1578.7	1630.9	1682.4	1733.4	1784.3
	$h, \text{Btu}/\text{lbm}$	940.6	1187.2	1322.4	1422.1	1507.3	1584.9	1657.6	1727.1	1794.3	1859.9	1924.5	1988.3	2051.7
	$s, \text{Btu}/(\text{lbm} \cdot \text{R})$	1.0710	1.2601	1.3563	1.4224	1.4754	1.5208	1.5610	1.5974	1.6309	1.6620	1.6912	1.7189	1.7452
7000	$v, \text{ft}^3/\text{lbm}$	0.03341	0.05760	0.08172	0.1004	0.1161	0.1299	0.1425	0.1542	0.1653	0.1759	0.1862	0.1963	0.2062
	$u, \text{Btu}/\text{lbm}$	855.0	1049.7	1175.0	1261.7	1333.5	1397.8	1457.7	1514.6	1569.4	1622.8	1675.0	1726.7	1777.8
	$h, \text{Btu}/\text{lbm}$	898.3	1124.3	1280.9	1391.8	1483.9	1566.1	1642.3	1714.4	1783.5	1850.7	1916.3	1981.0	2045.0
	$s, \text{Btu}/(\text{lbm} \cdot \text{R})$	1.0321	1.2049	1.3163	1.3899	1.4471	1.4953	1.5374	1.5751	1.6096	1.6414	1.6711	1.6991	1.7257
8000	$v, \text{ft}^3/\text{lbm}$	0.03061	0.04657	0.06722	0.08445	0.09892	0.1116	0.1231	0.1337	0.1437	0.1533	0.1625	0.1715	0.1803
	$u, \text{Btu}/\text{lbm}$	830.7	1003.7	1141.0	1236.8	1314.2	1382.3	1444.9	1503.8	1560.1	1614.6	1667.7	1719.9	1771.4
	$h, \text{Btu}/\text{lbm}$	876.0	1072.6	1240.5	1361.9	1460.6	1547.5	1627.1	1701.7	1772.9	1841.5	1908.3	1973.7	2038.4
	$s, \text{Btu}/(\text{lbm} \cdot \text{R})$	1.0098	1.1598	1.2793	1.3598	1.4212	1.4720	1.5160	1.5552	1.5906	1.6231	1.6533	1.6817	1.7085

Note: Saturated liquid entropies have been adjusted to make the Gibbs functions of the liquid and vapor phases exactly equal. For this reason, there are some small differences between values presented here and the original tables.
Sources: Reprinted by permission from Reynolds, W. C., Perkins, H. C., Engineering Thermodynamics, second ed., 1977, McGraw-Hill, New York. Recalculated from equations given in Keenan, J. H., Keyes, F. G., Hill, P. G., Moore, J. G. Steam Tables. Wiley, New York, 1969. Reprinted by permission of John Wiley & Sons, Inc.

Table C.3b Superheated Water Vapor (Metric Units)

p , MPa (T_{sat} , °C)	Temperature, °C													
	50	100	150	200	250	300	350	400	500	600	700	800	900	
0.002 (17.5)	v , m ³ /kg	74.52	86.08	97.63	109.2	120.7	132.3	143.8	155.3	178.4	201.5	224.6	247.6	270.7
	u , kJ/kg	2445.2	2516.3	2588.3	2661.6	2736.2	2812.2	2889.8	2969.0	3132.3	3302.5	3479.7	3663.9	3855.1
	h , kJ/kg	2594.3	2688.4	2783.6	2879.9	2977.6	3076.7	3177.4	3279.6	3489.1	3705.5	3928.8	4159.1	4396.5
	s , kJ/(kg · K)	8.9227	9.1936	9.4328	9.6479	9.8442	10.0251	10.1935	10.3513	10.6414	10.9044	11.1465	11.3718	11.5832
0.005 (32.9)	v , m ³ /kg	29.78	34.42	39.04	43.66	48.28	52.90	57.51	62.13	71.36	80.59	89.82	99.05	108.3
	u , kJ/kg	2444.7	2516.0	2588.1	2661.4	2736.1	2812.2	2889.8	2968.9	3132.3	3302.5	3479.6	3663.9	3855.0
	h , kJ/kg	2593.6	2688.1	2783.3	2879.8	2977.5	3076.6	3177.3	3279.6	3489.1	3705.4	3928.8	4159.1	4396.5
	s , kJ/(kg · K)	8.4982	8.7699	9.0095	9.2248	9.4212	9.6022	9.7706	9.9284	10.2185	10.4815	10.7236	10.9489	11.1603
0.01 (45.8)	v , m ³ /kg	14.87	17.20	19.51	21.83	24.14	26.45	28.75	31.06	35.68	40.29	44.91	49.53	54.14
	u , kJ/kg	2443.9	2515.5	2587.9	2661.3	2736.0	2812.1	2889.7	2968.9	3132.3	3302.5	3479.6	3663.8	3855.0
	h , kJ/kg	2592.6	2687.5	2783.0	2879.5	2977.3	3076.5	3177.2	3279.5	3489.0	3705.4	3928.7	4159.1	4396.4
	s , kJ/(kg · K)	8.1757	8.4487	8.6890	8.9046	9.1010	9.2821	9.4506	9.6084	9.8985	10.1616	10.4037	10.6290	10.8404
0.02 (60.1)	v , m ³ /kg	–	8.585	9.748	10.91	12.06	13.22	14.37	15.53	17.84	20.15	22.45	24.76	27.07
	u , kJ/kg	–	2514.5	2587.3	2660.9	2735.7	2811.9	2889.5	2968.8	3132.2	3302.4	3479.6	3663.8	3855.0
	h , kJ/kg	–	2686.2	2782.3	2879.1	2977.0	3076.3	3177.0	3279.4	3488.9	3705.3	3928.7	4159.1	4396.4
	s , kJ/(kg · K)	–	8.1263	8.3678	8.5839	8.7807	8.9619	9.1304	9.2884	9.5785	9.8417	10.0838	10.3091	10.5205
0.05 (81.3)	v , m ³ /kg	–	3.418	3.889	4.356	4.820	5.284	5.747	6.209	7.134	8.057	8.981	9.904	10.83
	u , kJ/kg	–	2511.6	2585.6	2659.8	2735.0	2811.3	2889.1	2968.4	3131.9	3302.2	3479.5	3663.7	3854.9
	h , kJ/kg	–	2682.5	2780.1	2877.6	2976.0	3075.5	3176.4	3278.9	3488.6	3705.1	3928.5	4158.9	4396.3
	s , kJ/(kg · K)	–	7.6955	7.9409	8.1588	8.3564	8.5380	8.7069	8.8650	9.1554	9.4186	9.6608	9.8861	10.0975
0.07 (89.9)	v , m ³ /kg	–	2.434	2.773	3.108	3.441	3.772	4.103	4.434	5.095	5.755	6.415	7.074	7.734
	u , kJ/kg	–	2509.6	2584.5	2659.1	2734.5	2811.0	2888.8	2968.2	3131.8	3302.1	3479.4	3663.6	3854.9
	h , kJ/kg	–	2680.0	2778.6	2876.7	2975.3	3075.0	3176.1	3278.6	3488.4	3704.9	3928.4	4158.8	4396.2
	s , kJ/(kg · K)	–	7.5349	7.7829	8.0020	8.2001	8.3821	8.5511	8.7094	8.9999	9.2632	9.5054	9.7307	9.9422
0.1 (99.6)	v , m ³ /kg	–	1.696	1.936	2.172	2.406	2.639	2.871	3.103	3.565	4.028	4.490	4.952	5.414
	u , kJ/kg	–	2506.6	2582.7	2658.0	2733.7	2810.4	2888.4	2967.8	3131.5	3301.9	3479.2	3663.5	3854.8
	h , kJ/kg	–	2676.2	2776.4	2875.3	2974.3	3074.3	3175.5	3278.1	3488.1	3704.7	3928.2	4158.7	4396.1
	s , kJ/(kg · K)	–	7.3622	7.6142	7.8351	8.0341	8.2165	8.3858	8.5442	8.8350	9.0984	9.3406	9.5660	9.7775

p , MPa (T_{sat} , °C)		Temperature, °C												
		150	200	250	300	350	400	450	500	550	600	700	800	900
0.15 (111.4)	v , m ³ /kg	1.285	1.444	1.601	1.757	1.912	2.067	2.222	2.376	2.530	2.685	2.993	3.301	3.609
	u , kJ/kg	2579.8	2656.2	2732.5	2809.5	2887.7	2967.3	3048.4	3131.1	3215.6	3301.6	3479.0	3663.4	3854.6
	h , kJ/kg	2772.6	2872.9	2972.7	3073.0	3174.5	3277.3	3381.7	3487.6	3595.1	3704.3	3927.9	4158.5	4395.9
	s , kJ/(kg · K)	7.4201	7.6441	7.8446	8.0278	8.1975	8.3562	8.5057	8.6473	8.7821	8.9109	9.1533	9.3787	9.5903
0.2 (120.2)	v , m ³ /kg	0.9596	1.080	1.199	1.316	1.433	1.549	1.665	1.781	1.897	2.013	2.244	2.475	2.706
	u , kJ/kg	2576.9	2654.4	2731.2	2808.6	2886.9	2966.7	3047.9	3130.7	3215.2	3301.4	3478.8	3663.2	3854.5
	h , kJ/kg	2768.8	2870.5	2971.0	3071.8	3173.5	3276.5	3381.0	3487.0	3594.7	3704.0	3927.7	4158.3	4395.8
	s , kJ/(kg · K)	7.2803	7.5074	7.7094	7.8934	8.0636	8.2226	8.3723	8.5140	8.6489	8.7778	9.0203	9.2458	9.4574
0.4 (143.6)	v , m ³ /kg	0.4708	0.5342	0.5951	0.6548	0.7139	0.7726	0.8311	0.8893	0.9475	1.006	1.121	1.237	1.353
	u , kJ/kg	2564.5	2646.8	2726.1	2804.8	2884.0	2964.4	3046.0	3129.2	3213.9	3300.2	3477.9	3662.5	3853.9
	h , kJ/kg	2752.8	2860.5	2964.2	3066.7	3169.6	3273.4	3378.4	3484.9	3592.9	3702.4	3926.5	4157.4	4395.1
	s , kJ/(kg · K)	6.9307	7.1714	7.3797	7.5670	7.7390	7.8992	8.0497	8.1921	8.3274	8.4566	8.6995	8.9253	9.1370
0.6 (158.9)	v , m ³ /kg	–	0.3520	0.3938	0.4344	0.4742	0.5137	0.5529	0.5920	0.6309	0.6697	0.7472	0.8245	0.9017
	u , kJ/kg	–	2638.9	2720.9	2801.0	2881.1	2962.0	3044.1	3127.6	3212.5	3299.1	3477.1	3661.8	3853.3
	h , kJ/kg	–	2850.1	2957.2	3061.6	3165.7	3270.2	3375.9	3482.7	3591.1	3700.9	3925.4	4156.5	4394.4
	s , kJ/(kg · K)	–	6.9673	7.1824	7.3732	7.5472	7.7086	7.8600	8.0029	8.1386	8.2682	8.5115	8.7375	8.9494
0.8 (170.4)	v , m ³ /kg	–	0.2608	0.2931	0.3241	0.3544	0.3843	0.4139	0.4433	0.4726	0.5018	0.5601	0.6181	0.6761
	u , kJ/kg	–	2630.6	2715.5	2797.1	2878.2	2959.7	3042.2	3125.9	3211.2	3297.9	3476.2	3661.1	3852.8
	h , kJ/kg	–	2839.2	2950.0	3056.4	3161.7	3267.1	3373.3	3480.6	3589.3	3699.4	3924.3	4155.7	4393.6
	s , kJ/(kg · K)	–	6.8167	7.0392	7.2336	7.4097	7.5723	7.7245	7.8680	8.0042	8.1341	8.3779	8.6041	8.8161
1 (179.9)	v , m ³ /kg	–	0.2060	0.2327	0.2579	0.2825	0.3066	0.3304	0.3541	0.3776	0.4011	0.4478	0.4943	0.5407
	u , kJ/kg	–	2621.9	2709.9	2793.2	2875.2	2957.3	3040.2	3124.3	3209.8	3296.8	3475.4	3660.5	3852.2
	h , kJ/kg	–	2827.9	2942.6	3051.2	3157.7	3263.9	3370.7	3478.4	3587.5	3697.9	3923.1	4154.8	4392.9
	s , kJ/(kg · K)	–	6.6948	6.9255	7.1237	7.3019	7.4658	7.6188	7.7630	7.8996	8.0298	8.2740	8.5005	8.7127
1.5 (198.3)	v , m ³ /kg	–	0.1325	0.1520	0.1697	0.1866	0.2030	0.2192	0.2352	0.2510	0.2668	0.2981	0.3292	0.3603
	u , kJ/kg	–	2598.1	2695.3	2783.1	2867.6	2951.3	3035.3	3120.3	3206.4	3293.9	3473.2	3658.7	3850.8
	h , kJ/kg	–	2796.8	2923.2	3037.6	3147.4	3255.8	3364.1	3473.0	3582.9	3694.0	3920.3	4152.6	4391.2
	s , kJ/(kg · K)	–	6.4554	6.7098	6.9187	7.1025	7.2697	7.4249	7.5706	7.7083	7.8393	8.0846	8.3118	8.5243

(Continued)

Table C.3b Superheated Water Vapor (Metric Units) *continued*

P , MPa (T_{sat} , °C)		Temperature, °C												
		250	300	350	400	450	500	550	600	650	700	750	800	900
2 (212.4)	v , m ³ /kg	0.1114	0.1255	0.1386	0.1512	0.1635	0.1757	0.1877	0.1996	0.2114	0.2232	0.2350	0.2467	0.2700
	u , kJ/kg	2679.6	2772.6	2859.8	2945.2	3030.4	3116.2	3203.0	3290.9	3380.2	3471.0	3563.2	3657.0	3849.3
	h , kJ/kg	2902.5	3023.5	3137.0	3247.6	3357.5	3467.6	3578.3	3690.1	3803.1	3917.5	4033.2	4150.4	4389.4
	s , kJ/(kg · K)	6.5461	6.7672	6.9571	7.1279	7.2853	7.4325	7.5713	7.7032	7.8290	7.9496	8.0656	8.1774	8.3903
3 (233.9)	v , m ³ /kg	0.07058	0.08114	0.09053	0.09936	0.1079	0.1162	0.1244	0.1324	0.1404	0.1484	0.1563	0.1641	0.1798
	u , kJ/kg	2644.0	2750.0	2843.7	2932.7	3020.4	3107.9	3196.0	3285.0	3375.2	3466.6	3559.4	3653.6	3846.5
	h , kJ/kg	2855.8	2993.5	3115.3	3230.8	3344.0	3456.5	3569.1	3682.3	3796.5	3911.7	4028.2	4146.0	4385.9
	s , kJ/(kg · K)	6.2880	6.5398	6.7436	6.9220	7.0842	7.2346	7.3757	7.5093	7.6364	7.7580	7.8747	7.9871	8.2008
4 (250.4)	v , m ³ /kg	–	0.05884	0.06645	0.07341	0.08003	0.08643	0.09269	0.09885	0.1049	0.1109	0.1169	0.1229	0.1347
	u , kJ/kg	–	2725.3	2826.6	2919.9	3010.1	3099.5	3189.0	3279.1	3370.1	3462.1	3555.5	3650.1	3843.6
	h , kJ/kg	–	2960.7	3092.4	3213.5	3330.2	3445.2	3559.7	3674.4	3789.8	3905.9	4023.2	4141.6	4382.3
	s , kJ/(kg · K)	–	6.3622	6.5828	6.7698	6.9371	7.0908	7.2343	7.3696	7.4981	7.6206	7.7381	7.8511	8.0655
6 (275.6)	v , m ³ /kg	–	0.03616	0.04223	0.04739	0.05214	0.05665	0.06101	0.06525	0.06942	0.07352	0.07758	0.08160	0.08958
	u , kJ/kg	–	2667.2	2789.6	2892.8	2988.9	3082.2	3174.6	3266.9	3359.6	3453.2	3547.6	3643.1	3837.8
	h , kJ/kg	–	2884.2	3043.0	3177.2	3301.8	3422.1	3540.6	3658.4	3776.2	3894.3	4013.1	4132.7	4375.3
	s , kJ/(kg · K)	–	6.0682	6.3342	6.5415	6.7201	6.8811	7.0296	7.1685	7.2996	7.4242	7.5433	7.6575	7.8735
8 (295.1)	v , m ³ /kg	–	0.02426	0.02995	0.03432	0.03817	0.04175	0.04516	0.04845	0.05166	0.05481	0.05791	0.06097	0.06702
	u , kJ/kg	–	2590.9	2747.7	2863.8	2966.7	3064.3	3159.8	3254.4	3349.0	3444.0	3539.6	3636.1	3832.1
	h , kJ/kg	–	2785.0	2987.3	3138.3	3272.0	3398.3	3521.0	3642.0	3762.3	3882.5	4002.9	4123.8	4368.3
	s , kJ/(kg · K)	–	5.7914	6.1309	6.3642	6.5559	6.7248	6.8786	7.0214	7.1553	7.2821	7.4027	7.5182	7.7359
10 (311.1)	v , m ³ /kg	–	–	0.02242	0.02641	0.02975	0.03279	0.03564	0.03837	0.04101	0.04358	0.04611	0.04859	0.05349
	u , kJ/kg	–	–	2699.2	2832.4	2943.3	3045.8	3144.5	3241.7	3338.2	3434.7	3531.5	3629.0	3826.3
	h , kJ/kg	–	–	2923.4	3096.5	3240.8	3373.6	3500.9	3625.3	3748.3	3870.5	3992.6	4114.9	4361.2
	s , kJ/(kg · K)	–	–	5.9451	6.2127	6.4197	6.5974	6.7569	6.9037	7.0406	7.1696	7.2919	7.4086	7.6280
12 (324.8)	v , m ³ /kg	–	–	0.01721	0.02108	0.02412	0.02680	0.02929	0.03164	0.03390	0.03610	0.03824	0.04034	0.04447
	u , kJ/kg	–	–	2641.1	2798.3	2918.8	3026.6	3128.9	3228.7	3327.2	3425.3	3523.4	3621.8	3820.6
	h , kJ/kg	–	–	2847.6	3051.2	3208.2	3348.2	3480.3	3608.3	3734.0	3858.4	3982.3	4105.9	4354.2
	s , kJ/(kg · K)	–	–	5.7604	6.0754	6.3006	6.4879	6.6535	6.8045	6.9445	7.0757	7.1998	7.3178	7.5390