

# TECHNICAL REFERENCE

Clean Steam is high purity steam that is sterile and pyrogen free. It is used by hospitals and research institutions as well as in the Pharmaceutical, Biotechnical, Electronics, Food and Cosmetics Industries.

**NICHOLSON** has become an innovator in Clean Steam applications through extensive research and development, working closely with major engineering firms in the pharmaceutical and biotechnical industries throughout the United States. From revolutionary new designs such as the CDH Series to the value oriented DS100 Series, **NICHOLSON** innovations set the standard for Clean Steam management.

# STEAM TABLE\*

h = Total heat of steam, Btu per pound

v = Specific volume, cubic feet per pound

Pres- sure psi (gage)	Temper- ature F° (sat.)		Satur- ated Liquid	Satur- ated Vapor	TOTAL TEMPERATURE, °F													
					220	240	260	280	300	320	340	360	380	400	420	440	460	
0	212	h v	180.1 0.0167	1150.4 26.80	1154.4 27.15	1164.2 28.00	1173.8 28.85	1183.3 29.70	1192.8 30.53	1202.3 31.37	1211.7 32.20	1221.1 33.03	1230.5 33.85	1239.9 34.68	1249.3 35.50	1258.8 36.32	1268.2 37.14	
5	228	h v	196.2 0.0168	1156.3 20.089		1162.3 20.48	1172.2 21.11	1182.0 21.74	1191.6 22.36	1201.2 22.98	1210.8 23.60	1220.3 24.21	1229.7 24.82	1239.2 25.43	1248.7 26.04	1258.2 26.65	1267.6 27.25	
10	240	h v	208.4 0.0169	1160.6 16.303			1170.7 16.819	1180.6 17.330	1190.5 17.836	1200.2 18.337	1209.8 18.834	1219.4 19.329	1229.0 19.821	1238.5 20.31	1248.1 20.80	1257.6 21.29	1267.1 21.77	
15	250	h v	218.8 0.0170	1164.1 13.746			1169.1 13.957	1179.3 14.390	1189.3 14.816	1199.1 15.238	1208.9 15.657	1218.6 16.072	1228.3 16.485	1237.9 16.897	1247.5 17.306	1257.0 17.714	1266.6 18.121	
20	259	h v	227.9 0.0171	1167.1 11.898			1167.5 11.911	1177.9 12.288	1188.1 12.659	1198.1 13.025	1208.0 13.387	1217.8 13.746	1227.5 14.103	1237.2 14.457	1246.8 14.810	1256.4 15.162	1266.1 15.512	
25	267	h v	236.0 0.0171	1169.7 10.498				1176.5 10.711	1186.8 11.040	1197.0 11.364	1207.0 11.684	1216.9 12.001	1226.7 12.315	1236.5 12.628	1246.2 12.938	1255.9 13.247	1265.5 13.555	
30	274	h v	243.4 0.0172	1172.0 9.401				1175.0 9.484	1185.6 9.781	1195.9 10.072	1206.0 10.359	1216.0 10.643	1225.9 10.925	1235.8 11.204	1245.6 11.482	1255.3 11.758	1265.0 12.0033	
40	287	h v	256.3 0.0173	1175.9 7.787					1183.0 7.947	1193.6 8.192	1204.0 8.432	1214.3 8.668	1224.4 8.902	1234.3 9.134	1244.3 9.364	1254.1 9.592	1263.9 9.819	
50	298	h v	267.5 0.0174	1179.1 6.655					1180.3 6.676	1191.3 6.889	1202.0 7.096	1212.5 7.300	1222.7 7.501	1232.9 7.700	1242.9 7.896	1252.9 8.091	1262.8 8.285	
60	308	h v	277.4 0.0175	1181.9 5.816						1188.9 5.9321	1199.9 6.116	1210.6 6.296	1221.1 6.473	1231.4 6.648	1241.6 6.820	1251.7 6.991	1261.7 7.161	
70	316	h v	286.4 0.0176	1184.2 5.168						1186.4 5.200	1197.7 5.366	1208.7 5.528	1219.4 5.687	1229.9 5.843	1240.2 5.997	1250.4 6.150	1260.6 6.301	
80	324	h v	294.6 0.0177	1186.2 4.652							1195.5 4.773	1206.7 4.921	1217.7 5.065	1228.3 5.207	1238.8 5.347	1249.2 5.485	1259.4 5.621	
90	331	h v	302.1 0.0178	1188.1 4.232							1193.2 4.292	1204.7 4.429	1215.9 4.562	1226.7 4.693	1237.4 4.821	1247.9 4.947	1258.2 5.071	
100	338	h v	309.1 0.0178	1189.7 3.882							1190.8 3.895	1202.7 4.022	1214.1 4.146	1225.2 4.267	1236.0 4.385	1246.6 4.502	1257.1 4.617	
125	353	h v	324.8 0.0180	1193.0 3.220								1197.3 3.258	1209.4 3.365	1211.1 3.468	1232.3 3.569	1243.3 3.667	1254.1 3.764	
150	366	h v	338.5 0.0182	1195.6 2.752									1204.5 2.818	1216.7 2.910	1228.4 2.998	1239.8 3.085	1251.0 3.169	
175	378	h v	350.8 0.0183	1197.6 2.404										1199.3 2.414	1212.2 2.498	1224.5 2.577	1236.3 2.655	1247.8 2.730
200	388	h v	361.9 0.0185	1199.3 2.134											1207.4 2.180	1220.3 2.253	1232.6 2.324	1244.5 2.393
225	397	h v	372.1 0.0186	1200.6 1.9183											1202.5 1.9276	1216.0 1.9964	1228.8 2.062	1241.1 2.126
250	406	h v	381.6 0.0187	1201.7 1.7422												1211.5 1.7870	1224.9 1.8488	1237.6 1.9081
275	414	h v	390.5 0.0188	1202.6 1.5954												1206.8 1.6130	1220.8 1.6717	1234.0 1.7277
300	422	h v	398.8 0.0190	1203.2 1.4711													1216.5 1.5222	1230.3 1.5755
350	436	h v	414.1 0.0192	1204.1 1.2720													1207.5 1.2831	1222.4 1.3326
400	448	h v	428.1 0.0194	1204.6 1.1194														1214.0 1.1468
450	460	h v	440.9 0.0196	1204.6 0.9985														
500	470	h v	452.9 0.0198	1204.2 0.9004														
550	480	h v	464.1 0.0200	1203.7 0.8191														
600	489	h v	474.7 0.0202	1203.0 0.7503														

\*Adapted with permission from "Thermodynamic Properties of Steam", Keenan and Keyes, published by John Wiley & Sons, Inc.

# STEAM TABLE\*

h = Total heat of steam, Btu per pound

v = Specific volume, cubic feet per pound

TOTAL TEMPERATURE, °F															Temperature °F (sat.)	Pressure psi (gage)	
480	500	520	540	560	580	600	620	640	660	680	700	720	740	750			
1277.6 37.96	1287.1 38.78	1296.6 39.60	1306.2 40.41	1315.7 41.23	1325.3 42.04	1334.8 42.86	1344.5 43.68	1354.2 44.49	1363.8 45.31	1373.5 46.12	1383.2 46.94	1393.0 47.75	1402.8 48.56	1407.7 48.97	h v	212	0
1277.1 27.86	1286.6 28.46	1296.2 29.06	1305.7 29.67	1315.3 30.27	1324.8 30.87	1334.4 31.47	1344.1 32.07	1353.8 32.67	1363.5 33.27	1373.2 33.87	1382.9 34.47	1392.7 35.07	1402.6 35.67	1407.5 35.96	h v	228	5
1276.6 22.26	1286.2 22.74	1295.8 23.22	1305.3 23.71	1314.9 24.19	1324.5 24.68	1334.1 25.16	1343.8 25.64	1353.5 26.12	1363.2 26.60	1372.9 27.08	1382.6 27.56	1392.5 28.04	1402.3 28.52	1407.2 28.76	h v	240	10
1276.2 18.528	1285.7 18.933	1295.3 19.337	1304.9 19.741	1314.5 20.144	1324.2 20.547	1333.8 20.95	1343.5 21.35	1353.2 21.75	1362.9 22.15	1372.6 22.56	1382.4 22.96	1392.3 23.36	1402.1 23.76	1407.0 23.96	h v	250	15
1275.7 15.862	1285.3 16.210	1294.9 16.558	1304.5 16.905	1314.1 17.251	1323.8 17.597	1333.5 17.943	1343.2 18.288	1352.9 18.633	1362.6 18.977	1372.3 19.322	1382.1 19.666	1391.9 20.01	1401.8 20.35	1406.7 20.52	h v	259	20
1275.2 13.862	1284.8 14.168	1294.5 14.473	1304.1 14.778	1313.8 15.082	1323.4 15.385	1333.1 15.688	1342.8 15.990	1352.5 16.293	1362.3 16.595	1372.1 16.896	1381.9 17.198	1391.7 17.499	1401.6 17.8001	1406.5 7.951	h v	267	25
1274.7 12.307	1284.4 12.580	1294.0 12.852	1303.7 13.123	1313.4 13.394	1323.1 13.665	1332.8 13.935	1342.5 14.204	1352.2 14.473	1362.0 14.742	1371.8 15.011	1381.6 15.279	1391.5 15.547	1401.4 15.815	1406.3 15.949	h v	274	30
1273.7 10.044	1283.4 10.269	1293.2 10.493	1302.9 10.717	1312.6 10.940	1322.4 11.162	1332.1 11.384	1341.9 11.605	1351.7 11.826	1361.5 12.047	1371.3 12.268	1381.1 12.488	1391.0 12.708	1400.9 12.927	1405.8 13.037	h v	287	40
1272.7 8.478	1282.5 8.670	1292.3 8.861	1302.1 9.051	1311.9 9.240	1321.7 9.429	1331.5 9.618	1341.3 9.806	1351.1 9.993	1360.9 10.181	1370.8 10.368	1380.6 10.555	1390.5 10.741	1400.4 10.928	1405.4 11.021	h v	298	50
1271.6 7.329	1281.5 7.496	1291.4 7.663	1301.3 7.829	1311.1 7.994	1321.0 8.159	1330.8 8.323	1340.6 8.486	1350.5 8.649	1360.3 8.812	1370.2 8.975	1380.1 9.138	1390.0 9.300	1399.9 9.462	1404.9 9.543	h v	308	60
1270.6 6.450	1280.6 6.599	1290.5 6.747	1300.5 6.894	1310.4 7.041	1320.2 7.187	1330.1 7.332	1340.0 7.477	1349.9 7.622	1359.8 7.766	1369.7 7.910	1379.6 8.054	1389.6 8.198	1399.5 8.341	1404.5 8.413	h v	316	70
1269.5 5.756	1279.6 5.891	1289.6 6.024	1299.6 6.156	1309.6 6.288	1319.5 6.419	1329.4 6.550	1339.4 6.680	1349.3 6.810	1359.3 6.940	1369.2 7.069	1379.1 7.199	1389.1 7.327	1399.0 7.456	1404.0 7.520	h v	324	80
1268.5 5.195	1278.6 5.317	1288.7 5.439	1298.8 5.559	1308.8 5.679	1318.8 5.799	1328.7 5.918	1338.7 6.036	1348.7 6.154	1358.6 6.272	1368.6 6.389	1378.5 6.506	1388.5 6.623	1398.5 6.740	1403.5 6.798	h v	331	90
1267.4 4.730	1277.7 4.843	1287.8 4.955	1297.9 5.066	1308.0 5.176	1318.0 5.285	1328.1 5.394	1338.1 5.503	1348.0 5.611	1358.0 5.719	1368.0 5.827	1378.0 5.934	1388.1 6.041	1398.1 6.148	1403.1 6.201	h v	338	100
1266.7 3.860	1276.2 3.954	1285.5 4.047	1295.8 4.140	1306.0 4.232	1316.2 4.323	1326.4 4.413	1336.5 4.503	1346.6 4.593	1356.6 4.683	1366.7 4.772	1376.8 4.861	1386.9 4.949	1397.0 5.038	1402.0 5.082	h v	353	125
1261.9 3.252	1272.6 3.334	1283.2 3.414	1293.6 3.494	1304.0 3.573	1314.3 3.652	1324.6 3.730	1334.8 3.807	1345.0 3.884	1355.2 3.960	1365.3 4.037	1375.4 4.113	1385.6 4.188	1395.8 4.264	1400.8 4.301	h v	366	150
1259.0 2.804	1270.0 2.877	1280.8 2.948	1291.4 3.019	1302.0 3.089	1312.4 3.157	1322.8 3.226	1333.2 3.294	1343.5 3.361	1353.7 3.429	1363.9 3.495	1374.2 3.562	1384.4 3.628	1394.6 3.694	1399.7 3.727	h v	378	175
1256.0 2.460	1267.3 2.525	1278.3 2.590	1289.2 2.653	1299.9 2.716	1310.5 2.777	1321.0 2.839	1331.4 2.900	1341.8 2.960	1352.2 3.019	1362.5 3.079	1372.8 3.139	1383.1 3.198	1393.3 3.256	1398.5 3.286	h v	388	200
1253.0 2.187	1264.5 2.247	1275.8 2.306	1286.9 2.364	1297.8 2.421	1308.5 2.477	1319.2 2.533	1329.8 2.587	1340.3 2.642	1350.7 2.696	1361.1 2.750	1371.5 2.804	1381.9 2.857	1392.2 2.910	1397.3 2.936	h v	397	225
1249.9 1.9654	1261.7 2.021	1273.2 2.076	1284.5 2.129	1295.6 2.181	1306.5 2.233	1317.3 2.284	1328.0 2.334	1338.7 2.384	1349.2 2.434	1359.7 2.483	1370.2 2.532	1380.6 2.580	1391.0 2.629	1396.2 2.653	h v	406	250
1246.6 1.7816	1258.8 1.8338	1270.6 1.8846	1282.1 1.9342	1293.4 1.9829	1304.5 2.031	1315.5 2.078	1326.3 2.125	1337.0 2.171	1347.7 2.217	1358.3 2.262	1368.8 2.307	1379.3 2.352	1389.8 2.396	1395.0 2.418	h v	414	275
1243.3 1.6266	1255.8 1.6759	1267.9 1.7237	1279.7 1.7703	1291.2 1.8159	1302.5 1.8607	1313.6 1.9048	1324.5 1.9483	1335.4 1.9912	1346.1 2.034	1356.8 2.076	1367.4 2.118	1378.0 2.159	1388.6 2.200	1393.8 2.220	h v	422	300
1236.4 1.3795	1249.6 1.4243	1262.4 1.4675	1274.7 1.5094	1286.6 1.5501	1298.2 1.5900	1309.7 1.6291	1320.9 1.6676	1332.0 1.7056	1343.0 1.7430	1353.9 1.7801	1364.7 1.8168	1375.4 1.8531	1386.1 1.8892	1391.4 1.9071	h v	436	350
1229.0 1.1908	1243.2 1.2325	1256.6 1.2724	1269.4 1.3108	1281.8 1.3480	1293.9 1.3842	1305.7 1.4196	1317.2 1.4544	1328.6 1.4885	1339.8 1.5222	1350.9 1.5554	1361.9 1.5883	1372.8 1.6207	1383.6 1.6529	1389.0 1.6689	h v	448	400
1221.2 1.0416	1236.3 1.0811	1250.5 1.1186	1264.0 1.1544	1276.9 1.1889	1289.4 1.2224	1301.6 1.2550	1313.5 1.2868	1325.1 1.3180	1336.5 1.3488	1347.8 1.3789	1359.0 1.4088	1370.1 1.4382	1381.1 1.4675	1386.5 1.4819	h v	460	450
1212.8 0.9204	1229.0 0.9584	1244.0 0.9941	1258.3 1.0280	1271.8 1.0604	1284.8 1.0917	1297.3 1.1221	1309.6 1.1516	1321.5 1.1805	1333.2 1.2088	1344.7 1.2367	1356.1 1.2641	1367.3 1.2913	1378.4 1.3180	1384.0 1.3313	h v	470	500
	1221.4 0.8565	1237.4 0.8909	1252.4 0.9234	1266.5 0.9542	1280.0 0.9838	1293.0 1.0124	1305.6 1.0401	1317.8 1.0671	1329.8 1.0935	1341.6 1.1195	1353.2 1.1449	1364.6 1.1700	1375.8 1.1947	1381.4 1.2070	h v	480	550
	1213.2 0.7703	1230.3 0.8040	1246.1 0.8353	1261.0 0.8649	1275.1 0.8931	1288.5 0.9203	1301.5 0.9465	1314.1 0.9720	1326.3 0.9968	1338.3 1.0211	1350.2 1.0450	1361.8 1.0684	1373.2 1.0916	1378.9 1.1030	h v	489	600

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## PRESSURE TO VACUUM

## PROPERTIES OF WATER

Gage Indicated		Absolute Pressure		
PSIG	Inches of Hg	PSIA	Inches of Hg	Torrlicelli
-14.70000	29.92000	0.0	0.0	0.0
-14.69998	29.91996	0.00002	0.00004	0.001
-14.69996	29.91992	0.00004	0.00008	0.002
-14.69994	29.91988	0.00006	0.00012	0.003
-14.69992	29.91984	0.00008	0.00016	0.004
-14.69990	29.91980	0.00010	0.00020	0.005
-14.69981	29.91961	0.00019	0.00039	0.010
-14.69961	29.91921	0.00039	0.00079	0.020
-14.69942	29.91882	0.00058	0.00118	0.030
-14.69923	29.91843	0.00077	0.00157	0.040
-14.69903	29.91803	0.00097	0.00197	0.050
-14.69806	29.91606	0.00194	0.00394	0.100
-14.69613	29.91212	0.00387	0.00788	0.200
-14.69449	29.90818	0.00551	0.01182	0.300
-14.69226	29.90424	0.00774	0.01576	0.400
-14.69032	29.90030	0.00968	0.01970	0.500
-14.68066	29.88063	0.01934	0.03937	1.000
-14.66698	29.84126	0.03302	0.07874	2.000
-14.64197	29.80189	0.05803	0.11811	3.000
-14.62262	29.76252	0.07738	0.15748	4.000
-14.60329	29.72315	0.09671	0.19685	5.000
-14.50658	29.52630	0.19342	0.39370	10.000
-14.40980	29.32940	0.29020	0.59060	15.000
-14.31320	29.13260	0.38680	0.78740	20.000
-14.21840	28.93570	0.48160	0.98430	25.000
-14.20870	28.920	0.49130	1.000	25.400
-14.11970	28.740	0.58030	1.181	30.000
-13.75700	28.000	0.94330	1.920	48.770
-12.28300	25.000	2.41700	4.920	124.970
-10.31800	21.000	4.38200	8.920	226.570
-8.84400	18.000	5.85600	11.920	302.770
-7.37000	15.000	7.320	14.920	378.970
-5.89600	12.000	8.804	17.920	455.770
-4.91300	10.000	9.787	19.920	505.970
-3.93000	8.000	10.770	21.920	556.770
-2.94800	6.000	11.752	23.920	607.570
-1.96500	4.000	12.735	25.920	658.370
-0.98300	2.000	13.732	27.920	709.170
-0.49100	1.000	14.209	28.920	733.570
-0.24600	0.500	14.454	29.420	747.270
ATMOSPHERIC				
0.0	0.0	14.700	29.920	760.000
+ 0.30		15.000	30.540	775.720
+ 1.00		15.700	31.970	811.910
+ 2.00		16.700	34.000	863.630
+ 10.00		24.700	50.290	277.35

Water Temp.	Saturation Pressure	Weight	Weight Density	Specific Volume
Deg. F	PSIA	lbs/Gallon	lbs/Cu.Ft.	Cu.Ft./lb
32	0.0886	8.344	62.414	0.016022
40	0.1216	8.345	62.426	0.016019
50	0.1780	8.343	62.410	0.016023
60	0.2561	8.338	62.371	0.016033
70	0.3629	8.329	62.305	0.016050
80	0.5068	8.318	62.220	0.016072
90	0.6981	8.304	62.116	0.016099
100	0.9492	8.288	61.996	0.016130
110	1.2750	8.270	61.862	0.016165
120	1.6927	8.250	61.713	0.016204
130	2.2230	8.228	61.550	0.016247
140	2.8892	8.205	61.376	0.016293
150	3.7184	8.180	61.188	0.016343
160	4.7414	8.154	60.994	0.016395
170	5.9926	8.126	60.787	0.016451
180	7.5110	8.097	60.569	0.016510
190	9.340	8.067	60.343	0.016572
200	11.526	8.035	60.107	0.016637
210	14.123	8.002	59.862	0.016705
212	14.696	7.996	59.812	0.016719
220	17.186	7.969	59.613	0.016775
240	24.968	7.898	59.081	0.016926
260	35.427	7.823	58.517	0.017089
280	49.200	7.743	57.924	0.017264
300	67.005	7.661	57.307	0.01745
350	134.604	7.431	55.586	0.01799
400	247.259	7.172	53.648	0.01864
450	422.55	6.880	51.467	0.01943
500	680.86	6.543	48.948	0.02043
550	1045.43	6.143	45.956	0.02176
600	1543.2	5.655	42.301	0.02364
650	2208.4	4.999	37.397	0.02674
700	3094.3	3.651	27.307	0.03662

**NOTE:**

Weight of water per gallon is based on 7.48052 gallons per cubic foot.

Specific gravity of water @ 60°F = 1.00

## CONDENSATION WARM-UP LOADS

Steam Pressure PSIG	HEADER SIZE														0°F* Correct Factor
	2"	2½"	3"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24"	
1	6.4	10.2	13.3	19.0	25.7	33.3	50	71	94	111	145	184	216	301	1.50
5	7.2	11.4	14.9	21.2	28.7	37.2	56	80	105	124	163	206	241	336	1.45
10	7.8	12.4	16.2	23.0	31.2	40.5	61	86	114	135	177	224	262	365	1.41
20	8.8	14.0	18.3	26.0	35.2	45.7	69	98	129	153	200	253	296	413	1.37
40	10.3	16.4	21.4	30.5	41.3	53.6	81	114	151	179	234	296	347	484	1.32
60	11.5	18.2	23.9	34.0	46.0	59.7	90	127	169	200	261	330	387	539	1.29
80	12.5	19.8	25.9	36.9	50.0	64.8	98	138	183	217	283	358	420	585	1.27
100	13.3	21.1	27.7	39.4	53.4	69.3	104	148	195	231	302	383	449	625	1.26
125	14.3	22.6	29.6	42.2	57.2	74.2	112	158	209	248	324	410	481	670	1.25
150	15.1	24.0	31.4	44.7	60.6	78.6	118	168	222	263	343	434	509	709	1.24
175	15.9	25.2	33.0	47.0	63.7	82.7	124	176	233	276	361	457	536	746	1.23
200	16.6	26.4	34.5	49.1	66.6	86.4	130	184	244	289	377	477	560	779	1.22
250	17.9	28.5	37.3	53.0	71.9	93.3	140	199	263	312	407	515	604	842	1.21
300	26.3	40.2	53.8	78.6	109.0	150.0	228	338	464	557	716	896	1096	1555	1.20
400	29.3	44.8	59.9	87.7	121.5	167.0	254	376	517	620	798	998	1221	1733	1.19
500	32.1	48.9	65.5	95.7	132.8	182.5	277	411	566	678	872	1091	1335	1894	1.18
600	34.6	52.9	70.7	103.4	143.4	197.1	299	444	611	732	942	1179	1441	2045	1.17

Condensation loads are in pounds per hour per 100 feet of insulated steam main with ambient temperature of 70°F and an insulation efficiency of 80%.

Loads are based on Schedule 40 pipe for pressures up to and including 250 PSIG and on schedule 80 pipe for pressures above 250 PSIG.

## CONDENSATION LOADS

Steam Pressure PSIG	HEADER SIZE														0°F* Correct Factor
	2"	2½"	3"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24"	
1	4.6	5.5	6.6	8.3	10.1	11.8	15.1	18.6	21.8	23.8	26.9	30.1	33.2	39.4	1.40
5	5.1	6.1	7.3	9.3	11.3	13.3	16.9	20.8	24.4	26.6	30.1	33.7	37.2	44.1	1.37
10	5.7	6.8	8.2	10.3	12.6	14.8	18.9	23.2	27.2	29.7	33.7	37.6	41.5	49.3	1.34
20	6.7	8.0	9.7	12.2	14.8	17.4	22.3	27.4	32.1	35.1	39.7	44.4	49.0	58.2	1.29
40	8.4	10.0	12.0	15.1	18.4	21.7	27.7	34.1	40.0	43.6	49.5	55.3	61.0	72.5	1.24
60	9.7	11.6	13.9	17.6	21.4	25.2	32.2	39.6	46.5	50.7	57.5	64.3	71.0	84.3	1.22
80	10.9	13.0	15.6	19.7	24.0	28.2	36.2	44.4	52.2	57.0	64.6	72.2	79.7	94.7	1.20
100	11.9	14.3	17.1	21.6	26.4	31.0	39.7	48.9	57.4	62.6	71.0	79.4	87.7	104.2	1.18
125	13.2	15.7	18.9	23.8	29.1	34.2	43.8	53.9	63.3	69.1	78.4	87.6	96.8	115.0	1.17
150	14.3	17.1	20.5	25.9	31.6	37.2	47.6	58.6	68.8	75.2	85.3	95.3	105.3	125.2	1.16
175	15.3	18.3	22.0	27.8	33.9	40.0	51.2	63.0	74.0	80.9	91.7	102.6	113.3	134.7	1.15
200	16.3	19.5	23.4	29.7	36.2	42.6	54.6	67.2	78.9	86.2	97.8	109.4	120.8	143.7	1.14
250	18.2	21.8	26.2	33.1	40.4	47.6	61.1	75.2	88.3	96.5	109.5	122.4	135.3	160.8	1.13
300	20.0	23.9	28.8	36.4	44.4	52.4	67.1	82.7	97.1	106.1	120.5	134.7	148.9	177.1	1.12
400	23.4	27.9	33.6	42.5	51.9	61.2	78.6	96.8	113.8	124.3	141.1	157.8	174.5	207.6	1.11
500	26.5	31.7	38.2	48.4	59.1	69.7	89.4	110.2	129.5	141.6	160.8	179.8	198.8	236.6	1.10
600	29.6	35.4	42.6	54.0	66.0	77.8	100.0	123.2	144.9	158.4	179.8	201.2	223.5	264.8	1.09

Condensation loads are in pounds per hour per 100 feet of insulated steam main with ambient temperature of 70°F and an insulation efficiency of 80%.

Chart loads represent losses due to radiation and convection for saturated steam.

\*For ambient temperature of 0°F, multiply load value by the correction factor corresponding to the steam pressure.

# CONVERSION TABLES

LIQUID WEIGHTS and MEASURES		
To Convert	To	Multiply By
Gallons	Liters	3.7853
Gallons	Cu. Inches	231
Gallons	Cu. Feet	0.1337
Gallons	Cu. Meters	0.00379
Gallons	Lbs. of Water	8.339
Liters	Gallons	0.26418
Liters	Cu. Inches	61.025
Liters	Cu. Feet	0.0353
Liters	Cu. Meters	0.001
Liters	Lbs. of Water	2.202
Cu. Inches	Gallons	0.00433
Cu. Inches	Liters	0.01639
Cu. Inches	Cu. Feet	0.00058
Cu. Inches	Cu. Meters	0.000016
Cu. Inches	Lbs. of Water	0.0362
Cu. Feet	Gallons	7.48052
Cu. Feet	Liters	28.316
Cu. Feet	Cu. Inches	1728
Cu. Feet	Cu. Meters	0.0283
Cu. Feet	Lbs. of Water	62.371
Cu. Meters	Gallons	264.17
Cu. Meters	Liters	999.972
Cu. Meters	Cu. Inches	61023.74
Cu. Meters	Cu. Feet	35.3145
Cu. Meters	Lbs. of Water	2202.61
Lbs. of Water	Gallons	0.11992
Lbs. of Water	Liters	0.45419
Lbs. of Water	Cu. Inches	27.643
Lbs. of Water	Cu. Feet	0.01603
Lbs. of Water	Cu. Meters	0.000454
LINEAL MEASURES		
Inches	mm	25.4
Inches	cm	2.54
Inches	Meters	0.0254
Feet	cm	30.48
Feet	Meters	0.3048
mm	Inches	0.03937
mm	Feet	0.00328
cm	Inches	0.3937
cm	Feet	0.03281
Meters	Feet	3.28
AREA		
Sq. Inches	Sq. Feet	0.006944
Sq. Inches	Sq. cm	6.4516
Sq. Feet	Sq. Inches	144
Sq. Feet	Sq. cm	929.03
Sq. Feet	Sq. Meters	0.0929
Sq. cm	Sq. Inches	0.155
Sq. cm	Sq. Feet	0.00108
Sq. cm	Sq. Meters	0.0001
Sq. Meter	Sq. Inches	1550
Sq. Meter	Sq. Feet	10.76

CONVERSIONS of PRESSURE AND HEAD					
To Convert	To	Multiply By	To Convert	To	Multiply By
Lbs. per Sq. In.	Lbs. per Sq. Ft.	144	Ins. of Mercury	Lbs. per Sq. In.	0.491154
Lbs. per Sq. In.	Atmospheres	0.06805	Ins. of Mercury	Lbs. per Sq. Ft.	70.7262
Lbs. per Sq. In.	Ins. of Water	27.728	Ins. of Mercury	Atmospheres	0.033421
Lbs. per Sq. In.	Ft. of Water	2.3106	Ins. of Mercury	Ins. of Water	13.6185
Lbs. per Sq. In.	Ins. of Mercury	2.03602	Ins. of Mercury	Ft. of Water	1.1349
Lbs. per Sq. In.	mm of Mercury	51.715	Ins. of Mercury	mm of Mercury	25.40005
Lbs. per Sq. In.	Bar	0.06895	Ins. of Mercury	Bar	0.033864
Lbs. per Sq. In.	kg per Sq. cm	0.070307	Ins. of Mercury	kg per Sq. cm	0.03453
Lbs. per Sq. In.	kg per Sq. M	703.070	Ins. of Mercury	kg per Sq. M	345.316
Lbs. per Sq. Ft.	Lbs. per Sq. In.	0.0069445	mm of Mercury	Lbs. per Sq. In.	0.019337
Lbs. per Sq. Ft.	Atmospheres	0.000473	mm of Mercury	Lbs. per Sq. Ft.	2.7845
Lbs. per Sq. Ft.	Ins. of Water	0.1926	mm of Mercury	Atmospheres	0.001316
Lbs. per Sq. Ft.	Ft. of Water	0.01605	mm of Mercury	Ins. of Water	0.53616
Lbs. per Sq. Ft.	Ins. of Mercury	0.014139	mm of Mercury	Ft. of Water	0.04468
Lbs. per Sq. Ft.	mm of Mercury	0.35913	mm of Mercury	Ins. of Mercury	0.03937
Lbs. per Sq. Ft.	Bar	0.000479	mm of Mercury	Bar	0.00133
Lbs. per Sq. Ft.	kg per Sq. cm	0.000488	mm of Mercury	kg per Sq. cm	0.00136
Lbs. per Sq. Ft.	kg per Sq. M	4.88241	mm of Mercury	kg per Sq. M	13.59509
Atmospheres	Lbs. per Sq. In.	14.696	kg per Sq. cm	Lbs. per Sq. In.	14.2233
Atmospheres	Lbs. per Sq. Ft.	2116.22	kg per Sq. cm	Lbs. per Sq. Ft.	2048.155
Atmospheres	Ins. of Water	407.484	kg per Sq. cm	Atmospheres	0.96784
Atmospheres	Ft. of Water	33.957	kg per Sq. cm	Ins. of Water	394.38
Atmospheres	Ins. of Mercury	29.921	kg per Sq. cm	Ft. of Water	32.865
Atmospheres	mm of Mercury	760	kg per Sq. cm	Ins. of Mercury	28.959
Atmospheres	Bar	1.01325	kg per Sq. cm	mm of Mercury	735.559
Atmospheres	kg per Sq. cm	1.0332	kg per Sq. cm	Bar	0.98067
Atmospheres	kg per Sq. M	10332.27	kg per Sq. cm	kg per Sq. M	10000
Ins. of Water	Lbs. per Sq. In.	0.03609			
Ins. of Water	Lbs. per Sq. Ft.	5.1972			
Ins. of Water	Atmospheres	0.002454			
Ins. of Water	Ft. of Water	0.08333			
Ins. of Water	Ins. of Mercury	0.07343			
Ins. of Water	mm of Mercury	1.8651			
Ins. of Water	Bar	0.00249			
Ins. of Water	kg per Sq. cm	0.00253			
Ins. of Water	kg per Sq. M	25.375			
Ft. of Water	Lbs. per Sq. In.	0.432781			
Ft. of Water	Lbs. per Sq. Ft.	63.3205			
Ft. of Water	Atmospheres	0.029449			
Ft. of Water	Ins. of Water	12			
Ft. of Water	Ins. of Mercury	0.88115			
Ft. of Water	mm of Mercury	22.3813			
Ft. of Water	Bar	0.029839			
Ft. of Water	kg per Sq. cm	0.03043			
Ft. of Water	kg per Sq. M	304.275			

Note: All weights and measures of water are based on temperature of 60°F.

Note: Temperature of Water and Mercury is 68°F and 32°F respectively.

**TEMPERATURE**

To convert Fahrenheit to Celsius:  $\frac{^{\circ}\text{F} - 32}{1.8}$

To convert Celsius to Fahrenheit:  $(1.8 \times ^{\circ}\text{C}) + 32$

**VELOCITY**

1 Ft. per Sec. = 0.3048 M Per Sec.

1 M per Sec. = 3.2808 Ft. per Sec.

# PIPE DATA TABLES

Pipe Size (in.)	Outside Diameter (in.)	Weight Class	Carbon Steel Sched.	Stainless Steel Sched.	Wall Thickness (in.)	Inside Diameter (in.)	Circum. (Ext.) (in.)	Circum. (Int.) (in.)	Flow Area (sq. in.)	Weight of Pipe (lbs/Ft.)	Weight of Water (lbs/Ft.)	Gallons of Water per Ft.	Section Modulus	Pipe Size (in.)
1/8	.405	—	—	10S	.049	.307	1.27	.96	.074	.19	.032	.004	.00437	1/8
		STD	40	40S	.068	.269		.85	.057	.24	.025	.003	.00523	
		XS	80	80S	.095	.215		.68	.036	.31	.016	.002	.00602	
1/4	.540	—	—	10S	.065	.410	1.70	1.29	.132	.33	.057	.007	.01032	1/4
		STD	40	40S	.088	.364		1.14	.104	.42	.045	.005	.01227	
		XS	80	80S	.119	.302		.95	.072	.54	.031	.004	.01395	
3/8	.675	—	—	10S	.065	.545	2.12	1.71	.233	.42	.101	.012	.01736	3/8
		STD	40	40S	.091	.493		1.55	.191	.57	.083	.010	.0216	
		XS	80	80S	.126	.423		1.33	.141	.74	.061	.007	.0255	
1/2	.840	—	—	5S	.065	.710	2.64	2.23	.396	.54	.172	.021	.0285	1/2
		—	—	10S	.083	.674		2.12	.357	.67	.155	.019	.0341	
		STD	40	40S	.109	.622		1.95	.304	.85	.132	.016	.0407	
		XS	80	80S	.147	.546		1.72	.234	1.09	.102	.012	.0478	
		—	160	—	.187	.466		1.46	.171	1.31	.074	.009	.0527	
3/4	1.050	—	—	5S	.065	.920	3.30	2.89	.665	.69	.288	.035	.0467	3/4
		—	—	10S	.083	.884		2.78	.614	.86	.266	.032	.0566	
		STD	40	40S	.113	.824		2.59	.533	1.13	.231	.028	.0706	
		XS	80	80S	.154	.742		2.33	.433	1.47	.188	.022	.0853	
		—	160	—	.219	.612		1.92	.296	1.94	.128	.015	.1004	
1	1.315	—	—	5S	.065	1.185	4.13	3.72	1.103	.87	.478	.057	.0760	1
		—	—	10S	.109	1.097		3.45	.945	1.40	.409	.049	.1151	
		STD	40	40S	.133	1.049		3.30	.864	1.68	.375	.045	.1328	
		XS	80	80S	.179	.957		3.01	.719	2.17	.312	.037	.1606	
		—	160	—	.250	.815		2.56	.522	2.84	.230	.027	.1903	
1 1/4	1.660	—	—	5S	.065	1.530	5.22	4.81	1.839	1.11	.797	.096	.1250	1 1/4
		—	—	10S	.109	1.442		4.53	1.633	1.81	.708	.085	.1934	
		STD	40	40S	.140	1.380		4.34	1.495	2.27	.649	.078	.2346	
		XS	80	80S	.191	1.278		4.02	1.283	3.00	.555	.067	.2913	
		—	160	—	.250	1.160		3.64	1.057	3.76	.458	.055	.3421	
1 1/2	1.900	—	—	5S	.065	1.770	5.97	5.56	2.461	1.28	1.066	.128	.1662	1 1/2
		—	—	10S	.109	1.682		5.28	2.222	2.09	.963	.115	.2598	
		STD	40	40S	.145	1.610		5.06	2.036	2.72	.882	.106	.3262	
		XS	80	80S	.200	1.500		4.71	1.767	3.63	.765	.092	.4118	
		—	160	—	.281	1.338		4.20	1.406	4.86	.608	.073	.5078	
2	2.375	—	—	5S	.065	2.245	7.46	7.05	3.958	1.61	1.72	.206	.2652	2
		—	—	10S	.109	2.157		6.78	3.654	2.64	1.58	.190	.4204	
		STD	40	40S	.154	2.067		6.49	3.355	3.65	1.45	.174	.5606	
		XS	80	80S	.218	1.939		6.09	2.953	5.02	1.28	.153	.7309	
		—	160	—	.344	1.687		5.30	2.241	7.46	.97	.116	.9790	
2 1/2	2.875	—	—	5S	.083	2.709	9.03	8.51	5.764	2.48	2.50	.299	.4939	2 1/2
		—	—	10S	.120	2.635		8.28	5.453	3.53	2.36	.283	.6868	
		STD	40	40S	.203	2.469		7.76	4.788	5.79	2.07	.249	1.064	
		XS	80	80S	.276	2.323		7.30	4.238	7.66	1.87	.220	1.339	
		—	160	—	.375	2.125		6.68	3.546	10.01	1.54	.184	1.638	
XXS	—	—	.552	1.771	5.56	2.464	13.69	1.07	.128	1.997				

# PIPE DATA TABLES CONT'D.

Pipe Size (in.)	Outside Diameter (in.)	Weight Class	Carbon Steel Sched.	Stainless Steel Sched.	Wall Thickness (in.)	Inside Diameter (in.)	Circum. (Ext.) (in.)	Circum. (Int.) (in.)	Flow Area (sq. in.)	Weight of Pipe (lbs/Ft.)	Weight of Water (lbs/Ft.)	Gallons of Water per Ft.	Section Modulus	Pipe Size (in.)
3	3.500	—	—	5S	.083	3.334	11.00	10.47	8.730	3.03	3.78	.454	.744	3
		—	—	10S	.120	3.260		10.24	8.347	4.33	3.62	.434	1.041	
		STD	40	40S	.216	3.068		9.64	7.393	7.58	3.20	.384	1.724	
		XS	80	80S	.300	2.900		9.11	6.605	10.25	2.86	.343	2.225	
		—	160	—	.438	2.624		8.24	5.408	14.32	2.35	.281	2.876	
		XXS	—	—	.600	2.300		7.23	4.155	18.58	1.80	.216	3.424	
4	4.500	—	—	5S	.083	4.334	14.14	13.62	14.75	3.92	6.39	.766	1.249	4
		—	—	10S	.120	4.260		13.38	14.25	5.61	6.18	.740	1.761	
		STD	40	40S	.237	4.026		12.65	12.73	10.79	5.50	.661	3.214	
		XS	80	80S	.337	3.826		12.02	11.50	14.98	4.98	.597	4.271	
		—	120	—	.438	3.624		11.39	10.31	19.00	4.47	.536	5.178	
		—	160	—	.531	3.438		10.80	9.28	22.51	4.02	.482	5.898	
XXS	—	—	.674	3.152	9.90	7.80	27.54	3.38	.405	6.791				
5	5.563	—	—	5S	.109	5.345	17.48	16.79	22.44	6.36	9.72	1.17	2.498	5
		—	—	10S	.134	5.295		16.63	22.02	7.77	9.54	1.14	3.029	
		STD	40	40S	.258	5.047		15.86	20.01	14.62	8.67	1.04	5.451	
		XS	80	80S	.375	4.813		15.12	18.19	20.78	7.88	.945	7.431	
		—	120	—	.500	4.563		14.34	16.35	27.04	7.09	.849	9.250	
		—	160	—	.625	4.313		13.55	14.61	32.96	6.33	.759	10.796	
XXS	—	—	.750	4.063	12.76	12.97	38.55	5.61	.674	12.090				
6	6.625	—	—	5S	.109	6.407	20.81	20.13	32.24	7.60	13.97	1.68	3.576	6
		—	—	10S	.134	6.357		19.97	31.74	9.29	13.75	1.65	4.346	
		STD	40	40S	.280	6.065		19.05	28.89	18.97	12.51	1.50	8.496	
		XS	80	80S	.432	5.761		18.10	26.07	28.57	11.29	1.35	12.22	
		—	120	—	.562	5.501		17.28	23.77	36.39	10.30	1.24	14.98	
		—	160	—	.719	5.187		16.30	21.15	45.35	9.16	1.10	17.81	
XXS	—	—	.864	4.897	15.38	18.84	53.16	8.16	.978	20.02				
8	8.625	—	—	5S	.109	8.407	27.10	26.41	55.51	9.93	24.06	2.88	6.131	8
		—	—	10S	.148	8.329		26.17	54.48	13.40	23.61	2.83	8.212	
		—	20	—	.250	8.125		25.53	51.85	22.36	22.47	2.69	13.39	
		—	30	—	.277	8.071		25.36	51.16	24.70	22.17	2.66	14.69	
		STD	40	40S	.322	7.981		25.07	50.03	28.55	21.70	2.60	16.81	
		—	60	—	.406	7.813		24.55	47.94	35.64	20.77	2.49	20.58	
		XS	80	80S	.500	7.625		23.95	45.66	43.39	19.78	2.37	24.51	
		—	100	—	.594	7.437		23.36	43.46	50.95	18.83	2.26	28.14	
		—	120	—	.719	7.187		22.58	40.59	60.71	17.59	2.11	32.58	
		—	140	—	.812	7.001		21.99	38.50	67.76	16.68	2.00	35.65	
		XXS	—	—	.875	6.875		21.60	37.12	72.42	16.10	1.93	37.56	
		—	160	—	.906	6.813		21.40	36.46	74.69	15.80	1.89	38.48	
10	10.750	—	—	5S	.134	10.482	33.77	32.93	86.29	15.19	37.39	4.48	11.71	10
		—	—	10S	.165	10.420		32.74	85.28	18.65	36.95	4.43	14.30	
		—	20	—	.250	10.250		32.20	82.52	28.04	35.76	4.29	21.15	
		—	30	—	.307	10.136		31.84	80.69	34.24	34.96	4.19	25.57	
		STD	40	40S	.365	10.020		31.48	78.86	40.48	34.20	4.10	29.90	
		XS	60	80S	.500	9.750		30.63	74.66	54.74	32.35	3.88	39.43	
		—	80	—	.594	9.562		30.04	71.84	64.43	31.13	3.73	45.54	
		—	100	—	.719	9.312		29.25	68.13	77.03	29.53	3.54	53.22	
		—	120	—	.844	9.062		28.47	64.53	89.29	27.96	3.35	60.32	
		XXS	140	—	1.000	8.750		27.49	60.13	104.13	26.06	3.12	68.43	
		—	160	—	1.125	8.500		26.70	56.75	115.64	24.59	2.95	74.29	

# PIPE DATA TABLES CONT'D.

Pipe Size (in.)	Outside Diameter (in.)	Weight Class	Carbon Steel Sched.	Stainless Steel Sched.	Wall Thickness (in.)	Inside Diameter (in.)	Circum. (Ext.) (in.)	Circum. (Int.) (in.)	Flow Area (sq. in.)	Weight of Pipe (lbs/Ft.)	Weight of Water (lbs/Ft.)	Gallons of Water per Ft.	Section Modulus	Pipe Size (in.)		
12	12.750	—	—	5S	.156	12.438	40.06	39.08	121.50	20.98	52.65	6.31	19.2	12		
		—	—	10S	.180	12.390		38.92	120.57	24.17	52.25	6.26	22.0			
		—	20	—	.250	12.250		38.48	117.86	33.38	51.07	6.12	30.2			
		—	30	—	.330	12.090		37.98	114.80	43.77	49.74	5.96	39.0			
		—	STD	—	40S	.375		12.000	37.70	113.10	49.56	49.00	5.88		43.8	
		—	40	—	—	.406		11.938	37.50	111.93	53.52	48.50	5.81		47.1	
		XS	—	80S	.500	11.750		36.91	108.43	65.42	46.92	5.63	56.7			
		—	60	—	—	.562		11.626	36.52	106.16	73.15	46.00	5.51		62.8	
		—	80	—	—	.688		11.374	35.73	101.64	88.63	44.04	5.28		74.6	
		—	100	—	—	.844		11.062	34.75	96.14	107.32	41.66	4.99		88.1	
		XXS	120	—	—	1.000		10.750	33.77	90.76	125.49	39.33	4.71		100.7	
		—	140	—	—	1.125		10.500	32.99	86.59	139.67	37.52	4.50		109.9	
		—	160	—	—	1.312		10.126	31.81	80.53	160.27	34.89	4.18		122.6	
14	14.000	—	—	5S	.156	13.688	43.98	43.00	147.15	23.07	63.77	7.64	23.2	14		
		—	—	10S	.188	13.624		42.80	145.78	27.73	63.17	7.57	27.8			
		—	10	—	.250	13.500		42.41	143.14	36.71	62.03	7.44	36.6			
		—	20	—	.312	13.376		42.02	140.52	45.61	60.89	7.30	45.0			
		—	STD	—	30	—		.375	13.250	41.63	137.88	54.57	59.75		7.16	53.2
		—	40	—	—	.438		13.124	41.23	135.28	63.44	58.64	7.03		61.3	
		XS	—	—	.500	13.000		40.84	132.73	72.09	57.46	6.90	69.1			
		—	60	—	—	.594		12.812	40.25	128.96	85.05	55.86	6.70		80.3	
		—	80	—	—	.750		12.500	39.27	122.72	106.13	53.18	6.37		98.2	
		—	100	—	—	.938		12.124	38.09	115.49	130.85	50.04	6.00		117.8	
		—	120	—	—	1.094		11.812	37.11	109.62	150.79	47.45	5.69		132.8	
		—	140	—	—	1.250		11.500	36.13	103.87	170.28	45.01	5.40		146.8	
		—	160	—	—	1.406		11.188	35.15	98.31	189.11	42.60	5.11		159.6	
16	16.00	—	—	5S	.165	15.670	50.27	49.23	192.85	27.90	83.57	10.02	32.2	16		
		—	—	10S	.188	15.624		49.08	191.72	31.75	83.08	9.96	36.5			
		—	10	—	.250	15.500		48.69	188.69	42.05	81.74	9.80	48.0			
		—	20	—	.312	15.376		48.31	185.69	52.27	80.50	9.65	59.2			
		—	STD	—	30	—		.375	15.250	47.91	182.65	82.58	79.12		9.49	70.3
		XS	40	—	.500	15.000		47.12	176.72	82.77	76.58	9.18	91.5			
		—	60	—	—	.656		14.688	46.14	169.44	107.50	73.42	8.80		116.6	
		—	80	—	—	.844		14.312	44.96	160.92	136.61	69.73	8.36		144.5	
		—	100	—	—	1.031		13.938	43.79	152.58	164.82	66.12	7.93		170.5	
		—	120	—	—	1.219		13.562	42.61	144.50	192.43	62.62	7.50		194.5	
		—	140	—	—	1.438		13.124	41.23	135.28	233.64	58.64	7.03		220.0	
		—	160	—	—	1.594		12.812	40.26	128.96	245.25	55.83	6.70		236.7	
		18	18.00	—	—	5S		.165	17.67	56.55	55.51	245.22	31.43		106.26	12.74
—	—			10S	.188	17.62	55.37	243.95	35.76		105.71	12.67	46.4			
—	10			—	.250	17.50	54.98	240.53	47.39		104.21	12.49	61.1			
—	20			—	.312	17.38	54.59	237.13	58.94		102.77	12.32	75.5			
—	STD			—	—	.375	17.25	54.19	233.71		70.59	101.18	12.14	89.6		
—	30			—	—	.438	17.12	53.80	230.30		82.15	99.84	11.96	103.4		
XS	—			—	.500	17.00	53.41	226.98	93.45		98.27	11.79	117.0			
—	40			—	—	.562	16.88	53.02	223.68		104.87	96.93	11.62	130.1		
—	60			—	—	.750	16.50	51.84	213.83		138.17	92.57	11.11	168.3		
—	80			—	—	.938	16.12	50.66	204.24		170.92	88.50	10.61	203.8		
—	100			—	—	1.156	15.69	49.29	193.30		207.96	83.76	10.04	242.3		
—	120			—	—	1.375	15.25	47.91	182.66		244.14	79.07	9.49	277.6		
—	140			—	—	1.562	14.88	46.73	173.80		274.22	75.32	9.03	305.5		
—	160	—	—	1.781	14.44	45.36	163.72	308.50	70.88	8.50	335.6					

# PIPE DATA TABLES CONT'D.

Pipe Size (in.)	Outside Diameter (in.)	Weight Class	Carbon Steel Sched.	Stainless Steel Sched.	Wall Thickness (in.)	Inside Diameter (in.)	Circum. (Ext.) (in.)	Circum. (Int.) (in.)	Flow Area (sq. in.)	Weight of Pipe (lbs/Ft.)	Weight of Water (lbs/Ft.)	Gallons of Water per Ft.	Section Modulus	Pipe Size (in.)
20	20.00	—	—	5S	.188	19.62	62.83	61.65	302.46	39.78	131.06	15.71	57.4	20
		—	—	10S	.218	19.56		61.46	300.61	46.06	130.27	15.62	66.3	
		—	10	—	.250	19.50		61.26	298.65	52.73	129.42	15.51	75.6	
		—	20	—	.375	19.25		60.48	290.04	78.60	125.67	15.12	111.3	
		STD	30	—	.500	19.00		59.69	283.53	104.13	122.87	14.73	145.7	
		XS	40	—	.594	18.81		59.10	278.00	123.11	120.46	14.44	170.4	
		—	60	—	.812	18.38		57.73	265.21	166.40	114.92	13.78	225.7	
		—	80	—	1.031	17.94		56.35	252.72	208.87	109.51	13.13	277.1	
		—	100	—	1.281	17.44		54.78	238.83	256.10	103.39	12.41	331.5	
		—	120	—	1.500	17.00		53.41	226.98	296.37	98.35	11.79	375.5	
		—	140	—	1.750	16.50		51.84	213.82	341.09	92.66	11.11	421.7	
—	160	—	1.969	16.06	50.46	202.67	379.17	87.74	10.53	458.5				
22	22.00	—	—	5S	.188	21.62	69.12	67.93	367.25	43.80	159.14	19.08	69.7	22
		—	—	10S	.218	21.56		67.75	365.21	50.71	158.26	18.97	80.4	
		—	10	—	.250	21.50		67.54	363.05	58.07	157.32	18.86	91.8	
		STD	20	—	.375	21.25		66.76	354.66	86.61	153.68	18.42	135.4	
		XS	30	—	.500	21.00		65.97	346.36	114.81	150.09	17.99	117.5	
		—	60	—	.875	20.25		63.62	322.06	197.41	139.56	16.73	295.0	
		—	80	—	1.125	19.75		62.05	306.35	250.81	132.76	15.91	366.4	
		—	100	—	1.375	19.25		60.48	291.04	302.88	126.12	15.12	432.6	
		—	120	—	1.625	18.75		58.90	276.12	353.61	119.65	14.34	493.8	
		—	140	—	1.875	18.25		57.33	261.59	403.00	113.36	13.59	550.3	
		—	160	—	2.125	17.75		55.76	247.45	451.06	107.23	12.85	602.4	
24	24.00	—	—	5S	.218	23.56	75.40	74.03	436.10	55	188.98	22.65	96.0	24
		—	10	10S	.250	23.50		73.83	433.74	63	187.95	22.53	109.6	
		STD	20	—	.375	23.25		73.04	424.56	95	183.95	22.05	161.9	
		XS	—	—	.500	23.00		72.26	415.48	125	179.87	21.58	212.5	
		—	30	—	.562	22.88		71.86	411.00	141	178.09	21.35	237.0	
		—	40	—	.688	22.62		71.08	402.07	171	174.23	20.88	285.1	
		—	60	—	.969	22.06		69.31	382.35	238	165.52	19.86	387.7	
		—	80	—	1.219	21.56		67.74	365.22	297	158.26	18.97	472.8	
		—	100	—	1.531	20.94		65.78	344.32	367	149.06	17.89	570.8	
		—	120	—	1.812	20.38		64.01	326.08	430	141.17	16.94	652.1	
		—	140	—	2.062	19.88		62.44	310.28	483	134.45	16.12	718.9	
—	160	—	2.344	19.31	60.67	292.98	542	126.84	15.22	787.9				
30	30.00	—	—	5S	.250	29.50	94.25	92.68	683.49	79	296.18	35.51	172.3	30
		—	10	10S	.312	29.38		92.29	677.71	99	293.70	35.21	213.8	
		STD	—	—	.375	29.25		91.89	671.96	119	291.18	34.91	255.3	
		XS	20	—	.500	29.00		91.11	660.52	158	286.22	34.31	336.1	
		—	30	—	.625	28.75		90.32	649.18	196	281.31	33.72	414.9	

## GLOSSARY OF TERMS

**Celtron Cartridge** - The thermodynamic capsule comprising the operational components of most Nicholson thermodynamic traps.

**Differential Pressure** - The pressure upstream of the steam trap less the pressure after the trap is referred to as differential pressure. When sizing Nicholson traps the capacity charts are based on the differential pressures across the trap.

**HC** - This is a suffix on some Nicholson thermostatic traps indicating a high capacity option. Sometimes called OS.

**ISO** - See Subcooling fill.

**L** - A suffix on some Nicholson thermostatic and thermodynamic traps indicating a low capacity option.

**OS** - See HC

**R** - A suffix on some Nicholson thermostatic traps indicating a reduced capacity option.

**Saturated Temperature** - The temperature at which water boils at a given pressure. Water changes phase into steam along a pressure temperature curve. These pressures and temperatures may be found in the steam tables.

**Skirted Seat (SK)** - This is an option employing a seat that diffuses the condensate discharge reducing the possibility of internal body erosion. This option, available on the N450 and N650, should be specified when the steam service pressure is in the top third of the trap's pressure rating.

**Spiral Wound Gasket** - This class of gasket is utilized throughout our higher pressure traps and the Uniflex union. It is characterized by utilizing a metal winding, often stainless steel, sandwiching a filler, often a graphite material. While relatively expensive, the sealing performance of this class of gasket is generally considered superior to most others.

**Steam Lock Release (SLR)** - This is an orifice from .0225 to .03125 inches dependent on model, added to a steam trap to prevent flash steam locking. This option is recommended when condensate piping must rise over an obstacle before draining to a trap. A typical application would be a coil in a kettle whose outlet must rise over the side before dropping to the steam trap. An alternate usage typically involves thermostatic traps in clean steam or sterilizer applications. The SLR is specified to increase sensitivity and minimize condensate backup.

**Sterilizer Trim** - This option typically employs an alternate seat. Internal geometries are altered in such a fashion that trap sensitivity is increased. The option takes its name from the service often requiring the most sensitive of thermostatic traps. Sterilizer trim is occasionally combined with high capacity and SLR options thus yielding a super sensitive high capacity steam trap.

**Subcool** - often associated with the sensitivity of a thermostatic trap this term indicates a temperature below the saturated steam curve. Thermostatic traps actuate at temperatures below saturated. Standard Nicholson Traps typically actuate in the 8° to 10°F subcool range i.e. they expel condensate 8° to 10°F below saturated steam temperature.

**Subcooling Fill** - An optional bellows utilizing an alternate fill enabling the trap to release condensate at 30° to 40°F below saturated temperature. This option should be specified when reducing the volume of flash steam created by condensate is desired or when pressures exceeding 500 psi are expected. Also referred to as ISO.

**Welded Bellows** - Temperature sensitive, fluid filled bellows opens to let condensate and air out and closes to trap steam in. Welded bellows fail open or fail closed in the event of bellows failure. Welded bellows are available in stainless steel and inconel, depending on model.