



Designation: D4311/D4311M – 21

Standard Practice for Determining Asphalt Volume Correction to a Base Temperature¹

This standard is issued under the fixed designation D4311/D4311M; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This practice provides tables of volume correction factors which may be used to convert volumes of asphalt measured at different temperatures to a volume at a standard base temperature. These tables are applicable to all types of asphalts except emulsified asphalts.

1.2 This practice provides tables to convert asphalt volumes to 15 °C [60 °F] from volumes measured at any temperature from –25 to +275 °C [0 to 500 °F].

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

NOTE 1—Correction factors in Table 1 and Table 2 are for use in place of correction factors provided in Guide D1250, which do not address requirements for asphalt specifications.²

1.4 The text of this standard references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

¹ This practice is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.40 on Asphalt Specifications.

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² Factors originally published for Groups 0 and 1 oils in Tables 7, 25, and 55 in D1250 – 52 T. Last previous edition D1250 – 04.

2. Referenced Documents

2.1 ASTM Standards:³

D70/D70M Test Method for Specific Gravity and Density of Semi-Solid Asphalt Binder (Pycnometer Method)

D1250 Guide for the Use of the Joint API and ASTM Adjunct for Temperature and Pressure Volume Correction Factors for Generalized Crude Oils, Refined Products, and Lubricating Oils: API MPMS Chapter 11.1

D3142/D3142M Test Method for Specific Gravity, API Gravity, or Density of Cutback Asphalts by Hydrometer Method

D3289 Test Method for Density of Semi-Solid and Solid Asphalt Materials (Nickel Crucible Method)

3. Significance and Use

3.1 Asphalts change in volume with change in temperature. They are loaded or transferred at widely varying temperatures. Volume correction factors are used to adjust bulk volumes measured at those temperatures to corresponding volumes at a base temperature of 15 °C or [60 °F] for the purposes of custody transfer and accounting operations.

3.2 Correction factors as provided in this practice have proven to be sufficiently accurate for the intended purposes.

3.3 Coefficients of expansion used for development of data in this practice are as follows:

Table	Column A	Column B
1	0.00035	0.00040
2	0.00063	0.00072

4. Procedure

4.1 Volume correction factors are provided for volume adjustments to 15 °C in Table 1 and [60 °F] in Table 2. The tables are entered with asphalt temperature at which bulk volume is measured.

4.2 The tables provide two sets of factors in columns labeled A and B. The selection of the appropriate column, A or B, is defined by table footnotes. The selection is based on

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.



TABLE 1 Volume Reduction to 15 °C

Observed Temperature, °C	Volume Correction ^{A,B} Factor to 15 °C		Observed Temperature, °C	Volume Correction ^{A,B} Factor to 15 °C		Observed Temperature, °C	Volume Correction ^{A,B} Factor to 15 °C	
	A	B		A	B		A	B
-25.0	1.0254	1.0290	0	1.0095	1.0108	25.0	0.9937	0.9929
-24.5	1.0251	1.0287	0.5	1.0092	1.0104	25.5	0.9934	0.9925
-24.0	1.0248	1.0283	1.0	1.0088	1.0101	26.0	0.9931	0.9921
-23.5	1.0244	1.0279	1.5	1.0085	1.0097	26.5	0.9928	0.9918
-23.0	1.0241	1.0276	2.0	1.0082	1.0094	27.0	0.9925	0.9914
-22.5	1.0238	1.0272	2.5	1.0079	1.0090	27.5	0.9922	0.9911
-22.0	1.0235	1.0268	3.0	1.0076	1.0086	28.0	0.9918	0.9907
-21.5	1.0232	1.0265	3.5	1.0073	1.0083	28.5	0.9915	0.9904
-21.0	1.0228	1.0261	4.0	1.0069	1.0079	29.0	0.9912	0.9900
-20.5	1.0225	1.0257	4.5	1.0066	1.0076	29.5	0.9909	0.9897
-20.0	1.0222	1.0254	5.0	1.0063	1.0072	30.0	0.9906	0.9893
-19.5	1.0219	1.0250	5.5	1.0060	1.0068	30.5	0.9903	0.9889
-19.0	1.0216	1.0246	6.0	1.0057	1.0065	31.0	0.9900	0.9886
-18.5	1.0212	1.0243	6.5	1.0054	1.0061	31.5	0.9897	0.9882
-18.0	1.0209	1.0239	7.0	1.0050	1.0057	32.0	0.9893	0.9879
-17.5	1.0206	1.0235	7.5	1.0047	1.0054	32.5	0.9890	0.9875
-17.0	1.0203	1.0232	8.0	1.0044	1.0050	33.0	0.9887	0.9872
-16.5	1.0200	1.0228	8.5	1.0041	1.0047	33.5	0.9884	0.9868
-16.0	1.0196	1.0224	9.0	1.0038	1.0043	34.0	0.9881	0.9865
-15.5	1.0193	1.0221	9.5	1.0035	1.0039	34.5	0.9878	0.9861
-15.0	1.0190	1.0217	10.0	1.0031	1.0036	35.0	0.9875	0.9858
-14.5	1.0187	1.0213	10.5	1.0028	1.0032	35.5	0.9872	0.9854
-14.0	1.0184	1.0210	11.0	1.0025	1.0029	36.0	0.9869	0.9850
-13.5	1.0180	1.0206	11.5	1.0022	1.0025	36.5	0.9865	0.9847
-13.0	1.0177	1.0202	12.0	1.0019	1.0022	37.0	0.9862	0.9843
-12.5	1.0174	1.0199	12.5	1.0016	1.0018	37.5	0.9859	0.9840
-12.0	1.0171	1.0195	13.0	1.0013	1.0014	38.0	0.9856	0.9836
-11.5	1.0168	1.0192	13.5	1.0009	1.0011	38.5	0.9853	0.9833
-11.0	1.0165	1.0188	14.0	1.0006	1.0007	39.0	0.9850	0.9829
-10.5	1.0161	1.0184	14.5	1.0003	1.0004	39.5	0.9847	0.9826
-10.0	1.0158	1.0181	15.0	1.0000	1.0000	40.0	0.9844	0.9822
-9.5	1.0155	1.0177	15.5	0.9997	0.9996	40.5	0.9841	0.9819
-9.0	1.0152	1.0173	16.0	0.9994	0.9993	41.0	0.9837	0.9815
-8.5	1.0149	1.0170	16.5	0.9991	0.9989	41.5	0.9834	0.9812
-8.0	1.0145	1.0166	17.0	0.9987	0.9986	42.0	0.9831	0.9808
-7.5	1.0142	1.0162	17.5	0.9984	0.9982	42.5	0.9828	0.9805
-7.0	1.0139	1.0159	18.0	0.9981	0.9979	43.0	0.9825	0.9801
-6.5	1.0136	1.0155	18.5	0.9978	0.9975	43.5	0.9822	0.9797
-6.0	1.0133	1.0152	19.0	0.9975	0.9971	44.0	0.9819	0.9794
-5.5	1.0130	1.0148	19.5	0.9972	0.9968	44.5	0.9816	0.9790
-5.0	1.0126	1.0144	20.0	0.9969	0.9964	45.0	0.9813	0.9787
-4.5	1.0123	1.0141	20.5	0.9965	0.9961	45.5	0.9809	0.9783
-4.0	1.0120	1.0137	21.0	0.9962	0.9957	46.0	0.9806	0.9780
-3.5	1.0117	1.0133	21.5	0.9959	0.9953	46.5	0.9803	0.9776
-3.0	1.0114	1.0130	22.0	0.9956	0.9950	47.0	0.9800	0.9773
-2.5	1.0111	1.0126	22.5	0.9953	0.9946	47.5	0.9797	0.9769
-2.0	1.0107	1.0122	23.0	0.9950	0.9943	48.0	0.9794	0.9766
-1.5	1.0104	1.0119	23.5	0.9947	0.9939	48.5	0.9791	0.9762
-1.0	1.0101	1.0115	24.0	0.9944	0.9936	49.0	0.9788	0.9759
-0.5	1.0098	1.0112	24.5	0.9940	0.9932	49.5	0.9785	0.9755
50.0	0.9782	0.9752	75.0	0.9628	0.9578	100.0	0.9476	0.9407
50.5	0.9779	0.9748	75.5	0.9625	0.9574	100.5	0.9473	0.9403
51.5	0.9772	0.9741	76.5	0.9619	0.9567	101.5	0.9467	0.9396
52.0	0.9769	0.9738	77.0	0.9616	0.9564	102.0	0.9464	0.9393
51.0	0.9775	0.9745	76.0	0.9622	0.9571	101.0	0.9470	0.9400
52.5	0.9766	0.9734	77.5	0.9613	0.9561	102.5	0.9461	0.9390
53.5	0.9760	0.9727	78.5	0.9606	0.9554	103.5	0.9455	0.9383
54.0	0.9757	0.9724	79.0	0.9603	0.9550	104.0	0.9452	0.9379
54.5	0.9754	0.9720	79.5	0.9600	0.9547	104.5	0.9449	0.9376
53.0	0.9763	0.9731	78.0	0.9609	0.9557	103.0	0.9458	0.9386
55.0	0.9751	0.9717	80.0	0.9597	0.9543	105.0	0.9446	0.9373