Appendix B: Property Tables for Water

Tables B-1 and B-2 present data for saturated liquid and saturated vapor. Table B-1 is presented information at regular intervals of temperature while Table B-2 is presented at regular intervals of pressure. Table B-3 presents data for superheated vapor over a matrix of temperatures and pressures. Table B-4 presents data for compressed liquid over a matrix of temperatures and pressures. These tables were generated using EES with the substance Steam_IAPWS which implements the high accuracy thermodynamic properties of water described in *1995 Formulation for the Thermodynamic Properties of Ordinary Water Substance for General and Scientific Use*, issued by the International Associated for the Properties of Water and Steam (IAPWS).

Table B-1: Properties of Saturated Water, Presented at Regular Intervals of Temperature

Temp. T (°C)	Pressure P (kPa)	Specific volume (m^3/kg)		Specific internal energy (kJ/kg)		Specific enthalpy (kJ/kg)		Specific entropy (kJ/kg-K)		T (°C)
		$10^3\ v_f$	v_g	u_f	u_g	h_f	h_g	s_f	s_g	
0.01	0.6117	1.0002	206.00	0	2374.9	0.000	2500.9	0	9.1556	0.01
2	0.7060	1.0001	179.78	8.3911	2377.7	8.3918	2504.6	0.03061	9.1027	2
4	0.8135	1.0001	157.14	16.812	2380.4	16.813	2508.2	0.06110	9.0506	4
6	0.9353	1.0001	137.65	25.224	2383.2	25.225	2511.9	0.09134	8.9994	6
8	1.0729	1.0002	120.85	33.626	2385.9	33.627	2515.6	0.12133	8.9492	8
10	1.2281	1.0003	106.32	42.020	2388.7	42.022	2519.2	0.15109	8.8999	10
12	1.4028	1.0006	93.732	50.408	2391.4	50.410	2522.9	0.18061	8.8514	12
14	1.5989	1.0008	82.804	58.791	2394.1	58.793	2526.5	0.20990	8.8038	14
16	1.8187	1.0011	73.295	67.169	2396.9	67.170	2530.2	0.23898	8.7571	16
18	2.0646	1.0015	65.005	75.542	2399.6	75.544	2533.8	0.26784	8.7112	18
20	2.3392	1.0018	57.762	83.913	2402.3	83.915	2537.4	0.29649	8.6661	20
22	2.6452	1.0023	51.422	92.280	2405.1	92.283	2541.1	0.32493	8.6217	22
24	2.9857	1.0028	45.861	100.65	2407.8	100.65	2544.7	0.35318	8.5782	24
26	3.3638	1.0033	40.975	109.01	2410.5	109.01	2548.3	0.38123	8.5354	26
28	3.7830	1.0038	36.673	117.37	2413.2	117.37	2551.9	0.40909	8.4933	28
30	4.2469	1.0044	32.879	125.73	2415.9	125.74	2555.6	0.43676	8.4520	30
32	4.7596	1.0050	29.527	134.09	2418.6	134.10	2559.2	0.46425	8.4114	32
34	5.3251	1.0057	26.560	142.45	2421.3	142.46	2562.8	0.49155	8.3714	34
36	5.9480	1.0064	23.929	150.81	2424.0	150.82	2566.4	0.51868	8.3322	36
38	6.6330	1.0071	21.593	159.17	2426.7	159.18	2569.9	0.54563	8.2935	38
40	7.3851	1.0079	19.515	167.53	2429.4	167.53	2573.5	0.57241	8.2556	40
42	8.2098	1.0087	17.663	175.89	2432.1	175.90	2577.1	0.59902	8.2182	42
44	9.1127	1.0095	16.010	184.25	2434.8	184.26	2580.7	0.62546	8.1815	44
46	10.100	1.0104	14.534	192.61	2437.4	192.62	2584.2	0.65174	8.1454	46
48	11.178	1.0112	13.212	200.97	2440.1	200.98	2587.8	0.67786	8.1098	48
50	12.352	1.0122	12.026	209.33	2442.7	209.34	2591.3	0.70382	8.0748	50
55	15.763	1.0146	9.5639	230.24	2449.3	230.26	2600.1	0.76803	7.9898	55
60	19.947	1.0171	7.6670	251.16	2455.9	251.18	2608.8	0.83130	7.9082	60
65	25.043	1.0199	6.1935	272.09	2462.4	272.12	2617.5	0.89366	7.8296	65
70	31.202	1.0228	5.0396	293.04	2468.9	293.07	2626.1	0.95514	7.7540	70
75	38.597	1.0258	4.1291	313.99	2475.3	314.03	2634.6	1.01578	7.6812	75
80	47.416	1.0291	3.4053	334.97	2481.6	335.02	2643.0	1.07559	7.6111	80
85	57.868	1.0324	2.8260	355.96	2487.8	356.02	2651.4	1.13461	7.5435	85
90	70.183	1.0360	2.3593	376.97	2494.0	377.04	2659.6	1.19288	7.4782	90
95	84.609	1.0396	1.9808	398.00	2500.1	398.09	2667.6	1.25040	7.4151	95
100	101.42	1.0435	1.6720	419.06	2506.0	419.17	2675.6	1.30722	7.3542	100

Table B-1 (continued): Properties of Saturated Water, Presented at Regular Intervals of Temperature

Temp. T (°C)	Pressure P (kPa)	Specific volume (m^3/kg)		Specific internal energy (kJ/kg)		Specific enthalpy (kJ/kg)		Specific entropy (kJ/kg-K)		T (°C)
		$10^3\ v_f$	v_g	u_f	u_g	h_f	h_g	s_f	s_g	
105	120.90	1.0474	1.4186	440.15	2511.9	440.28	2683.4	1.3634	7.2952	105
110	143.38	1.0516	1.2094	461.27	2517.7	461.42	2691.1	1.4188	7.2382	110
115	169.18	1.0559	1.0360	482.42	2523.3	482.59	2698.6	1.4737	7.1829	115
120	198.67	1.0603	0.89136	503.60	2528.9	503.81	2706.0	1.5279	7.1292	120
125	232.23	1.0649	0.77012	524.83	2534.3	525.07	2713.1	1.5816	7.0771	125
130	270.28	1.0697	0.66808	546.10	2539.5	546.38	2720.1	1.6346	7.0265	130
135	313.22	1.0746	0.58179	567.41	2544.7	567.75	2726.9	1.6872	6.9773	135
140	361.53	1.0798	0.50850	588.77	2549.6	589.16	2733.5	1.7392	6.9294	140
145	415.68	1.0850	0.44600	610.19	2554.4	610.64	2739.8	1.7908	6.8827	145
150	476.16	1.0905	0.39248	631.66	2559.1	632.18	2745.9	1.8418	6.8371	150
160	618.23	1.1020	0.30680	674.79	2567.8	675.47	2757.5	1.9426	6.7492	160
170	792.18	1.1143	0.24260	718.20	2575.7	719.08	2767.9	2.0417	6.6650	170
180	1002.8	1.1274	0.19385	761.92	2582.8	763.05	2777.2	2.1392	6.5841	180
190	1255.2	1.1414	0.15636	806.00	2589.0	807.43	2785.3	2.2355	6.5059	190
200	1554.9	1.1565	0.12721	850.46	2594.2	852.26	2792.0	2.3305	6.4302	200
210	1907.7	1.1727	0.10429	895.38	2598.3	897.61	2797.3	2.4245	6.3563	210
220	2319.6	1.1901	0.086094	940.79	2601.3	943.55	2801.0	2.5176	6.2840	220
230	2797.1	1.2089	0.071505	986.76	2602.9	990.14	2802.9	2.6100	6.2128	230
240	3347.0	1.2294	0.059707	1033.4	2603.1	1037.5	2803.0	2.7018	6.1424	240
250	3976.2	1.2516	0.050085	1080.7	2601.8	1085.7	2801.0	2.7933	6.0721	250
260	4692.3	1.2759	0.042175	1128.9	2598.7	1134.8	2796.6	2.8847	6.0017	260
270	5503.0	1.3028	0.035622	1178.0	2593.7	1185.1	2789.7	2.9762	5.9305	270
280	6416.6	1.3326	0.030153	1228.2	2586.4	1236.7	2779.9	3.0681	5.8579	280
290	7441.8	1.3660	0.025554	1279.7	2576.5	1289.8	2766.7	3.1608	5.7834	290
300	8587.9	1.4038	0.021659	1332.7	2563.6	1344.8	2749.6	3.2548	5.7059	300
310	9865.0	1.4475	0.018333	1387.7	2547.1	1402.0	2727.9	3.3506	5.6243	310
320	11284.3	1.4987	0.015470	1445.1	2526.0	1462.0	2700.6	3.4491	5.5372	320
330	12858.1	1.5604	0.012979	1505.7	2499.2	1525.8	2666.0	3.5516	5.4422	330
340	14600.7	1.6377	0.010783	1570.7	2464.5	1594.6	2622.0	3.6602	5.3358	340
350	16529.3	1.7407	0.008806	1642.4	2418.3	1671.2	2563.9	3.7788	5.2114	350
360	18666.0	1.8950	0.006950	1726.2	2351.9	1761.5	2481.6	3.9165	5.0537	360
370	21043.8	2.2172	0.004953	1844.5	2230.1	1891.2	2334.3	4.1119	4.8009	370
373.95	22064.0	3.1056	0.003106	2015.7	2015.7	2084.3	2084.3	4.4070	4.4070	373.95

Table B-2: Properties of Saturated Water, Presented at Regular Intervals of Pressure

Pressure P (kPa)	Temp. T (°C)	Specific volume (m^3/kg)		Specific internal energy (kJ/kg)		Specific enthalpy (kJ/kg)		Specific entropy (kJ/kg-K)		P (kPa)
		$10^3\ v_f$	v_g	u_f	u_g	h_f	h_g	s_f	s_g	
1	6.9705	1.0001	129.19	29.302	2384.5	29.303	2513.7	0.10593	8.9749	1
1.5	13.0205	1.0007	87.964	54.686	2392.8	54.688	2524.7	0.19558	8.8270	1.5
2	17.4957	1.0014	66.990	73.431	2398.9	73.433	2532.9	0.26058	8.7227	2
2.5	21.0777	1.0021	54.242	88.422	2403.8	88.424	2539.4	0.31184	8.6421	2.5
3	24.0796	1.0028	45.654	100.98	2407.9	100.98	2544.8	0.35430	8.5765	3
4	28.9607	1.0041	34.791	121.39	2414.5	121.39	2553.7	0.42240	8.4734	4
5	32.8743	1.0053	28.185	137.75	2419.8	137.75	2560.7	0.47620	8.3938	5
6	36.1587	1.0065	23.733	151.47	2424.2	151.48	2566.6	0.52082	8.3291	6
7	38.9992	1.0075	20.524	163.34	2428.1	163.35	2571.7	0.55903	8.2745	7
8	41.5082	1.0085	18.099	173.83	2431.4	173.84	2576.2	0.59249	8.2273	8
10	45.8056	1.0103	14.670	191.80	2437.2	191.81	2583.9	0.64919	8.1488	10
12	49.4178	1.0119	12.358	206.90	2442.0	206.91	2590.3	0.69628	8.0850	12
14	52.5458	1.0134	10.691	219.98	2446.1	219.99	2595.8	0.73663	8.0311	14
16	55.3120	1.0147	9.4307	231.55	2449.8	231.57	2600.7	0.77201	7.9847	16
18	57.7971	1.0160	8.4432	241.95	2453.0	241.96	2605.0	0.80354	7.9438	18
20	60.0569	1.0172	7.6481	251.40	2456.0	251.42	2608.9	0.83202	7.9073	20
25	64.9618	1.0199	6.2034	271.93	2462.4	271.96	2617.5	0.89319	7.8302	25
30	69.0942	1.0222	5.2287	289.24	2467.7	289.27	2624.6	0.94407	7.7675	30
40	75.8560	1.0264	3.9933	317.58	2476.3	317.63	2636.1	1.02607	7.6691	40
50	81.3163	1.0299	3.2403	340.49	2483.2	340.54	2645.2	1.09120	7.5931	50
60	85.9255	1.0331	2.7320	359.85	2489.0	359.91	2652.9	1.14545	7.5312	60
70	89.9314	1.0359	2.3650	376.68	2493.9	376.75	2659.4	1.19208	7.4791	70
80	93.4853	1.0385	2.0873	391.63	2498.2	391.71	2665.2	1.23305	7.4340	80
100	99.6059	1.0432	1.6941	417.40	2505.6	417.51	2675.0	1.30277	7.3589	100
101.325	99.9743	1.0434	1.6734	418.95	2506.00	419.06	2675.56	1.30693	7.35451	101.325
120	104.7837	1.0473	1.4285	439.24	2511.7	439.36	2683.1	1.36094	7.2978	120
140	109.2919	1.0510	1.2367	458.27	2516.9	458.42	2690.0	1.41101	7.2461	140
160	113.2977	1.0544	1.0915	475.21	2521.4	475.38	2696.1	1.45507	7.2015	160
180	116.9117	1.0576	0.97759	490.51	2525.5	490.70	2701.4	1.49448	7.1621	180
200	120.2106	1.0605	0.88578	504.50	2529.1	504.71	2706.3	1.53018	7.1270	200
250	127.4120	1.0672	0.71873	535.08	2536.8	535.35	2716.5	1.60724	7.0525	250
300	133.5230	1.0732	0.60582	561.11	2543.2	561.43	2724.9	1.67173	6.9917	300
350	138.8577	1.0786	0.52422	583.89	2548.5	584.26	2732.0	1.72738	6.9402	350
400	143.6089	1.0836	0.46242	604.22	2553.1	604.66	2738.1	1.77646	6.8955	400
500	151.8315	1.0925	0.37483	639.54	2560.7	640.09	2748.1	1.86039	6.8207	500
600	158.8268	1.1006	0.31560	669.72	2566.8	670.38	2756.2	1.93083	6.7593	600
700	164.9464	1.1080	0.27278	696.23	2571.8	697.00	2762.8	1.99178	6.7071	700
800	170.4066	1.1148	0.24035	719.97	2576.0	720.87	2768.3	2.04566	6.6616	800
900	175.3505	1.1212	0.21489	741.55	2579.6	742.56	2773.0	2.09405	6.6213	900

Table B-2 (continued): Properties of Saturated Water, Presented at Regular Intervals of Pressure

Pressure P (kPa)	Temp. T (°C)	Specific volume (m^3/kg)		Specific internal energy (kJ/kg)		Specific enthalpy (kJ/kg)		Specific entropy (kJ/kg-K)		P (kPa)
		$10^3\ v_f$	v_g	u_f	u_g	h_f	h_g	s_f	s_g	
1000	179.88	1.1272	0.19437	761.39	2582.8	762.51	2777.1	2.1381	6.5850	1000
1100	184.06	1.1330	0.17745	779.78	2585.5	781.03	2780.7	2.1785	6.5520	1100
1200	187.96	1.1385	0.16326	796.96	2587.8	798.33	2783.8	2.2159	6.5217	1200
1300	191.60	1.1438	0.15119	813.10	2589.9	814.59	2786.5	2.2508	6.4936	1300
1400	195.04	1.1489	0.14078	828.35	2591.8	829.96	2788.9	2.2835	6.4675	1400
1500	198.29	1.1539	0.13171	842.82	2593.4	844.55	2791.0	2.3143	6.4430	1500
1600	201.37	1.1587	0.12374	856.59	2594.8	858.44	2792.8	2.3435	6.4200	1600
1700	204.31	1.1633	0.11668	869.75	2596.1	871.72	2794.5	2.3711	6.3982	1700
1800	207.11	1.1679	0.11037	882.35	2597.3	884.46	2795.9	2.3975	6.3775	1800
1900	209.80	1.1724	0.10471	894.46	2598.3	896.69	2797.2	2.4226	6.3578	1900
2000	212.38	1.1767	0.099587	906.12	2599.1	908.47	2798.3	2.4467	6.3390	2000
2200	217.25	1.1852	0.090701	928.24	2600.6	930.85	2800.1	2.4921	6.3038	2200
2400	221.79	1.1934	0.083247	948.97	2601.7	951.83	2801.4	2.5342	6.2712	2400
2600	226.05	1.2013	0.076901	968.51	2602.4	971.63	2802.4	2.5735	6.2409	2600
2800	230.06	1.2091	0.071432	987.02	2602.9	990.41	2802.9	2.6105	6.2124	2800
3000	233.85	1.2166	0.066667	1004.6	2603.2	1008.3	2803.2	2.6454	6.1856	3000
3250	238.33	1.2258	0.061508	1025.6	2603.2	1029.5	2803.1	2.6866	6.1541	3250
3500	242.56	1.2349	0.057061	1045.4	2603.0	1049.7	2802.7	2.7253	6.1244	3500
3750	246.55	1.2437	0.053186	1064.3	2602.5	1069.0	2801.9	2.7618	6.0963	3750
4000	250.35	1.2524	0.049779	1082.4	2601.7	1087.4	2800.8	2.7966	6.0696	4000
4500	257.44	1.2695	0.044061	1116.4	2599.7	1122.1	2798.0	2.8613	6.0198	4500
5000	263.94	1.2862	0.039448	1148.1	2597.0	1154.5	2794.2	2.9207	5.9737	5000
6000	275.59	1.3190	0.032449	1205.8	2589.9	1213.8	2784.6	3.0275	5.8902	6000
7000	285.83	1.3515	0.027378	1258.0	2581.0	1267.5	2772.6	3.1220	5.8148	7000
8000	295.01	1.3843	0.023525	1306.0	2570.5	1317.1	2758.7	3.2077	5.7450	8000
9000	303.35	1.4177	0.020489	1350.9	2558.5	1363.7	2742.9	3.2866	5.6791	9000
10,000	311.00	1.4522	0.018028	1393.3	2545.2	1407.9	2725.5	3.3603	5.6159	10,000
11,000	318.08	1.4881	0.015988	1433.9	2530.4	1450.2	2706.3	3.4299	5.5544	11,000
12,000	324.68	1.5260	0.014264	1473.0	2514.3	1491.3	2685.4	3.4964	5.4939	12,000
13,000	330.85	1.5663	0.012781	1511.1	2496.6	1531.4	2662.7	3.5606	5.4336	13,000
14,000	336.67	1.6097	0.011487	1548.4	2477.1	1571.0	2637.9	3.6232	5.3728	14,000
15,000	342.16	1.6572	0.010341	1585.5	2455.7	1610.3	2610.8	3.6848	5.3108	15,000
16,000	347.36	1.7100	0.009312	1622.6	2432.0	1649.9	2581.0	3.7461	5.2466	16,000
18,000	356.99	1.8402	0.007504	1699.1	2375.0	1732.2	2510.0	3.8720	5.1064	18,000
20,000	365.75	2.0378	0.005862	1785.8	2294.8	1826.6	2412.1	4.0146	4.9310	20,000
22,000	373.71	2.7031	0.003644	1951.7	2092.4	2011.1	2172.6	4.2942	4.5439	22,000
22,064	373.95	3.1056	0.003106	2015.7	2015.7	2084.3	2084.3	4.4067	4.4072	22,064

Table B-3: Properties of Superheated Vapor: Pressures from 10 kPa to 400 kPa

P (kPa)		Temperature, *T* (°C)									
		50	100	150	200	300	400	500	600	800	1000
10	*v* (m^3/kg)	14.867	17.196	19.513	21.826	26.446	31.063	35.68	40.296	49.527	58.758
	u (kJ/kg)	2443.3	2515.5	2587.9	2661.4	2812.3	2969.3	3132.9	3303.3	3665.4	4055.3
	h (kJ/kg)	2592.0	2687.5	2783.0	2879.6	3076.7	3280.0	3489.7	3706.3	4160.6	4642.8
	s (kJ/kg-K)	8.1741	8.4489	8.6893	8.9049	9.2827	9.6094	9.8998	10.163	10.631	11.043
20	*v* (m^3/kg)		8.5855	9.7486	10.907	13.220	15.530	17.839	20.147	24.763	29.379
	u (kJ/kg)		2514.5	2587.4	2661.0	2812.1	2969.2	3132.8	3303.3	3665.3	4055.2
	h (kJ/kg)		2686.2	2782.3	2879.2	3076.5	3279.8	3489.6	3706.2	4160.6	4642.8
	s (kJ/kg-K)		8.1263	8.3681	8.5843	8.9625	9.2893	9.5798	9.8432	10.311	10.723
40	*v* (m^3/kg)		4.2799	4.8662	5.448	6.6067	7.7628	8.9179	10.073	12.381	14.689
	u (kJ/kg)		2512.5	2586.3	2660.3	2811.7	2969.0	3132.7	3303.2	3665.3	4055.2
	h (kJ/kg)		2683.7	2780.9	2878.2	3076.0	3279.5	3489.4	3706.1	4160.5	4642.7
	s (kJ/kg-K)		7.8011	8.0456	8.2629	8.642.0	8.9691	9.2597	9.5231	9.9913	10.403
60	*v* (m^3/kg)		2.8445	3.2387	3.6283	4.4023	5.1739	5.9444	6.7144	8.2538	9.7927
	u (kJ/kg)		2510.5	2585.2	2659.6	2811.4	2968.8	3132.5	3303.0	3665.2	4055.1
	h (kJ/kg)		2681.1	2779.5	2877.3	3075.5	3279.2	3489.2	3705.9	4160.4	4642.7
	s (kJ/kg-K)		7.6084	7.8559	8.0743	8.4542	8.7816	9.0723	9.3359	9.8041	10.216
80	*v* (m^3/kg)		2.1267	2.4250	2.7184	3.3002	3.8794	4.4576	5.0353	6.1901	7.3444
	u (kJ/kg)		2508.4	2584.1	2658.9	2811.0	2968.5	3132.4	3302.9	3665.1	4055.1
	h (kJ/kg)		2678.5	2778.1	2876.4	3075.0	3278.9	3489.0	3705.7	4160.3	4642.6
	s (kJ/kg-K)		7.4699	7.7204	7.9401	8.3208	8.6485	8.9394	9.2030	9.6712	10.083
100	*v* (m^3/kg)		1.6959	1.9367	2.1724	2.6389	3.1027	3.5655	4.0279	4.9519	5.8755
	u (kJ/kg)		2506.2	2582.9	2658.2	2810.7	2968.3	3132.2	3302.8	3665.0	4055.0
	h (kJ/kg)		2675.8	2776.6	2875.5	3074.5	3278.6	3488.7	3705.6	4160.2	4642.6
	s (kJ/kg-K)		7.3611	7.6148	7.8356	8.2172	8.5452	8.8362	9.0999	9.5682	9.9800
200	*v* (m^3/kg)			0.9599	1.0805	1.3162	1.5493	1.7814	2.0130	2.4755	2.9375
	u (kJ/kg)			2577.1	2654.6	2808.8	2967.2	3131.4	3302.2	3664.7	4054.8
	h (kJ/kg)			2769.1	2870.7	3072.1	3277.0	3487.7	3704.8	4159.8	4642.3
	s (kJ/kg-K)			7.2810	7.5081	7.8941	8.2236	8.5153	8.7793	9.2479	9.6599
300	*v* (m^3/kg)			0.6340	0.7164	0.8753	1.0315	1.1867	1.3414	1.6500	1.9582
	u (kJ/kg)			2571.0	2651.0	2807.0	2966.0	3130.6	3301.6	3664.3	4054.5
	h (kJ/kg)			2761.2	2865.9	3069.6	3275.5	3486.6	3704.0	4159.3	4642.0
	s (kJ/kg-K)			7.0792	7.3132	7.7037	8.0347	8.3271	8.5915	9.0605	9.4726
400	*v* (m^3/kg)			0.4709	0.5343	0.6549	0.7726	0.8894	1.0056	1.2373	1.4686
	u (kJ/kg)			2564.4	2647.2	2805.1	2964.9	3129.8	3301.0	3663.9	4054.3
	h (kJ/kg)			2752.8	2860.9	3067.1	3273.9	3485.5	3703.3	4158.9	4641.7
	s (kJ/kg-K)			6.9306	7.1723	7.5677	7.9003	8.1933	8.4580	8.9274	9.3396
P (kPa)		50	100	150	200	300	400	500	600	800	1000
		Temperature, *T* (°C)									

Table B-3 (continued): Properties of Superheated Vapor: Pressures from 500 kPa to 1.6 MPa

P (kPa)		Temperature, *T* (°C)									
		200	250	300	400	500	600	700	800	900	1000
500	*v* (m^3/kg)	0.4250	0.4744	0.5226	0.6173	0.7109	0.8041	0.897	0.9897	1.0823	1.1748
	u (kJ/kg)	2643.3	2723.8	2803.3	2963.7	3129.0	3300.4	3478.6	3663.6	3855.4	4054.0
	h (kJ/kg)	2855.8	2961.0	3064.6	3272.4	3484.5	3702.5	3927.0	4158.4	4396.6	4641.4
	s (kJ/kg-K)	7.0610	7.2725	7.4614	7.7956	8.0893	8.3544	8.5978	8.8240	9.0362	9.2364
600	*v* (m^3/kg)	0.3521	0.3939	0.4344	0.5137	0.5920	0.6698	0.7472	0.8246	0.9018	0.9789
	u (kJ/kg)	2639.4	2721.2	2801.4	2962.5	3128.2	3299.8	3478.1	3663.2	3855.1	4053.8
	h (kJ/kg)	2850.6	2957.6	3062.0	3270.8	3483.4	3701.7	3926.4	4157.9	4396.2	4641.1
	s (kJ/kg-K)	6.9683	7.1833	7.3740	7.7097	8.0041	8.2695	8.5132	8.7395	8.9518	9.1521
700	*v* (m^3/kg)	0.3000	0.3364	0.3714	0.4398	0.5070	0.5738	0.6403	0.7066	0.7729	0.8390
	u (kJ/kg)	2635.3	2718.6	2799.5	2961.4	3127.4	3299.3	3477.6	3662.8	3854.8	4053.5
	h (kJ/kg)	2845.3	2954.0	3059.5	3269.2	3482.3	3700.9	3925.9	4157.5	4395.9	4640.8
	s (kJ/kg-K)	6.8884	7.1070	7.2995	7.6368	7.9319	8.1977	8.4415	8.6681	8.8804	9.0807
800	*v* (m^3/kg)	0.2609	0.2932	0.3242	0.3843	0.4433	0.5019	0.5601	0.6182	0.6762	0.7341
	u (kJ/kg)	2631.1	2715.9	2797.5	2960.2	3126.6	3298.7	3477.2	3662.5	3854.5	4053.3
	h (kJ/kg)	2839.8	2950.4	3056.9	3267.7	3481.3	3700.1	3925.3	4157.0	4395.5	4640.5
	s (kJ/kg-K)	6.8177	7.0402	7.2345	7.5735	7.8692	8.1354	8.3794	8.6061	8.8185	9.0189
900	*v* (m^3/kg)	0.2304	0.2596	0.2874	0.3411	0.3938	0.4459	0.4977	0.5494	0.6010	0.6525
	u (kJ/kg)	2626.7	2713.2	2795.6	2959.1	3125.8	3298.1	3476.7	3662.1	3854.2	4053.0
	h (kJ/kg)	2834.1	2946.8	3054.3	3266.1	3480.2	3699.4	3924.7	4156.6	4395.1	4640.3
	s (kJ/kg-K)	6.7539	6.9805	7.1767	7.5173	7.8138	8.0804	8.3246	8.5514	8.7639	8.9644
1000	*v* (m^3/kg)	0.2060	0.2327	0.2580	0.3066	0.3541	0.4011	0.4478	0.4944	0.5408	0.5872
	u (kJ/kg)	2622.3	2710.4	2793.7	2957.9	3125.0	3297.5	3476.3	3661.7	3853.9	4052.7
	h (kJ/kg)	2828.3	2943.1	3051.6	3264.5	3479.1	3698.6	3924.1	4156.1	4394.8	4640.0
	s (kJ/kg-K)	6.6956	6.9265	7.1246	7.4670	7.7642	8.0311	8.2755	8.5024	8.7150	8.9155
1200	*v* (m^3/kg)	0.1693	0.1924	0.2139	0.2548	0.2946	0.3339	0.3730	0.4118	0.4506	0.4893
	u (kJ/kg)	2612.9	2704.7	2789.7	2955.5	3123.4	3296.3	3475.3	3661.0	3853.3	4052.2
	h (kJ/kg)	2816.1	2935.6	3046.3	3261.3	3477.0	3697.0	3922.9	4155.2	4394.0	4639.4
	s (kJ/kg-K)	6.5909	6.8313	7.0335	7.3793	7.6779	7.9456	8.1904	8.4176	8.6303	8.8310
1400	*v* (m^3/kg)	0.1430	0.1636	0.1823	0.2178	0.2522	0.2860	0.3195	0.3529	0.3861	0.4193
	u (kJ/kg)	2602.7	2698.9	2785.7	2953.1	3121.8	3295.1	3474.4	3660.3	3852.7	4051.7
	h (kJ/kg)	2803.0	2927.9	3040.9	3258.1	3474.8	3695.5	3921.7	4154.3	4393.3	4638.8
	s (kJ/kg-K)	6.4975	6.7488	6.9553	7.3046	7.6047	7.8730	8.1183	8.3458	8.5587	8.7595
1600	*v* (m^3/kg)		0.1419	0.1587	0.1901	0.2203	0.2500	0.2794	0.3087	0.3378	0.3669
	u (kJ/kg)		2692.9	2781.6	2950.8	3120.1	3293.9	3473.5	3659.5	3852.1	4051.2
	h (kJ/kg)		2919.9	3035.4	3254.9	3472.6	3693.9	3920.5	4153.4	4392.6	4638.2
	s (kJ/kg-K)		6.6753	6.8864	7.2394	7.5410	7.8101	8.0558	8.2834	8.4965	8.6974
P (kPa)		200	250	300	400	500	600	700	800	900	1000
		Temperature, *T* (°C)									

Table B-3 (continued): Properties of Superheated Vapor: Pressures from 1.8 MPa to 9 MPa

P (kPa)		Temperature, T (°C)									
		250	300	350	400	500	600	700	800	900	1000
1800	v (m^3/kg)	0.1250	0.1402	0.1546	0.1685	0.1955	0.2220	0.2482	0.2743	0.3002	0.3261
	u (kJ/kg)	2686.7	2777.4	2863.6	2948.3	3118.5	3292.7	3472.6	3658.8	3851.5	4050.7
	h (kJ/kg)	2911.7	3029.9	3141.9	3251.6	3470.4	3692.3	3919.4	4152.4	4391.9	4637.6
	s (kJ/kg-K)	6.6088	6.8246	7.0120	7.1814	7.4845	7.7543	8.0005	8.2284	8.4417	8.6427
2000	v (m^3/kg)	0.1115	0.1255	0.1386	0.1512	0.1757	0.1996	0.2233	0.2467	0.2701	0.2934
	u (kJ/kg)	2680.3	2773.2	2860.5	2945.9	3116.9	3291.5	3471.7	3658.0	3850.9	4050.2
	h (kJ/kg)	2903.3	3024.2	3137.7	3248.4	3468.3	3690.7	3918.2	4151.5	4391.1	4637.1
	s (kJ/kg-K)	6.5475	6.7684	6.9583	7.1292	7.4337	7.7043	7.9509	8.1791	8.3925	8.5936
3000	v (m^3/kg)	0.07063	0.08118	0.09056	0.09938	0.1162	0.1325	0.1484	0.1642	0.1799	0.1955
	u (kJ/kg)	2644.7	2750.8	2844.4	2933.6	3108.6	3285.5	3467.0	3654.3	3847.9	4047.7
	h (kJ/kg)	2856.5	2994.3	3116.1	3231.7	3457.2	3682.8	3912.2	4146.9	4387.5	4634.2
	s (kJ/kg-K)	6.2893	6.5412	6.7450	6.9235	7.2359	7.5103	7.759	7.9885	8.2028	8.4045
4000	v (m^3/kg)		0.05887	0.06647	0.07343	0.08644	0.09886	0.1110	0.1229	0.1348	0.1465
	u (kJ/kg)		2726.2	2827.4	2920.8	3100.3	3279.4	3462.4	3650.6	3844.8	4045.1
	h (kJ/kg)		2961.7	3093.3	3214.5	3446	3674.9	3906.3	4142.3	4383.9	4631.2
	s (kJ/kg-K)		6.3639	6.5843	6.7714	7.0922	7.3706	7.6214	7.8523	8.0675	8.2698
5000	v (m^3/kg)		0.04535	0.05197	0.05784	0.06858	0.07870	0.08852	0.09816	0.1077	0.1172
	u (kJ/kg)		2699.0	2809.5	2907.5	3091.8	3273.3	3457.7	3646.9	3841.8	4042.6
	h (kJ/kg)		2925.7	3069.3	3196.7	3434.7	3666.9	3900.3	4137.7	4380.2	4628.3
	s (kJ/kg-K)		6.2111	6.4516	6.6483	6.9781	7.2605	7.5136	7.7458	7.9619	8.1648
6000	v (m^3/kg)		0.03619	0.04225	0.04742	0.05667	0.06527	0.07355	0.08165	0.08964	0.09756
	u (kJ/kg)		2668.4	2790.4	2893.7	3083.1	3267.2	3453.0	3643.2	3838.8	4040.1
	h (kJ/kg)		2885.6	3043.9	3178.3	3423.1	3658.8	3894.3	4133.1	4376.6	4625.4
	s (kJ/kg-K)		6.0703	6.3357	6.5432	6.8826	7.1693	7.4247	7.6582	7.8751	8.0786
7000	v (m^3/kg)		0.02949	0.03526	0.03996	0.04816	0.05567	0.06285	0.06986	0.07675	0.08357
	u (kJ/kg)		2633.5	2770.1	2879.5	3074.3	3261.0	3448.3	3639.5	3835.7	4037.5
	h (kJ/kg)		2839.9	3016.9	3159.2	3411.4	3650.6	3888.3	4128.5	4373.0	4622.5
	s (kJ/kg-K)		5.9337	6.2305	6.4502	6.8000	7.0910	7.3487	7.5836	7.8014	8.0055
8000	v (m^3/kg)		0.02428	0.02997	0.03434	0.04177	0.04846	0.05483	0.06101	0.06708	0.07308
	u (kJ/kg)		2592.3	2748.3	2864.6	3065.4	3254.7	3443.6	3635.7	3832.7	4035.0
	h (kJ/kg)		2786.5	2988.1	3139.4	3399.5	3642.4	3882.2	4123.8	4369.3	4619.6
	s (kJ/kg-K)		5.7937	6.1321	6.3658	6.7266	7.0221	7.2822	7.5185	7.7372	7.9419
9000	v (m^3/kg)			0.02582	0.02996	0.03679	0.04286	0.04859	0.05413	0.05956	0.06492
	u (kJ/kg)			2725.0	2849.2	3056.3	3248.4	3438.8	3632.0	3829.6	4032.4
	h (kJ/kg)			2957.3	3118.8	3387.4	3634.1	3876.1	4119.2	4365.7	4616.7
	s (kJ/kg-K)			6.038	6.2876	6.6603	6.9605	7.2229	7.4606	7.6802	7.8855
P (kPa)		250	300	350	400	500	600	700	800	900	1000
		Temperature, T (°C)									

Table B-3 (continued): Properties of Superheated Vapor: Pressures from 10 MPa to 26 MPa

P (kPa)		Temperature, T (°C)									
		350	400	500	600	700	800	900	1000	1100	1200
10,000	v (m^3/kg)	0.02244	0.02644	0.03281	0.03838	0.04360	0.04863	0.05355	0.05839	0.06318	0.06794
	u (kJ/kg)	2699.6	2833.1	3047.0	3242.0	3434.0	3628.2	3826.5	4029.9	4238.5	4452.4
	h (kJ/kg)	2924.0	3097.5	3375.1	3625.8	3870.0	4114.5	4362.0	4613.8	4870.3	5131.7
	s (kJ/kg-K)	5.946	6.2141	6.5995	6.9045	7.1693	7.4085	7.6290	7.8349	8.0289	8.2126
12,000	v (m^3/kg)	0.01722	0.02111	0.02683	0.03165	0.03611	0.04037	0.04452	0.0486	0.05262	0.05661
	u (kJ/kg)	2641.4	2798.7	3028.1	3229.1	3424.4	3620.7	3820.4	4024.8	4234.2	4448.7
	h (kJ/kg)	2848.1	3052.0	3350.0	3608.9	3857.7	4105.1	4354.7	4608.0	4865.6	5128.0
	s (kJ/kg-K)	5.7609	6.0764	6.4903	6.8054	7.0753	7.3173	7.5396	7.7468	7.9416	8.126
14,000	v (m^3/kg)	0.01323	0.01724	0.02254	0.02684	0.03076	0.03448	0.03808	0.04161	0.04508	0.04852
	u (kJ/kg)	2567.8	2761.0	3008.4	3216.0	3414.7	3613.1	3814.3	4019.7	4229.9	4444.9
	h (kJ/kg)	2753.1	3002.3	3324.1	3591.8	3845.4	4095.8	4347.4	4602.1	4861.0	5124.2
	s (kJ/kg-K)	5.5598	5.9460	6.3932	6.7191	6.9941	7.2391	7.4632	7.6716	7.8673	8.0523
16,000	v (m^3/kg)	0.009766	0.01428	0.01932	0.02324	0.02675	0.03006	0.03325	0.03636	0.03942	0.04245
	u (kJ/kg)	2460.7	2719.1	2988.1	3202.6	3404.9	3605.4	3808.1	4014.6	4225.5	4441.2
	h (kJ/kg)	2617.0	2947.6	3297.3	3574.4	3832.9	4086.4	4340.1	4596.3	4856.3	5120.4
	s (kJ/kg-K)	5.3045	5.8180	6.3046	6.6421	6.9224	7.1704	7.3964	7.6060	7.8025	7.9882
18,000	v (m^3/kg)		0.01192	0.01681	0.02043	0.02363	0.02662	0.02949	0.03228	0.03502	0.03773
	u (kJ/kg)		2671.9	2967.1	3189.1	3395.1	3597.8	3801.9	4009.4	4221.2	4437.5
	h (kJ/kg)		2886.4	3269.7	3556.8	3820.4	4076.9	4332.7	4590.5	4851.6	5116.6
	s (kJ/kg-K)		5.6883	6.2223	6.5721	6.8579	7.1089	7.3368	7.5476	7.7451	7.9313
20,000	v (m^3/kg)		0.009950	0.01479	0.01819	0.02113	0.02387	0.02648	0.02902	0.03150	0.03396
	u (kJ/kg)		2617.9	2945.3	3175.3	3385.1	3590.1	3795.7	4004.3	4216.9	4433.8
	h (kJ/kg)		2816.9	3241.2	3539.0	3807.8	4067.5	4325.4	4584.7	4847.0	5112.9
	s (kJ/kg-K)		5.5526	6.1446	6.5075	6.7991	7.0531	7.2829	7.4950	7.6933	7.8802
22,000	v (m^3/kg)		0.008256	0.01314	0.01635	0.01909	0.02162	0.02403	0.02635	0.02863	0.03086
	u (kJ/kg)		2554.2	2922.7	3161.4	3375.1	3582.4	3789.5	3999.2	4212.5	4430.1
	h (kJ/kg)		2735.8	3211.8	3521.0	3795.1	4058.0	4318.1	4578.9	4842.3	5109.1
	s (kJ/kg-K)		5.4051	6.0705	6.4474	6.7448	7.0020	7.2337	7.4470	7.6462	7.8337
24,000	v (m^3/kg)		0.006732	0.01175	0.01481	0.01739	0.01975	0.02198	0.02413	0.02623	0.02829
	u (kJ/kg)		2475.9	2899.4	3147.2	3365.0	3574.6	3783.3	3994.0	4208.2	4426.4
	h (kJ/kg)		2637.5	3181.4	3502.7	3782.4	4048.5	4310.7	4573.1	4837.7	5105.4
	s (kJ/kg-K)		5.2369	5.9991	6.3908	6.6943	6.9546	7.1883	7.4029	7.6029	7.7911
26,000	v (m^3/kg)		0.005285	0.01058	0.01352	0.01595	0.01816	0.02024	0.02225	0.02420	0.02611
	u (kJ/kg)		2373	2875.1	3132.8	3354.8	3566.8	3777.1	3988.9	4203.9	4422.7
	h (kJ/kg)		2510.4	3150.2	3484.3	3769.6	4039	4303.4	4567.3	4833.1	5101.6
	s (kJ/kg-K)		5.0302	5.9298	6.3373	6.6469	6.9105	7.1461	7.362	7.5629	7.7517
P (kPa)		350	400	500	600	700	800	900	1000	1100	1200
		Temperature, T (°C)									

Table B-4: Properties of Compressed Liquid

P (MPa)		Temperature, T (°C)									
		0	20	40	60	80	100	120	140	160	180
5	10^3 v (m^3/kg)	0.9977	0.9996	1.0057	1.0149	1.0267	1.0410	1.0576	1.0769	1.0988	1.1240
	u (kJ/kg)	0.0441	83.609	166.92	250.29	333.82	417.65	501.91	586.80	672.55	759.47
	h (kJ/kg)	5.030	88.610	171.95	255.36	338.96	422.85	507.19	592.18	678.04	765.09
	s (kJ/kg-K)	0.00014	0.29543	0.57046	0.82865	1.0723	1.3034	1.5236	1.7344	1.9374	2.1338
10	10^3 v (m^3/kg)	0.9952	0.9973	1.0035	1.0127	1.0244	1.0385	1.0549	1.0738	1.0954	1.1200
	u (kJ/kg)	0.1171	83.308	166.33	249.43	332.69	416.23	500.18	584.72	670.06	756.48
	h (kJ/kg)	10.069	93.281	176.37	259.55	342.94	426.62	510.73	595.45	681.01	767.68
	s (kJ/kg-K)	0.00034	0.29435	0.56852	0.82602	1.0691	1.2996	1.5191	1.7293	1.9316	2.1272
20	10^3 v (m^3/kg)	0.9904	0.9929	0.9992	1.0084	1.0199	1.0337	1.0496	1.0679	1.0886	1.1122
	u (kJ/kg)	0.2257	82.708	165.17	247.75	330.50	413.50	496.85	580.71	665.28	750.78
	h (kJ/kg)	20.033	102.57	185.16	267.92	350.90	434.17	517.84	602.07	687.05	773.02
	s (kJ/kg-K)	0.00047	0.29208	0.56461	0.8208	1.0627	1.2920	1.5105	1.7194	1.9203	2.1143
40	10^3 v (m^3/kg)	0.9811	0.9845	0.9911	1.0001	1.0113	1.0245	1.0397	1.0569	1.0762	1.0980
	u (kJ/kg)	0.3078	81.520	162.96	244.58	326.37	408.36	490.61	573.26	656.43	740.32
	h (kJ/kg)	39.553	120.90	202.60	284.59	366.82	449.34	532.20	615.53	699.48	784.24
	s (kJ/kg-K)	-0.00024	0.28716	0.55676	0.81054	1.0503	1.2775	1.4938	1.7006	1.8990	2.0903
60	10^3 v (m^3/kg)	0.9725	0.9765	0.9833	0.9923	1.0032	1.0159	1.0304	1.0467	1.0649	1.0852
	u (kJ/kg)	0.2357	80.345	160.86	241.62	322.54	403.61	484.88	566.44	648.40	730.90
	h (kJ/kg)	58.584	138.94	219.87	301.16	382.73	464.56	546.70	629.24	712.30	796.01
	s (kJ/kg-K)	-0.00208	0.2818	0.54885	0.80049	1.0383	1.2637	1.4781	1.6829	1.8792	2.0681
80	10^3 v (m^3/kg)	0.9643	0.9690	0.9760	0.9849	0.9956	1.0078	1.0217	1.0372	1.0545	1.0735
	u (kJ/kg)	0.03710	79.182	158.88	238.85	318.96	399.20	479.57	560.16	641.05	722.35
	h (kJ/kg)	77.184	156.70	236.96	317.64	398.61	479.83	561.31	643.14	725.41	808.23
	s (kJ/kg-K)	-0.00489	0.27604	0.54087	0.79062	1.0266	1.2503	1.4631	1.6661	1.8605	2.0474
100	10^3 v (m^3/kg)	0.9567	0.9619	0.9691	0.9779	0.9883	1.0002	1.0136	1.0284	1.0448	1.0628
	u (kJ/kg)	-0.2637	78.031	156.99	236.24	315.62	395.09	474.65	554.36	634.29	714.52
	h (kJ/kg)	95.40	174.22	253.90	334.03	414.46	495.11	576.01	657.20	738.77	820.80
	s (kJ/kg-K)	-0.00851	0.26992	0.53284	0.7809	1.0153	1.2375	1.4487	1.6501	1.8429	2.0280
P (MPa)		0	20	40	60	80	100	150	200	250	300
		Temperature, T (°C)									