Designation: D 1555 – 95 (Reapproved 2000)

Standard Test Method for Calculation of Volume and Weight of Industrial Aromatic Hydrocarbons[1]

This standard is issued under the fixed designation D 1555; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 These tables are for use in calculating the weight and volume of benzene, toluene, mixed xylenes, styrene, ortho-xylene, meta-xylene, para-xylene, cumene, ethylbenzene, 300 to 350°F aromatic hydrocarbons, 350° to 400°F aromatic hydrocarbons and cyclohexane. A method is given for calculating the volume at 60°F from an observed volume at *t*°F. Table 1 lists the density in pounds per gallon at 60°F for high purity chemicals.

1.2 A procedure for the calculation of density in pounds per gallon at 60°F of materials of lower purity is provided.

NOTE 1—The purchaser and the seller should agree on a reasonable policy in regard to rounding of final numbers in all computations. Rounding the final weight or volume to not more than five significant digits is, in most cases, consistent with the experimental reliability of the data.

NOTE 2—An alternative method is Test Method D 4052.

1.3 The following applies to all specified limits in this test method: for purposes of determining conformance with this test method, an observed value or calculated value shall be rounded off "to the nearest unit" in the last right-hand digit used in expressing the specification limit, in accordance with the rounding-off method of Practice E 29.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 941 Test Method for Density and Relative Density (Specific Gravity) of Liquids by Lipkin Bicapillary Pycnometer[2]

D 1217 Test Method for Density and Relative Density (Specific Gravity) of Liquids by Bingham Pycnometer[2]

D 1250 Guide for Petroleum Measurement Tables[2]

D 3505 Test Method for Density or Relative Density of Pure Liquid Chemicals[3]

D 4052 Test Method for Density and Relative Density of Liquids by Digital Density Meter[4]

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications[5]

2.2 *Other Document:*

American Petroleum Institute Research Project 44[6]

TABLE 1 Relative Density and Density Data

Product	Relative Density 60°F/60°F	Density in Air at 60°F lb per U.S. Gallon
Benzene	0.8844	7.365
Cumene	0.8663	7.214
Cyclohexane	0.7834	6.522
Ethylbenzene	0.8718	7.259
m-Xylene	0.8687	7.234
o-Xylene	0.8848	7.367
p-Xylene	0.8657	7.209
Styrene	0.9110	7.586
Toluene	0.8718	7.260

3. Significance and Use

3.1 This test method is suitable for use in calculating weights and volumes of products outlined in Section 1. The information gained from this method can be used for determining quantities of stated aromatic hydrocarbons in tanks, shipping containers, etc.

4. Basic Data

4.1 All calculations are derived from densities furnished by the American Petroleum Institute Research Project 44. The tables are based on data for compounds of the highest purity, but can be used for materials in the range indicated in Table 2.

[1] This method is under the jurisdiction of ASTM Committee D16 on Aromatic Hydrocarbons and Related Chemicals and is the direct responsibility of Subcommittee D16.01 on Benzene, Toluene, Xylenes, Cyclohexane, and Their Derivatives.

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[2] *Annual Book of ASTM Standards*, Vol 05.01.

[3] *Annual Book of ASTM Standards*, Vol 06.04.

[4] *Annual Book of ASTM Standards*, Vol 05.02.

[5] *Annual Book of ASTM Standards*, Vol 14.02.

[6] "Selected Values of Properties of Hydrocarbons and Related Compounds," prepared by American Petroleum Institute Research Project 44 at the Chemical Thermodynamic Center, Department of Chemistry, Agriculture and Mechanical College Station, TX.

TABLE 2 Application Range of Table 3

Commercial Product	
Benzene	95 to 100 %
Toluene	95 to 100 %
Mixed xylene	all proportions
Styrene	95 to 100 %
o-Xylene	95 to 100 %
m-Xylene	95 to 100 %
p-Xylene	94 to 100 %
Cyclohexane	90 to 100 %
300–350°F Aromatic Hydrocarbons	all proportions
350–400°F Aromatic Hydrocarbons	all proportions
Cumene	95 to 100 %
Ethylbenzene	95 to 100 %

4.2 The basic data and conversion factors used are given in the Appendix to the 1963 Annual Report[7] of ASTM Committee D16. Densities listed in Table 1 are given in ASTM Data Series Publications.[8]

5. Tables

5.1 Table 3 contains 12 columns as follows:

[7] *Proceedings*, ASTM, Vol 63, 1963.

[8] "Physical Constants of Hydrocarbons C_1 to C_{10}," *ASTM Data Service Publication DS4A*, ASTM, 1971.

TABLE 3 Volume Corrections

Temperature, °F	Volume Corrections to 60°F[A]										
	Benzene	Toluene	*m*-Xylene and Mixed Xylene	Styrene	*o*-Xylene	*p*-Xylene	Cyclo-hexane[B]	Ethyl-benzene[B]	Cumene[B]	300 to 350°F Aromatic Hydro-carbons	350 to 400°F Aromatic Hydro-carbons
−5	...	1.0383	...	...	...	...	...	...	...	...	...
−4	...	1.0377	...	...	...	...	...	...	...	...	...
−3	...	1.0371	...	...	...	...	...	...	...	...	...
−2	...	1.0365	...	...	...	...	...	...	...	...	...
−1	...	1.0359	...	...	...	...	...	...	...	...	...
0	...	1.0353	...	...	...	...	...	...	...	...	...
1	...	1.0347	...	...	...	...	...	...	...	...	...
2	...	1.0341	...	...	...	...	...	...	...	...	...
3	...	1.0336	...	...	...	...	...	...	...	...	...
4	...	1.0330	...	...	...	...	...	...	...	...	...
5	...	1.0324	1.0293	...	1.0288	...	...	1.0306	1.0297	1.0286	1.0266
6	...	1.0318	1.0287	...	1.0283	...	...	1.0300	1.0292	1.0280	1.0262
7	...	1.0312	1.0282	...	1.0278	...	...	1.0295	1.0287	1.0275	1.0257
8	...	1.0306	1.0277	...	1.0273	...	...	1.0289	1.0281	1.0270	1.0252
9	...	1.0300	1.0272	...	1.0267	...	...	1.0284	1.0276	1.0265	1.0248
10	...	1.0294	1.0266	...	1.0262	...	...	1.0278	1.0270	1.0260	1.0243
11	...	1.0288	1.0261	...	1.0257	...	...	1.0273	1.0265	1.0254	1.0238
12	...	1.0283	1.0256	...	1.0252	...	...	1.0267	1.0260	1.0249	1.0233
13	...	1.0277	1.0251	...	1.0246	...	...	1.0262	1.0254	1.0244	1.0228
14	...	1.0271	1.0245	...	1.0241	...	...	1.0256	1.0249	1.0239	1.0223
15	...	1.0265	1.0240	1.0242	1.0236	...	...	1.0251	1.0244	1.0234	1.0218
16	...	1.0259	1.0235	1.0237	1.0231	...	...	1.0245	1.0238	1.0228	1.0214
17	...	1.0253	1.0230	1.0231	1.0225	...	...	1.0239	1.0233	1.0223	1.0209
18	...	1.0247	1.0224	1.0226	1.0220	...	...	1.0234	1.0228	1.0218	1.0203
19	...	1.0241	1.0219	1.0221	1.0215	...	...	1.0228	1.0222	1.0213	1.0199
20	...	1.0235	1.0214	1.0215	1.0210	...	...	1.0223	1.0217	1.0208	1.0194
21	...	1.0230	1.0208	1.0210	1.0204	...	...	1.0217	1.0211	1.0203	1.0189
22	...	1.0224	1.0203	1.0204	1.0199	...	...	1.0212	1.0206	1.0197	1.0184
23	...	1.0218	1.0198	1.0199	1.0194	...	...	1.0206	1.0201	1.0192	1.0180
24	...	1.0212	1.0193	1.0194	1.0189	...	...	1.0201	1.0195	1.0187	1.0175
25	...	1.0206	1.0187	1.0188	1.0184	...	...	1.0195	1.0190	1.0182	1.0170
26	...	1.0200	1.0182	1.0183	1.0178	...	...	1.0190	1.0184	1.0177	1.0165
27	...	1.0194	1.0177	1.0178	1.0173	...	...	1.0184	1.0179	1.0172	1.0160
28	...	1.0188	1.0171	1.0172	1.0168	...	...	1.0179	1.0174	1.0166	1.0155
29	...	1.0182	1.0166	1.0167	1.0163	...	...	1.0173	1.0168	1.0161	1.0151
30	...	1.0177	1.0161	1.0162	1.0157	...	...	1.0167	1.0163	1.0156	1.0146
31	...	1.0171	1.0155	1.0156	1.0152	...	...	1.0162	1.0157	1.0151	1.0141
32	...	1.0165	1.0150	1.0151	1.0147	...	...	1.0156	1.0152	1.0145	1.0136
33	...	1.0159	1.0145	1.0145	1.0142	...	...	1.0151	1.0147	1.0140	1.0131
34	...	1.0153	1.0139	1.0140	1.0136	...	...	1.0145	1.0141	1.0135	1.0126
35	...	1.0147	1.0134	1.0135	1.0131	...	...	1.0140	1.0136	1.0130	1.0122
36	...	1.0141	1.0129	1.0129	1.0126	...	...	1.0134	1.0130	1.0125	1.0116

TABLE 3 *Continued*

Temperature, °F	Volume Corrections to 60°F[A]										
	Benzene	Toluene	*m*-Xylene and Mixed Xylene	Styrene	*o*-Xylene	*p*-Xylene	Cyclo-hexane[B]	Ethyl-benzene[B]	Cumene[B]	300 to 350°F Aromatic Hydro-carbons	350 to 400°F Aromatic Hydro-carbons
37	...	1.0135	1.0123	1.0124	1.0121	...	...	1.0129	1.0125	1.0120	1.0112
38	...	1.0130	1.0118	1.0119	1.0115	...	...	1.0123	1.0120	1.0114	1.0107
39	...	1.0124	1.0113	1.0113	1.0110	...	...	1.0117	1.0114	1.0109	1.0102
40	1.0130	1.0118	1.0107	1.0108	1.0105	...	1.0132	1.0112	1.0109	1.0104	1.0097
41	1.0124	1.0112	1.0102	1.0102	1.0100	...	1.0126	1.0106	1.0103	1.0099	1.0092
42	1.0117	1.0106	1.0097	1.0097	1.0094	...	1.0119	1.0101	1.0098	1.0094	1.0087
43	1.0111	1.0100	1.0091	1.0092	1.0089	...	1.0112	1.0095	1.0092	1.0088	1.0082
44	1.0104	1.0094	1.0086	1.0086	1.0084	...	1.0106	1.0090	1.0087	1.0083	1.0078
45	1.0098	1.0088	1.0081	1.0081	1.0079	...	1.0099	1.0084	1.0082	1.0078	1.0073
46	1.0091	1.0082	1.0075	1.0075	1.0074	...	1.0093	1.0078	1.0076	1.0073	1.0068
47	1.0085	1.0077	1.0070	1.0070	1.0068	...	1.0085	1.0073	1.0071	1.0068	1.0063
48	1.0078	1.0071	1.0065	1.0065	1.0063	...	1.0079	1.0067	1.0065	1.0063	1.0058
49	1.0072	1.0065	1.0059	1.0059	1.0058	...	1.0073	1.0062	1.0060	1.0057	1.0054
50	1.0065	1.0059	1.0054	1.0054	1.0053	...	1.0066	1.0056	1.0054	1.0052	1.0048
51	1.0059	1.0053	1.0048	1.0049	1.0047	...	1.0060	1.0050	1.0049	1.0047	1.0044
52	1.0052	1.0047	1.0043	1.0043	1.0042	...	1.0053	1.0045	1.0044	1.0042	1.0039
53	1.0046	1.0041	1.0038	1.0038	1.0037	...	1.0046	1.0039	1.0038	1.0037	1.0034
54	1.0039	1.0035	1.0032	1.0032	1.0032	...	1.0040	1.0034	1.0033	1.0032	1.0029
55	1.0033	1.0029	1.0027	1.0027	1.0026	1.0027	1.0033	1.0028	1.0027	1.0026	1.0024
56	1.0026	1.0024	1.0022	1.0022	1.0021	1.0022	1.0027	1.0022	1.0022	1.0021	1.0019
57	1.0020	1.0018	1.0016	1.0016	1.0016	1.0016	1.0020	1.0017	1.0016	1.0016	1.0014
58	1.0013	1.0012	1.0011	1.0011	1.0011	1.0011	1.0013	1.0011	1.0011	1.0012	1.0011
59	1.0007	1.0006	1.0005	1.0005	1.0005	1.0005	1.0007	1.0006	1.0005	1.0006	1.0005
60	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
61	0.9993	0.9994	0.9995	0.9995	0.9995	0.9994	0.9993	0.9994	0.9995	0.9995	0.9995
62	0.9987	0.9988	0.9989	0.9989	0.9989	0.9989	0.9987	0.9989	0.9989	0.9990	0.9990
63	0.9980	0.9982	0.9984	0.9984	0.9984	0.9983	0.9980	0.9983	0.9984	0.9984	0.9986
64	0.9974	0.9976	0.9978	0.9978	0.9979	0.9978	0.9973	0.9978	0.9978	0.9980	0.9980
65	0.9967	0.9971	0.9973	0.9973	0.9974	0.9972	0.9967	0.9972	0.9973	0.9974	0.9976
66	0.9961	0.9965	0.9968	0.9968	0.9968	0.9967	0.9960	0.9966	0.9967	0.9969	0.9971
67	0.9954	0.9959	0.9962	0.9962	0.9963	0.9961	0.9953	0.9961	0.9962	0.9964	0.9966
68	0.9947	0.9953	0.9957	0.9957	0.9958	0.9956	0.9947	0.9955	0.9956	0.9959	0.9961
69	0.9941	0.9947	0.9951	0.9951	0.9953	0.9950	0.9940	0.9949	0.9951	0.9954	0.9956
70	0.9934	0.9941	0.9946	0.9946	0.9947	0.9945	0.9934	0.9944	0.9945	0.9948	0.9951
71	0.9928	0.9935	0.9940	0.9941	0.9942	0.9939	0.9927	0.9938	0.9940	0.9943	0.9946
72	0.9921	0.9929	0.9935	0.9935	0.9937	0.9934	0.9920	0.9933	0.9934	0.9938	0.9941
73	0.9914	0.9923	0.9930	0.9930	0.9932	0.9928	0.9914	0.9927	0.9929	0.9933	0.9936
74	0.9908	0.9918	0.9924	0.9924	0.9926	0.9923	0.9907	0.9921	0.9923	0.9928	0.9932
75	0.9901	0.9912	0.9919	0.9919	0.9921	0.9917	0.9900	0.9916	0.9918	0.9922	0.9927
76	0.9894	0.9905	0.9913	0.9914	0.9916	0.9912	0.9893	0.9910	0.9912	0.9917	0.9922
77	0.9888	0.9900	0.9908	0.9908	0.9911	0.9906	0.9887	0.9904	0.9907	0.9912	0.9917
78	0.9881	0.9894	0.9902	0.9903	0.9905	0.9901	0.9880	0.9899	0.9902	0.9907	0.9912
79	0.9874	0.9888	0.9897	0.9897	0.9900	0.9895	0.9873	0.9893	0.9896	0.9902	0.9907
80	0.9868	0.9882	0.9891	0.9892	0.9895	0.9890	0.9867	0.9887	0.9891	0.9897	0.9902
81	0.9861	0.9876	0.9886	0.9886	0.9889	0.9884	0.9860	0.9882	0.9885	0.9892	0.9898
82	0.9854	0.9870	0.9880	0.9881	0.9884	0.9878	0.9853	0.9876	0.9880	0.9886	0.9893
83	0.9848	0.9865	0.9875	0.9876	0.9879	0.9873	0.9847	0.9870	0.9874	0.9881	0.9888
84	0.9841	0.9859	0.9869	0.9870	0.9874	0.9867	0.9840	0.9865	0.9869	0.9876	0.9883
85	0.9834	0.9853	0.9864	0.9865	0.9868	0.9862	0.9833	0.9859	0.9863	0.9870	0.9878
86	0.9828	0.9847	0.9859	0.9859	0.9863	0.9856	0.9827	0.9853	0.9858	0.9865	0.9873
87	0.9821	0.9841	0.9853	0.9854	0.9858	0.9851	0.9820	0.9848	0.9852	0.9860	0.9868
88	0.9814	0.9835	0.9848	0.9849	0.9852	0.9845	0.9813	0.9842	0.9847	0.9855	0.9863
89	0.9808	0.9829	0.9842	0.9843	0.9847	0.9840	0.9806	0.9836	0.9841	0.9850	0.9858
90	0.9801	0.9823	0.9837	0.9838	0.9842	0.9834	0.9800	0.9831	0.9836	0.9844	0.9853
91	0.9794	0.9818	0.9831	0.9832	0.9837	0.9828	0.9793	0.9825	0.9830	0.9839	0.9848
92	0.9787	0.9812	0.9826	0.9827	0.9831	0.9823	0.9786	0.9819	0.9825	0.9834	0.9844
93	0.9781	0.9806	0.9820	0.9821	0.9826	0.9817	0.9780	0.9814	0.9819	0.9829	0.9839
94	0.9774	0.9800	0.9815	0.9816	0.9821	0.9812	0.9773	0.9808	0.9813	0.9824	0.9834