

Addendum to Chapter 11.1— Volume Correction Factors

Volume III

**TABLE 6C—Volume Correction Factors for
Individual and Special Applications,
Volume Correction for MTBE to 60°F**

Volume IX

**TABLE 54C—Volume Correction Factors for
Individual and Special Applications,
Volume Correction for MTBE to 15°C**

ADDENDUM TO API CHAPTER 11.1,
VOLUME III AND VOLUME IX
AUGUST 1980 (REAFFIRMED, OCTOBER 1993)
JANUARY 1995

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Addendum to Chapter 11.1— Volume Correction Factors

Volume III

**TABLE 6C—Volume Correction Factors for
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**TABLE 54C—Volume Correction Factors for
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Volume Correction for MTBE to 15°C**

Measurement Coordination

**ADDENDUM TO API CHAPTER 11.1,
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FOREWORD

The Chapter 11.1, "Volume Correction Factors," tables are jointly developed and published by the American Petroleum Institute (API), the American Society for Testing and Materials (ASTM), and the Institute of Petroleum (IP) as *API Manual of Petroleum Measurement Standards* (MPMS) Chapter 11.1 (API Standard 2540), ASTM D1250, and IP 200, respectively. This standard is also designated as an American National Standard (American National Standard Institute) under the designation of ANSI/ASTM D1250, and has been adopted by the International Standards Organization as ISO/91-1:1992.

With the 1990 amendments to the Clean Air Act and the resulting regulations requiring greater use of reformulated gasolines, there has been an increasing demand for methyl *tert*-butyl ether (MTBE) as a blending agent for those gasolines. The accurate transfer of MTBE requires that the volume being transferred be temperature compensated back to customary reference conditions. Within the United States those conditions are 60°F and the maximum of saturation pressure or atmospheric pressure. Most other countries have reference conditions of 15°C and the maximum of saturation pressure or atmospheric pressure.

This addendum has been approved through the API and IP standardization process, and has been submitted to ASTM Committee D02 on Petroleum Products and Lubricants, and ISO/TC 28, Petroleum Products and Lubricants, Subcommittee 3, Static Petroleum Measurement, for concurrent review as a draft addendum to D1250 and ISO/91-1:1992.

Due to the high priority API member companies have assigned to these revised volume correction factor tables for MTBE, this addendum is being published as approved through the API and IP standardization process while awaiting completion of the ASTM and ISO review procedures. At the conclusion of the ASTM and ISO review, this document will be published as an addendum to D1250 and ISO 91-1.

The API Committee on Static Petroleum Measurement currently has a project underway to address volume correction of MTBE gasoline blends and commercial grades of MTBE and other oxygenates. The results of this study will be available from the Measurement Coordinator upon completion of the project.

API publications may be used by anyone desiring to do so. Every effort has been made by the Institute to assure the accuracy and reliability of the data contained in them; however, the Institute makes no representation, warranty, or guarantee in connection with this publication and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use or for the violation of any federal, state, or municipal regulation with which this publication may conflict.

Suggested revisions are invited and should be submitted to the Measurement Coordinator, Exploration and Production Department, American Petroleum Institute, 1220 L Street, N.W., Washington, D.C. 20005.

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Addendum to Chapter 11.1—Volume Correction Factors

Volume III (Table 6C), Individual and Specialized Applications, Volume Correction for MTBE to 60°F Volume IX (Table 54C), Individual and Specialized Applications, Volume Correction for MTBE to 15°C

1 Scope

1.1 INTRODUCTION

With the recent emphasis on reformulated gasolines, there is an increasing demand to use methyl *tert*-butyl ether (MTBE) as a blending agent for reformulated gasolines. The accurate transfer of MTBE requires that the volume being transferred be temperature compensated back to customary reference conditions. Within the United States, those conditions are 60°F and the maximum of saturation pressure or atmospheric pressure. Most other countries have reference conditions of 15°C and the maximum of saturation pressure or atmospheric pressure.

1.2 PURPOSE

The purpose of this addendum is to provide the users of the API *Manual of Petroleum Measurement Standards* Chapter 11.1, "Volume Correction Factors," Volume III (Table 6C) and Volume IX (Table 54C), "Individual and Specialized Applications," with revised volume correction factor tables for methyl *tert*-butyl ether (MTBE). These tables are used for calculating the volume of mixtures composed predominantly of MTBE at standard conditions from volumes at other conditions. These tables apply to commercially available mixtures containing at least 85 weight percent MTBE.

1.3 SAFETY CONSIDERATIONS

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

2 Referenced Publications

The most recent editions of the following standards are cited in this addendum:

API

Manual of Petroleum Measurement Standards

Chapter 11.1, "Volume Correction Factors"

Volume III, Table 6C, "Individual and Special

Applications, Volume Correction to 60°F
Against Thermal Expansion Coefficients at
60°F"

Volume IX, Table 54C, "Individual and Special
Applications, Volume Correction to 15°C
Against Thermal Expansion Coefficients at
15°C"

ASTM¹

D1250 *Petroleum Measurement Tables*

Volume III, Table 6C, "Volume Correction Fac-
tors for Individual and Special Applications,
Volume Correction to 60°F Against Thermal
Expansion Coefficients at 60°F"

Volume IX, Table 54C, "Volume Correction
Factors for Individual and Special Applications,
Volume Correction to 15°C Against Thermal
Expansion Coefficients at 15°C"

IP²

200 *Petroleum Measurement Tables*

Volume III, Table 6C, "Individual and Special
Applications, Volume Correction to 60°F
Against Thermal Expansion Coefficients at
60°F"

Volume IX, Table 54C, "Individual and Special
Applications, Volume Correction to 15°C
Against Thermal Expansion Coefficients at
15°C"

ISO³

91/1 *Petroleum Measurement Tables*

"Part 1: Tables Based on Reference Tempera-
tures of 15°C and 60°F"

Section 5 contains a list of references for MTBE density.

¹American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103-1187

²Institute of Petroleum, 61 New Cavendish Street, London W1M8AR, United Kingdom

³International Organization for Standardization, ISO publications are available from ANSI (American National Standards Institute, 11 West 42nd Street, New York, New York 10036).

3 Significance and Use

3.1 GENERAL

These tables are suitable for use in calculating volumes of MTBE mixtures as outlined in 1.2. The information gained from this method can be used to determine quantities of MTBE in tanks, shipping containers, and other storage containers typically used in the petroleum industry.

3.2 RECOMMENDED USE OF VOLUME CORRECTION FACTORS FOR MTBE

It is recommended for pure MTBE that either Volume III, Table 6C—with a mean coefficient of thermal expansion, α_{60} , of $789.0 \times 10^{-6} \text{ }^{\circ}\text{F}^{-1}$ —or Volume IX, Table 54C—with a mean coefficient of thermal expansion, α_{15} , of $1420.2 \times 10^{-6} \text{ }^{\circ}\text{C}^{-1}$ —be used from API Chapter 11.1 of the *Manual of Petroleum Measurement Standards*. The use of these tables for commercial grades of MTBE is expected to introduce an additional uncertainty of less than 0.1 percent. The attached Tables 6C and 54C are an abridged version of the results available from the computer subroutines for Tables 6C and 54C. Interpolation of the printed tables will provide answers that differ no more than 1 in the last significant figure from the computer subroutines.

4 Basic Data

4.1 USE OF DATA OBTAINED

Density data obtained from the open literature for pure methyl *tert*-butyl ether (MTBE) were used for comparison against several tables proposed for correcting MTBE volumes. The data of Jangkamolkachai, et. al [1] were fit using a 60°F density of 745.3 kg/m³ (261.23 lb/bbl). This gave an overall fit over the range of 0°C to 60°C (32°F to 140°F) of ± 0.1 percent. An equivalent fit of the data was obtained using a 15°C density of 745.9 kg/m³ and a mean coefficient of thermal expansion of $1420.2 \times 10^{-6} \text{ }^{\circ}\text{C}^{-1}$. This data was compared to API Tables 6A, 6B, and a special fit of Table 6C. The best fit of the data was obtained using Table 6C. An equivalent fit was obtained using Table 54C.

4.2 COMPARISON TO PREVIOUS DATA

A review of the density data available for MTBE indicated that there were only two sources of experimental data for MTBE at temperatures other than 20°C or 25°C, Jangkamolkachai, et. al [1] and Obama, et. al [2]. Only 20°C or 25°C data were reported by Aim and Ciprian [3], Fen-

wick, et. al [4], Timmermans [5], and the Thermodynamics Research Center [6]. Although the *API Monograph Series* [7] reports data at other temperatures, it was found that the reported data was generated by fitting a correlation to the selected 20°C density. Obama, et. al [2] reported a coefficient of thermal expansion for MTBE at 25°C of $1.423 \times 10^{-3} \text{ }^{\circ}\text{C}^{-1}$ ($791 \times 10^{-6} \text{ }^{\circ}\text{F}^{-1}$) for data in the range of 15°C to 35°C (59°F to 95°F). The data of Obama, et. al [2] and Jangkamolkachai, et. al [1] were fit to the following equations:

$$VCF = \frac{\rho}{\rho_{60}} = \exp(-\alpha_{60}\Delta t(1 + 0.8\alpha_{60}\Delta t)) \quad (1)$$

and

$$VCF = \frac{\rho}{\rho_{15}} = \exp(-\alpha_{15}\Delta t(1 + 0.8\alpha_{15}\Delta t)) \quad (2)$$

Equation 1 was fit to the experimental data according to the procedures outlined in Chapter 11.1, Volume III, with both α_{60} and ρ_{60} as adjustable parameters.

Equation 2 was fit according to the procedures outlined in Chapter 11.1, Volume IX, with both α_{15} and ρ_{15} as adjustable parameters.

5 References for MTBE Density

1. A. Jangkamolkachai, G. C. Allred, and W. R. Parrish, "Densities and Excess Molar Volumes of Methyl *tert*-Butyl Ether with Hydrocarbons from 255.4 to 333.2 K," *Journal of Chemical Engineering Data*, 1991, pp. 481–484.
2. M. Obama, Y. Oodera, N. Kohama, T. Yanase, Y. Saito, and K. Kusano, "Densities, Molar Volumes, and Cubic Expansion Coefficients of 78 Aliphatic Ethers," *Journal of Chemical Engineering Data*, 1985, pp. 1–5.
3. K. Aim and M. Ciprian, "Vapor Pressures, Refractive Index at 20°C and Vapor-Liquid Equilibria at 101.325 kPa in the Methyl *tert*-Butyl Ether—Methanol System," *Journal of Chemical Engineering Data*, 1989, pp. 100–103.
4. J. O. Fenwick, D. Harrop, and A. J. Head, "Thermodynamic Properties of Organic Oxygen Compounds 41. Enthalpies of Formation of Eight Ethers," *Journal of Chemical Thermodynamics* 7, 1975, p. 943.
5. J. Timmermans, *Physicochemical Constants of Pure Organic Substances*, 2nd edition, Elsevier, New, York, 1965.
6. "Selected Values of Properties of Chemical Compounds," Thermodynamics Research Center, Data Project, Texas A&M University, College Station, Texas, extant 1980.
7. *API Monograph Series "tert-Butyl Methyl Ether,"* API Publication 723, University Microfilms International, Ann Arbor, MI, 1984.

Table 6C—Volume Correction Factors for MTBE

Factors for Correction of Volume to 60°F

Temp (°F)	VCF	Temp (°F)	VCF	Temp (°F)	VCF	Temp (°F)	VCF	Temp (°F)	VCF
0.0	1.0466	25.0	1.0274	50.0	1.0079	75.0	0.98812	100.0	0.96816
0.5	1.0462	25.5	1.0270	50.5	1.0075	75.5	0.98773	100.5	0.96776
1.0	1.0458	26.0	1.0266	51.0	1.0071	76.0	0.98733	101.0	0.96736
1.5	1.0455	26.5	1.0262	51.5	1.0067	76.5	0.98693	101.5	0.96696
2.0	1.0451	27.0	1.0258	52.0	1.0063	77.0	0.98653	102.0	0.96656
2.5	1.0447	27.5	1.0254	52.5	1.0059	77.5	0.98614	102.5	0.96615
3.0	1.0443	28.0	1.0250	53.0	1.0055	78.0	0.98574	103.0	0.96575
3.5	1.0439	28.5	1.0247	53.5	1.0051	78.5	0.98534	103.5	0.96535
4.0	1.0435	29.0	1.0243	54.0	1.0047	79.0	0.98494	104.0	0.96495
4.5	1.0432	29.5	1.0239	54.5	1.0043	79.5	0.98455	104.5	0.96455
5.0	1.0428	30.0	1.0235	55.0	1.0039	80.0	0.98415	105.0	0.96415
5.5	1.0424	30.5	1.0231	55.5	1.0035	80.5	0.98375	105.5	0.96374
6.0	1.0420	31.0	1.0227	56.0	1.0032	81.0	0.98335	106.0	0.96334
6.5	1.0416	31.5	1.0223	56.5	1.0028	81.5	0.98295	106.5	0.96294
7.0	1.0412	32.0	1.0219	57.0	1.0024	82.0	0.98255	107.0	0.96254
7.5	1.0409	32.5	1.0215	57.5	1.0020	82.5	0.98216	107.5	0.96213
8.0	1.0405	33.0	1.0212	58.0	1.0016	83.0	0.98176	108.0	0.96173
8.5	1.0401	33.5	1.0208	58.5	1.0012	83.5	0.98136	108.5	0.96133
9.0	1.0397	34.0	1.0204	59.0	1.0008	84.0	0.98096	109.0	0.96093
9.5	1.0393	34.5	1.0200	59.5	1.0004	84.5	0.98056	109.5	0.96052
10.0	1.0389	35.0	1.0196	60.0	1.0000	85.0	0.98016	110.0	0.96012
10.5	1.0386	35.5	1.0192	60.5	0.99961	85.5	0.97976	110.5	0.95972
11.0	1.0382	36.0	1.0188	61.0	0.99921	86.0	0.97937	111.0	0.95932
11.5	1.0378	36.5	1.0184	61.5	0.99882	86.5	0.97897	111.5	0.95891
12.0	1.0374	37.0	1.0180	62.0	0.99842	87.0	0.97857	112.0	0.95851
12.5	1.0370	37.5	1.0177	62.5	0.99803	87.5	0.97817	112.5	0.95811
13.0	1.0366	38.0	1.0173	63.0	0.99763	88.0	0.97777	113.0	0.95770
13.5	1.0363	38.5	1.0169	63.5	0.99724	88.5	0.97737	113.5	0.95730
14.0	1.0359	39.0	1.0165	64.0	0.99684	89.0	0.97697	114.0	0.95690
14.5	1.0355	39.5	1.0161	64.5	0.99645	89.5	0.97657	114.5	0.95649
15.0	1.0351	40.0	1.0157	65.0	0.99605	90.0	0.97617	115.0	0.95609
15.5	1.0347	40.5	1.0153	65.5	0.99565	90.5	0.97577	115.5	0.95569
16.0	1.0343	41.0	1.0149	66.0	0.99526	91.0	0.97537	116.0	0.95528
16.5	1.0339	41.5	1.0145	66.5	0.99486	91.5	0.97497	116.5	0.95488
17.0	1.0336	42.0	1.0141	67.0	0.99447	92.0	0.97457	117.0	0.95448
17.5	1.0332	42.5	1.0137	67.5	0.99407	92.5	0.97417	117.5	0.95407
18.0	1.0328	43.0	1.0134	68.0	0.99368	93.0	0.97377	118.0	0.95367
18.5	1.0324	43.5	1.0130	68.5	0.99328	93.5	0.97337	118.5	0.95327
19.0	1.0320	44.0	1.0126	69.0	0.99288	94.0	0.97297	119.0	0.95286
19.5	1.0316	44.5	1.0122	69.5	0.99249	94.5	0.97257	119.5	0.95246
20.0	1.0312	45.0	1.0118	70.0	0.99209	95.0	0.97217	120.0	0.95205
20.5	1.0309	45.5	1.0114	70.5	0.99170	95.5	0.97177	120.5	0.95165
21.0	1.0305	46.0	1.0110	71.0	0.99130	96.0	0.97137	121.0	0.95125
21.5	1.0301	46.5	1.0106	71.5	0.99090	96.5	0.97097	121.5	0.95084
22.0	1.0297	47.0	1.0102	72.0	0.99051	97.0	0.97057	122.0	0.95044
22.5	1.0293	47.5	1.0098	72.5	0.99011	97.5	0.97017	122.5	0.95003
23.0	1.0289	48.0	1.0094	73.0	0.98971	98.0	0.96977	123.0	0.94963
23.5	1.0285	48.5	1.0090	73.5	0.98932	98.5	0.96936	123.5	0.94922
24.0	1.0281	49.0	1.0087	74.0	0.98892	99.0	0.96896	124.0	0.94882
24.5	1.0278	49.5	1.0083	74.5	0.98852	99.5	0.96856	124.5	0.94842
25.0	1.0274	50.0	1.0079	75.0	0.98812	100.0	0.96816	125.0	0.94801

Note: This table is generated using $\alpha_{60} = 789.0 \times 10^{-6} \text{ }^{\circ}\text{F}^{-1}$ 

Table 54C—Volume Correction Factors for MTBE

Factors for Correction of Volume to 15°C

Temp (°C)	VCF	Temp (°C)	VCF	Temp (°C)	VCF	Temp (°C)	VCF	Temp (°C)	VCF
-20.00	1.0489	-6.00	1.0295	8.00	1.0099	22.00	0.99003	36.00	0.96993
-19.75	1.0485	-5.75	1.0292	8.25	1.0096	22.25	0.98967	36.25	0.96956
-19.50	1.0482	-5.50	1.0288	8.50	1.0092	22.50	0.98932	36.50	0.96920
-19.25	1.0479	-5.25	1.0285	8.75	1.0089	22.75	0.98896	36.75	0.96884
-19.00	1.0475	-5.00	1.0281	9.00	1.0085	23.00	0.98860	37.00	0.96848
-18.75	1.0472	-4.75	1.0278	9.25	1.0081	23.25	0.98824	37.25	0.96812
-18.50	1.0468	-4.50	1.0275	9.50	1.0078	23.50	0.98789	37.50	0.96776
-18.25	1.0465	-4.25	1.0271	9.75	1.0074	23.75	0.98753	37.75	0.96740
-18.00	1.0461	-4.00	1.0268	10.00	1.0071	24.00	0.98717	38.00	0.96704
-17.75	1.0458	-3.75	1.0264	10.25	1.0067	24.25	0.98681	38.25	0.96668
-17.50	1.0455	-3.50	1.0261	10.50	1.0064	24.50	0.98646	38.50	0.96631
-17.25	1.0451	-3.25	1.0257	10.75	1.0060	24.75	0.98610	38.75	0.96595
-17.00	1.0448	-3.00	1.0254	11.00	1.0057	25.00	0.98574	39.00	0.96559
-16.75	1.0444	-2.75	1.0250	11.25	1.0053	25.25	0.98538	39.25	0.96523
-16.50	1.0441	-2.50	1.0247	11.50	1.0050	25.50	0.98502	39.50	0.96487
-16.25	1.0437	-2.25	1.0243	11.75	1.0046	25.75	0.98467	39.75	0.96451
-16.00	1.0434	-2.00	1.0240	12.00	1.0043	26.00	0.98431	40.00	0.96415
-15.75	1.0430	-1.75	1.0236	12.25	1.0039	26.25	0.98395	40.25	0.96378
-15.50	1.0427	-1.50	1.0233	12.50	1.0035	26.50	0.98359	40.50	0.96342
-15.25	1.0424	-1.25	1.0229	12.75	1.0032	26.75	0.98323	40.75	0.96306
-15.00	1.0420	-1.00	1.0226	13.00	1.0028	27.00	0.98287	41.00	0.96270
-14.75	1.0417	-0.75	1.0222	13.25	1.0025	27.25	0.98252	41.25	0.96234
-14.50	1.0413	-0.50	1.0219	13.50	1.0021	27.50	0.98216	41.50	0.96197
-14.25	1.0410	-0.25	1.0215	13.75	1.0018	27.75	0.98180	41.75	0.96161
-14.00	1.0406	0.00	1.0212	14.00	1.0014	28.00	0.98144	42.00	0.96125
-13.75	1.0403	0.25	1.0208	14.25	1.0011	28.25	0.98108	42.25	0.96089
-13.50	1.0399	0.50	1.0205	14.50	1.0007	28.50	0.98072	42.50	0.96052
-13.25	1.0396	0.75	1.0201	14.75	1.0004	28.75	0.98036	42.75	0.96016
-13.00	1.0393	1.00	1.0198	15.00	1.0000	29.00	0.98000	43.00	0.95980
-12.75	1.0389	1.25	1.0194	15.25	0.99964	29.25	0.97964	43.25	0.95944
-12.50	1.0386	1.50	1.0191	15.50	0.99929	29.50	0.97929	43.50	0.95907
-12.25	1.0382	1.75	1.0187	15.75	0.99893	29.75	0.97893	43.75	0.95871
-12.00	1.0379	2.00	1.0184	16.00	0.99858	30.00	0.97857	44.00	0.95835
-11.75	1.0375	2.25	1.0180	16.25	0.99822	30.25	0.97821	44.25	0.95799
-11.50	1.0372	2.50	1.0177	16.50	0.99787	30.50	0.97785	44.50	0.95762
-11.25	1.0368	2.75	1.0173	16.75	0.99751	30.75	0.97749	44.75	0.95726
-11.00	1.0365	3.00	1.0170	17.00	0.99716	31.00	0.97713	45.00	0.95690
-10.75	1.0361	3.25	1.0166	17.25	0.99680	31.25	0.97677	45.25	0.95654
-10.50	1.0358	3.50	1.0162	17.50	0.99645	31.50	0.97641	45.50	0.95617
-10.25	1.0354	3.75	1.0159	17.75	0.99609	31.75	0.97605	45.75	0.95581
-10.00	1.0351	4.00	1.0155	18.00	0.99573	32.00	0.97569	46.00	0.95545
-9.75	1.0348	4.25	1.0152	18.25	0.99538	32.25	0.97533	46.25	0.95508
-9.50	1.0344	4.50	1.0148	18.50	0.99502	32.50	0.97497	46.50	0.95472
-9.25	1.0341	4.75	1.0145	18.75	0.99467	32.75	0.97461	46.75	0.95436
-9.00	1.0337	5.00	1.0141	19.00	0.99431	33.00	0.97425	47.00	0.95399
-8.75	1.0334	5.25	1.0138	19.25	0.99395	33.25	0.97389	47.25	0.95363
-8.50	1.0330	5.50	1.0134	19.50	0.99360	33.50	0.97353	47.50	0.95327
-8.25	1.0327	5.75	1.0131	19.75	0.99324	33.75	0.97317	47.75	0.95290
-8.00	1.0323	6.00	1.0127	20.00	0.99288	34.00	0.97281	48.00	0.95254
-7.75	1.0320	6.25	1.0124	20.25	0.99253	34.25	0.97245	48.25	0.95218
-7.50	1.0316	6.50	1.0120	20.50	0.99217	34.50	0.97209	48.50	0.95181
-7.25	1.0313	6.75	1.0117	20.75	0.99181	34.75	0.97173	48.75	0.95145
-7.00	1.0309	7.00	1.0113	21.00	0.99146	35.00	0.97137	49.00	0.95108
-6.75	1.0306	7.25	1.0110	21.25	0.99110	35.25	0.97101	49.25	0.95072
-6.50	1.0302	7.50	1.0106	21.50	0.99074	35.50	0.97065	49.50	0.95036
-6.25	1.0299	7.75	1.0103	21.75	0.99039	35.75	0.97029	49.75	0.94999
-6.00	1.0295	8.00	1.0099	22.00	0.99003	36.00	0.96993	50.00	0.94963

Note: This table is generated using $\alpha_{15} = 1420.2 \times 10^{-6} \text{ } ^\circ\text{C}^{-1}$

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Manual of Petroleum Measurement Standards Chapter 11.1—Volume Correction Factors

Volume III

TABLE 6C—Volume Correction Factors for Individual and Special Applications Volume Correction to 60°F Against Thermal Expansion Coefficients at 60°F

API STANDARD 2540
FIRST EDITION, AUGUST 1980

	American Petroleum Institute	API Std 2540
	Institute of Petroleum	IP 200
	American Society for Testing & Materials	ASTM D1250
	American National Standards Institute	ANSI/ASTM D1250

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Manual of Petroleum Measurement Standards Chapter 11.1—Volume Correction Factors

Volume III

TABLE 6C—Volume Correction Factors for Individual and Special Applications Volume Correction to 60°F Against Thermal Expansion Coefficients at 60°F

Measurement Coordination/Industry Affairs

API STANDARD 2540
FIRST EDITION, AUGUST 1980

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The tables included in this volume and the subroutines from which they were generated are voluntary standards and were developed under the auspices of the joint API/ASTM Committee on Static Petroleum Measurement in part from data generated by a project funded by the American Petroleum Institute at the U.S. National Bureau of Standards, Gaithersburg, Maryland.

Inquiries concerning application of the tables or the computer subroutines should be addressed to:

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Manual of Petroleum Measurement Standards

Chapter 11—Physical Properties Data Section 1—Volume Correction Factors

Volume III

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Note to User: TABLE 6C is internally numbered beginning with page 1. The actual table begins after the page noted in the contents.

FOREWORD

The Objectives

The complete collection of the jointly issued API/ASTM-IP tables of which this volume is a part is the result of close cooperation between the American Petroleum Institute (API), the Institute of Petroleum (London) (IP), and the American Society for Testing and Materials (ASTM). The overall objective of this effort was to meet the worldwide need for a uniform and authoritative publication, based on the most accurate information available. This publication serves as a basis for standardized calculations of measured quantities of petroleum fluids regardless of point of origin, destination, or units of measure used by custom or statute. To meet the objective of worldwide standardized measurement practices, the American National Standards Institute (ANSI) and the British Standards Institute (BSI) have also been closely involved nationally, resulting in the acceptance of the revised tables as an American National Standard and as a British Standard. In addition, in their respective capacities as Secretariat of the International Organization for Standardization TC/28 and of TC/28 SC3, ANSI and BSI have been instrumental in progressing the revised tables towards their adoption as an international standard by the International Organization for Standardization.

Historical Notes

The present collection supersedes all previous editions of the petroleum measurement Tables ANSI/ASTM D1250, IP200, and API Standard 2540. Action is being taken in ISO/TC 28 for the corresponding tables listed in ISO R91 and the tables in the addendum to R91 to be superseded by the present revised collection.

In view of the progress of metrication in countries formerly using the British system of weights and measures, demand for the revision of the British edition does not justify the considerable work involved. The present edition will therefore be withdrawn on the same date as the corresponding metric and American editions are published and will not be replaced.

For the metric edition the new standard covers products with densities in the range 610.0 to 1076.0 kg/m³. The tables for densities below this range, covering liquefied petroleum gases, have not been revised.

The original tables, which were developed in the late 1940s, were based on the 1916 data of Bearce and Peffer (1916) and represent thirty years of evolution. The history of this evolution is summarized by Hall et al. (1975).

Present Development

Downer and Inkley (1972) demonstrated that the original tables were not satisfactory representations of many petroleum fluids of current importance. In 1974 the American Petroleum Institute (API) and the United States National Bureau of Standards (NBS) initiated a research program funded by the API which intended to provide the solid scientific base for the development of more accurate, consequently more equitable, measurement tables. The result of this program was precise density data on 349 different fluids representing a wide variety of refined products and 66.8 percent of the world crude production in 1974. The completion of this five-year, \$500,000 project in March 1979 opened the way for modernizing the tables. Using the NBS density data and taking advantage of publications of outstanding technical authorities, a Joint API-ASTM Physical Properties Working

Group produced this present collection of the Petroleum Measurement Tables. The development and results of the work are described by Hankinson et al. (1979).

Conceptual Departure

A major conceptual departure from previous versions is inherent in the recognition of the present and future position of computers in the petroleum industry. The actual Standard represented by this volume and the companion volumes is neither the hardcopy printed tables nor the set of equations used to represent the density data but is an explicit implementation procedure used to develop computer subroutines. The standardization of an implementation procedure implies the standardization of the set of mathematical expressions, including calculational sequence and round-off procedures, used within the computer code. Absolute adherence to the outlined procedures will ensure that all computers and computer codes of the future, meeting the stated specifications and restrictions, will be able to produce identical results. Hence, the published implementation procedures are the primary Standard, the distributed subroutines are the secondary standard, and the published tables are produced for convenience.

Acknowledgments

The task of completing this project could not have been accomplished without many substantial contributions by a considerable number of individuals and companies. It is impossible to single out any specific individuals for special mention. However, included in the introductory material are lists of the officers of the API's Committee on Petroleum Measurement (COPM), the officers of the Joint API/ASTM Committee on Static Petroleum Measurement (COSM), the major contributors from the Institute of Petroleum, and the members of the COSM Physical Properties Working Group.

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- Bearce, H. W., and E. L. Peffer, "Technology Papers of National Bureau of Standards—Density and Thermal Expansion of American Petroleum Oils," GPO, pp. 125-154, Washington, DC, 1916.
 Downer, L., and F. A. Inkley, *Oil and Gas Journal*, Vol. 70, No. 25, p. 52-55, June 19, 1972.
 Hall, A. H., J. A. Simpson, and J. R. Whetstone, "Investigation of Densities and Thermal Expansion Coefficients Applicable to Petroleum Measurement," SP 7, World Petroleum Congress, Tokyo, 1975.
 Hankinson, R. W., R. G. Segers, T. Krolikowski Buck, and F. P. Gielzecki, *Oil and Gas Journal*, Vol. 77, No. 52, p. 66-70, December 24, 1979.

PREFACE

The Petroleum Measurement Tables, Volume Correction Factors (Volumes I through X), are, with this edition, incorporated into API's *Manual of Petroleum Measurement Standards*. These tables form Section 1 of Chapter 11, "Physical Properties Data." To simplify the transition from the American Society for Testing and Materials' (ASTM) publication of the original tables to API's publication in 1980, the original ASTM numerical designations have been retained for the individual tables.

The numbering system used throughout Volumes I through X corresponds to the numbering system of the *Manual of Petroleum Measurement Standards*. The system consists of a series of fields separated by decimal points. The first two fields (11.1) indicate chapter and section of the manual; the third field gives the ASTM table number. Therefore, although not serial, 11.1.5, 11.1.6, 11.1.23, 11.1.24, 11.1.53, and 11.1.54 are the major headings used. All other headings are subordinate to the three field headings.

Volumes I through IX, which are designed for field use, are arranged on a functional basis rather than on a topical basis.

First Series—Volumes I, II, and III

These three volumes contain TABLES 5 and 6, the tables for the °API, °F, 60°F base series, plus examples to guide the user. Each volume contains specific data as follows:

- Volume I —Generalized Crude Oils (TABLES 5A and 6A)
- Volume II —Generalized Products (TABLES 5B and 6B)
- Volume III —Individual and Special Applications (TABLE 6C) and an appendix describing the equations and constants used and the densities and coefficients of thermal expansion of each NBS sample.

Second Series—Volumes IV, V, and VI

These three volumes contain TABLES 23 and 24, the tables for the relative density, °F, 60°F base series, plus examples to guide the user. Each volume contains specific data as follows:

- Volume IV —Generalized Crude Oils (TABLES 23A and 24A)
- Volume V —Generalized Products (TABLES 23B and 24B)
- Volume VI —Individual and Special Applications (TABLE 24C) and an appendix describing the equations and constants used and the densities and coefficients of thermal expansion of each NBS sample.

Third Series—Volumes VII, VIII, and IX

These three volumes contain TABLES 53 and 54, the tables for the kilogram per cubic metre, °C, 15°C base series, plus examples to guide the user. Each volume contains specific data as follows:

- Volume VII —Generalized Crude Oils (TABLES 53A and 54A)
- Volume VIII—Generalized Products (TABLES 53B and 54B)
- Volume IX —Individual and Special Applications (TABLE 54C) and an appendix describing the equations and constants used and the densities and coefficients of thermal expansion for each NBS sample.

Volume X provides a complete breakdown of the Petroleum Measurement Tables, Volume Correction Factors, and references appropriate volumes for the location of specific tables. Volume X is the key volume of the entire set and contains the actual Standard, the implementation procedures, and the instructions for the

use of the computer subroutines. The history and development of the project are also included in Volume X under 11.1.6.

Inquiries concerning the application of the tables or the computer subroutines should be addressed to—

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O.W. Molony		British Standards Institution
P.D. O'Connell		Institute of Petroleum

COPM—API Committee on Petroleum Measurement

COSM—Joint API/ASTM Subcommittee on Static Petroleum Measurement

NBS—U.S. National Bureau of Standards

ISO—International Organization for Standardization

Chapter 11—Physical Properties Data

SECTION 1—VOLUME CORRECTION FACTORS

11.1.6 TABLES 6A, 6B, and 6C— Correction of Volume to 60°F Against API Gravity at 60°F and Thermal Expansion Coefficients (Abstract only)[†]

TABLES 6A, 6B, and 6C give the factors for converting liquid petroleum volumes measured at observed temperatures to the corresponding volumes at 60°F.

The data are presented in three tables to maximize accuracy while maintaining convenience of use:

TABLE 6A Generalized Crude Oils
(see Volume I)

TABLE 6B Generalized Products (see Volume II)

TABLE 6C Volume Correction Factors for
Individual and Special Applications

TABLES 6A and 6B use API gravity at 60°F to obtain volume correction factors. TABLE 6C uses experimentally determined thermal expansion coefficients to obtain volume correction factors.

The development and intended use of these tables is described in 11.1.6 in Volume X. The parameters K_0 and K_1 may be found in 11.1.24.7.1.

The limits of these tables are illustrated in Figure III-1, III-2, and III-3.

[†] The full text of 11.1.6 appears in Volume X.

11.1.6.7 TABLE 6C—VOLUME CORRECTION FACTORS FOR INDIVIDUAL AND SPECIAL APPLICATIONS, VOLUME CORRECTION TO 60°F AGAINST THERMAL EXPANSION COEFFICIENTS AT 60°F

TABLE 6C gives volume correction factors to convert petroleum liquid volumes to the corresponding volume at 60°F. The table presents tabular entries of volume correction factors against thermal expansion coefficients and temperature. The values were computed from the basic equation used to represent volume correction factors.

$$\text{VCF} = \text{EXP} [-\alpha_T \Delta t (1 + 0.8 \alpha_T \Delta t)] \quad (1)$$

$\alpha_T = \alpha$ at the base temperature

$\Delta t = t - T$

$t =$ any temperature

$T =$ base temperature

In this form the equation is independent of the group or substance. It can be used with any valid method of obtaining the thermal expansion coefficient for a given fluid as long as a statistically significant number of points are obtained. A minimum of ten such points is recommended. The appendix to TABLE 6C (11.1.6.7.1) presents values of the thermal expansion coefficient along with the base density for each of the NBS samples. In addition, values of the constants K_0 and K_1 are given for each major group. These constants

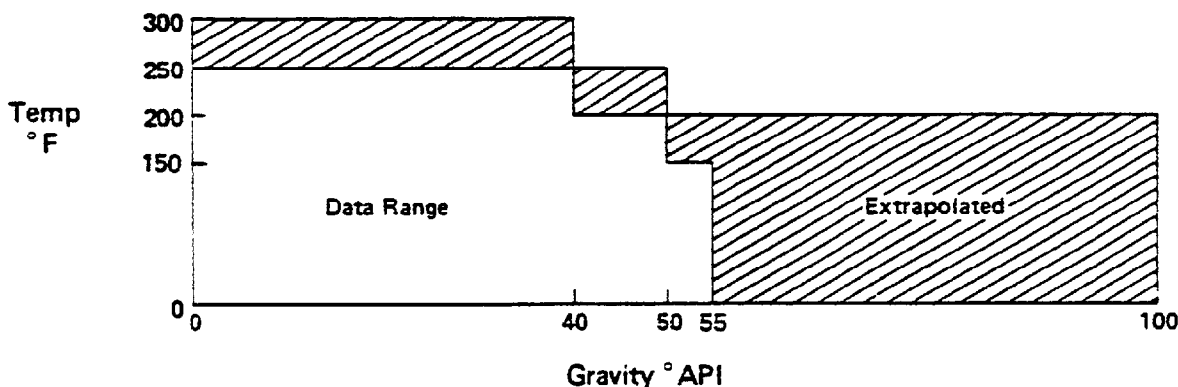


Figure III-1 — Data Limits for TABLE 6A, Generalized Crude Oils

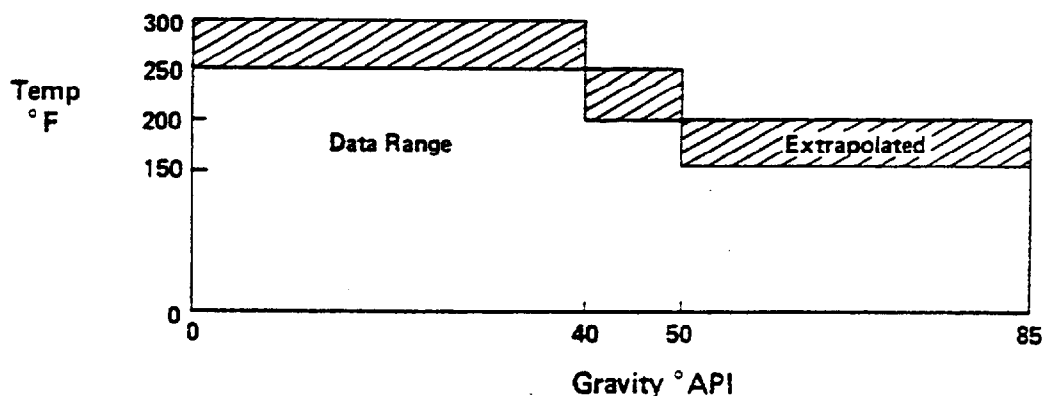


Figure III-2 — Data Limits for TABLE 6B, Generalized Products

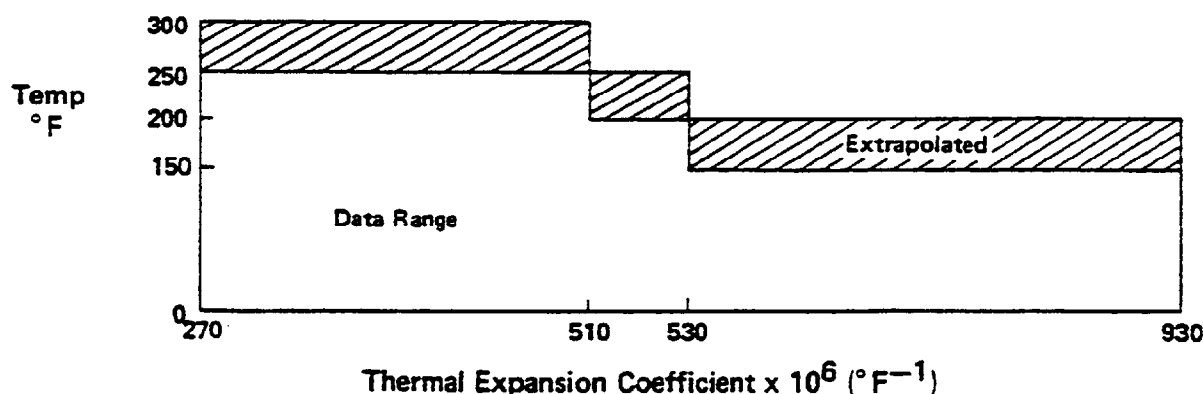


Figure III-3 — Data Limits for Table 6C, Volume Correction Factors for Individual and Special Applications

relate the thermal expansion coefficient to base density by

$$\alpha_T = \frac{K_0 + K_1 \rho_T}{\rho_T^2} \quad (2)$$

This table and its primary subroutine allow the use of measured data for previously unstudied fluids to supplement data included in the initial data base. High precision density data obtained from the laboratory for a fluid of interest may be reduced by Equation 1 to obtain ρ_T and α_T . TABLE 6C may then be entered with the α_T so determined.

TABLE 6C, when used with a minimum of ten data points, allows one to extract the highest degree of accuracy from the base data. It is suggested that TABLE 6C be used when:

1. TABLES 6A and 6B do not adequately represent the thermal expansion properties of the fluids of interest;

2. Precise thermal expansion coefficients may be obtained directly or indirectly by experiment (As an example, high precision density data may be used to compute the coefficients.); and

3. Buyers and sellers agree that, for their use, a greater degree of equity can be obtained.

The temperature ranges of this table are:

$\alpha \times 10^6$	°F
270 to 510	0 to 300
510 to 530	0 to 250
530 to 930	0 to 200

The volume correction factors given in this table are based on data from the U.S. National Bureau of Standards (NBS) and from other published data. The appendix to this table presents values of the thermal expansion coefficients at 60°F for each of the samples included in the NBS data set. Portions of the tempera-

ture range represent areas beyond these data. Thus, mathematical techniques were employed to extrapolate beyond the temperature range of the given data to determine the volume correction factors for these areas. These factors are denoted by an asterisk (*). Extension of this table beyond the ranges shown is not intended.

Increments used in this table for determining the volume correction factors are 0.5°F and 2 units for α . Interpolation between either temperature or thermal expansion coefficient is not intended since there is no practical method of interpolation that will produce the accuracy obtainable from the Standard.

This table must be entered with a known thermal expansion coefficient at 60°F and with an observed temperature.

Example 1

What is the net volume at 60°F of 165 000 barrels of gasoline at 45.0°F and a coefficient of thermal expansion of 680.0×10^{-6} at 60°F?

Enter the table in the column "Coefficient of Thermal Expansion," headed 680.0 at 45.0°F and note the volume correction factor 1.0102. Net volume at 60°F is

$$165\,000 \times 1.0102 = 166\,683.0$$

or

166 683 net barrels of gasoline.

Example 2

The laboratory reports the following experimental data for a specific petroleum fluid:

°C	kg/m ³
14.927	868.211
15.918	868.0219
20.212	864.5136
24.955	861.187
29.621	857.908
32.878	855.615
35.427	853.818
40.162	850.475
42.017	849.163
44.865	847.148

From these data the thermal expansion coefficient at 60°F is 447.482×10^{-6} reciprocal °F. (Note: A minimum of ten data pairs is suggested if this type of procedure is used.)

What is the net volume at 60°F of 270 000 barrels of this petroleum fluid at 80°F?

Enter the table in the column "Coefficient of Thermal Expansion," headed 447.0 at 80°F and note the volume correction factor 0.9910. Net volume at 60°F is

$$270\,000 \times 0.9910 = 267\,570.0$$

or

267 570 net barrels.

(Text continues on page III-7 following TABLE 6C.)

API/ASTM-IP PETROLEUM MEASUREMENT TABLE

TABLE 6C, VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 DEGREES F

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TABLE 6C, VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP F	
	270.0	272.0	274.0	276.0	278.0	280.0	282.0	284.0	286.0	288.0		290.0
0.0	1.0161	1.0162	1.0164	1.0165	1.0166	1.0167	1.0168	1.0169	1.0171	1.0172	1.0173	0.0
0.5	1.0160	1.0161	1.0162	1.0163	1.0165	1.0166	1.0167	1.0168	1.0169	1.0170	1.0172	0.5
1.0	1.0159	1.0160	1.0161	1.0162	1.0163	1.0164	1.0166	1.0167	1.0168	1.0169	1.0170	1.0
1.5	1.0157	1.0158	1.0159	1.0161	1.0162	1.0163	1.0164	1.0165	1.0166	1.0168	1.0169	1.5
2.0	1.0156	1.0157	1.0158	1.0159	1.0160	1.0162	1.0163	1.0164	1.0165	1.0166	1.0167	2.0
2.5	1.0155	1.0156	1.0157	1.0158	1.0159	1.0160	1.0161	1.0162	1.0164	1.0165	1.0166	2.5
3.0	1.0153	1.0154	1.0155	1.0157	1.0158	1.0159	1.0160	1.0161	1.0162	1.0163	1.0164	3.0
3.5	1.0152	1.0153	1.0154	1.0155	1.0156	1.0157	1.0159	1.0160	1.0161	1.0162	1.0163	3.5
4.0	1.0150	1.0152	1.0153	1.0154	1.0155	1.0156	1.0157	1.0158	1.0159	1.0160	1.0162	4.0
4.5	1.0149	1.0150	1.0151	1.0152	1.0154	1.0155	1.0156	1.0157	1.0158	1.0159	1.0160	4.5
5.0	1.0148	1.0149	1.0150	1.0151	1.0152	1.0153	1.0154	1.0155	1.0157	1.0158	1.0159	5.0
5.5	1.0146	1.0148	1.0149	1.0150	1.0151	1.0152	1.0153	1.0154	1.0155	1.0156	1.0157	5.5
6.0	1.0145	1.0146	1.0147	1.0148	1.0149	1.0150	1.0152	1.0153	1.0154	1.0155	1.0156	6.0
6.5	1.0144	1.0145	1.0146	1.0147	1.0148	1.0149	1.0150	1.0151	1.0152	1.0153	1.0154	6.5
7.0	1.0142	1.0144	1.0145	1.0146	1.0147	1.0148	1.0149	1.0150	1.0151	1.0152	1.0153	7.0
7.5	1.0141	1.0142	1.0143	1.0144	1.0145	1.0146	1.0147	1.0148	1.0149	1.0150	1.0152	7.5
8.0	1.0140	1.0141	1.0142	1.0143	1.0144	1.0145	1.0146	1.0147	1.0148	1.0149	1.0150	8.0
8.5	1.0138	1.0139	1.0140	1.0142	1.0143	1.0144	1.0145	1.0146	1.0147	1.0148	1.0149	8.5
9.0	1.0137	1.0138	1.0139	1.0140	1.0141	1.0142	1.0143	1.0144	1.0145	1.0146	1.0147	9.0
9.5	1.0136	1.0137	1.0138	1.0139	1.0140	1.0141	1.0142	1.0143	1.0144	1.0145	1.0146	9.5
10.0	1.0134	1.0135	1.0136	1.0137	1.0138	1.0139	1.0140	1.0141	1.0142	1.0143	1.0144	10.0
10.5	1.0133	1.0134	1.0135	1.0136	1.0137	1.0138	1.0139	1.0140	1.0141	1.0142	1.0143	10.5
11.0	1.0132	1.0133	1.0134	1.0135	1.0136	1.0137	1.0138	1.0139	1.0140	1.0141	1.0141	11.0
11.5	1.0130	1.0131	1.0132	1.0133	1.0134	1.0135	1.0136	1.0137	1.0138	1.0139	1.0140	11.5
12.0	1.0129	1.0130	1.0131	1.0132	1.0133	1.0134	1.0135	1.0136	1.0137	1.0138	1.0139	12.0
12.5	1.0128	1.0129	1.0130	1.0131	1.0132	1.0132	1.0133	1.0134	1.0135	1.0136	1.0137	12.5
13.0	1.0126	1.0127	1.0128	1.0129	1.0130	1.0131	1.0132	1.0133	1.0134	1.0135	1.0136	13.0
13.5	1.0125	1.0126	1.0127	1.0128	1.0129	1.0130	1.0131	1.0132	1.0132	1.0133	1.0134	13.5
14.0	1.0124	1.0125	1.0126	1.0126	1.0127	1.0128	1.0129	1.0130	1.0131	1.0132	1.0133	14.0
14.5	1.0122	1.0123	1.0124	1.0125	1.0126	1.0127	1.0128	1.0129	1.0130	1.0131	1.0131	14.5
15.0	1.0121	1.0122	1.0123	1.0124	1.0125	1.0126	1.0126	1.0127	1.0128	1.0129	1.0130	15.0

* DENOTES EXTRAPOLATED VALUE

ALPHA = 270.0 TO 290.0

TABLE 6C, VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP. F	
	270.0	272.0	274.0	276.0	278.0	280.0	282.0	284.0	286.0	288.0		290.0
15.0	1.0121	1.0122	1.0123	1.0124	1.0125	1.0126	1.0126	1.0127	1.0128	1.0129	1.0130	15.0
15.5	1.0120	1.0121	1.0121	1.0122	1.0123	1.0124	1.0125	1.0126	1.0127	1.0128	1.0129	15.5
16.0	1.0118	1.0119	1.0120	1.0121	1.0122	1.0123	1.0124	1.0124	1.0125	1.0126	1.0127	16.0
16.5	1.0117	1.0118	1.0119	1.0120	1.0120	1.0121	1.0122	1.0123	1.0124	1.0125	1.0126	16.5
17.0	1.0116	1.0117	1.0117	1.0118	1.0119	1.0120	1.0121	1.0122	1.0123	1.0123	1.0124	17.0
17.5	1.0114	1.0115	1.0116	1.0117	1.0118	1.0119	1.0119	1.0120	1.0121	1.0122	1.0123	17.5
18.0	1.0113	1.0114	1.0115	1.0116	1.0116	1.0117	1.0118	1.0119	1.0120	1.0121	1.0121	18.0
18.5	1.0112	1.0112	1.0113	1.0114	1.0115	1.0116	1.0117	1.0117	1.0118	1.0119	1.0120	18.5
19.0	1.0110	1.0111	1.0112	1.0113	1.0114	1.0114	1.0115	1.0116	1.0117	1.0118	1.0118	19.0
19.5	1.0109	1.0110	1.0111	1.0111	1.0112	1.0113	1.0114	1.0115	1.0115	1.0116	1.0117	19.5
20.0	1.0108	1.0108	1.0109	1.0110	1.0111	1.0112	1.0112	1.0113	1.0114	1.0115	1.0116	20.0
20.5	1.0106	1.0107	1.0108	1.0109	1.0109	1.0110	1.0111	1.0112	1.0113	1.0113	1.0114	20.5
21.0	1.0105	1.0106	1.0107	1.0107	1.0108	1.0109	1.0110	1.0110	1.0111	1.0112	1.0113	21.0
21.5	1.0104	1.0104	1.0105	1.0106	1.0107	1.0107	1.0108	1.0109	1.0110	1.0111	1.0111	21.5
22.0	1.0102	1.0103	1.0104	1.0105	1.0105	1.0106	1.0107	1.0108	1.0108	1.0109	1.0110	22.0
22.5	1.0101	1.0102	1.0102	1.0103	1.0104	1.0105	1.0105	1.0106	1.0107	1.0108	1.0108	22.5
23.0	1.0100	1.0100	1.0101	1.0102	1.0103	1.0103	1.0104	1.0105	1.0105	1.0106	1.0107	23.0
23.5	1.0098	1.0099	1.0100	1.0100	1.0101	1.0102	1.0103	1.0103	1.0104	1.0105	1.0106	23.5
24.0	1.0097	1.0098	1.0098	1.0099	1.0100	1.0100	1.0101	1.0102	1.0103	1.0103	1.0104	24.0
24.5	1.0096	1.0096	1.0097	1.0098	1.0098	1.0099	1.0100	1.0101	1.0101	1.0102	1.0103	24.5
25.0	1.0094	1.0095	1.0096	1.0096	1.0097	1.0098	1.0098	1.0099	1.0100	1.0100	1.0101	25.0
25.5	1.0093	1.0094	1.0094	1.0095	1.0096	1.0096	1.0097	1.0098	1.0098	1.0099	1.0100	25.5
26.0	1.0092	1.0092	1.0093	1.0094	1.0094	1.0095	1.0096	1.0096	1.0097	1.0098	1.0098	26.0
26.5	1.0090	1.0091	1.0092	1.0092	1.0093	1.0094	1.0094	1.0095	1.0096	1.0096	1.0097	26.5
27.0	1.0089	1.0090	1.0090	1.0091	1.0091	1.0092	1.0093	1.0093	1.0094	1.0095	1.0095	27.0
27.5	1.0088	1.0088	1.0089	1.0089	1.0090	1.0091	1.0091	1.0092	1.0093	1.0093	1.0094	27.5
28.0	1.0086	1.0087	1.0087	1.0088	1.0089	1.0089	1.0090	1.0091	1.0091	1.0092	1.0093	28.0
28.5	1.0085	1.0085	1.0086	1.0087	1.0087	1.0088	1.0089	1.0089	1.0090	1.0090	1.0091	28.5
29.0	1.0083	1.0084	1.0085	1.0085	1.0086	1.0087	1.0087	1.0088	1.0088	1.0089	1.0090	29.0
29.5	1.0082	1.0083	1.0083	1.0084	1.0085	1.0085	1.0086	1.0086	1.0087	1.0088	1.0088	29.5
30.0	1.0081	1.0081	1.0082	1.0083	1.0083	1.0084	1.0084	1.0085	1.0086	1.0086	1.0087	30.0

* DENOTES EXTRAPOLATED VALUE

ALPHA = 270.0 TO 290.0

TABLE 6C, VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP. F	
	270.0	272.0	274.0	276.0	278.0	280.0	282.0	284.0	286.0	288.0		290.0
30.0	1.0081	1.0081	1.0082	1.0083	1.0083	1.0084	1.0084	1.0085	1.0086	1.0086	1.0087	30.0
30.5	1.0079	1.0080	1.0081	1.0081	1.0082	1.0082	1.0083	1.0084	1.0084	1.0085	1.0085	30.5
31.0	1.0078	1.0079	1.0079	1.0080	1.0080	1.0081	1.0082	1.0082	1.0083	1.0083	1.0084	31.0
31.5	1.0077	1.0077	1.0078	1.0078	1.0079	1.0080	1.0080	1.0081	1.0081	1.0082	1.0082	31.5
32.0	1.0075	1.0076	1.0077	1.0077	1.0078	1.0078	1.0079	1.0079	1.0080	1.0080	1.0081	32.0
32.5	1.0074	1.0075	1.0075	1.0076	1.0076	1.0077	1.0077	1.0078	1.0078	1.0079	1.0080	32.5
33.0	1.0073	1.0073	1.0074	1.0074	1.0075	1.0075	1.0076	1.0077	1.0077	1.0078	1.0078	33.0
33.5	1.0071	1.0072	1.0072	1.0073	1.0074	1.0074	1.0075	1.0075	1.0076	1.0076	1.0077	33.5
34.0	1.0070	1.0071	1.0071	1.0072	1.0072	1.0073	1.0073	1.0074	1.0074	1.0075	1.0075	34.0
34.5	1.0069	1.0069	1.0070	1.0070	1.0071	1.0071	1.0072	1.0072	1.0073	1.0073	1.0074	34.5
35.0	1.0067	1.0068	1.0068	1.0069	1.0069	1.0070	1.0070	1.0071	1.0071	1.0072	1.0072	35.0
35.5	1.0066	1.0067	1.0067	1.0067	1.0068	1.0068	1.0069	1.0069	1.0070	1.0070	1.0071	35.5
36.0	1.0065	1.0065	1.0066	1.0066	1.0067	1.0067	1.0068	1.0068	1.0068	1.0069	1.0069	36.0
36.5	1.0063	1.0064	1.0064	1.0065	1.0065	1.0066	1.0066	1.0067	1.0067	1.0068	1.0068	36.5
37.0	1.0062	1.0062	1.0063	1.0063	1.0064	1.0064	1.0065	1.0065	1.0066	1.0066	1.0067	37.0
37.5	1.0061	1.0061	1.0062	1.0062	1.0063	1.0063	1.0064	1.0064	1.0064	1.0065	1.0065	37.5
38.0	1.0059	1.0060	1.0060	1.0061	1.0061	1.0062	1.0062	1.0063	1.0063	1.0063	1.0064	38.0
38.5	1.0058	1.0058	1.0059	1.0059	1.0060	1.0060	1.0061	1.0061	1.0061	1.0062	1.0062	38.5
39.0	1.0057	1.0057	1.0057	1.0058	1.0058	1.0059	1.0059	1.0060	1.0060	1.0060	1.0061	39.0
39.5	1.0055	1.0056	1.0056	1.0056	1.0057	1.0057	1.0058	1.0058	1.0059	1.0059	1.0059	39.5
40.0	1.0054	1.0054	1.0055	1.0055	1.0056	1.0056	1.0056	1.0057	1.0057	1.0057	1.0058	40.0
40.5	1.0053	1.0053	1.0053	1.0054	1.0054	1.0055	1.0055	1.0055	1.0056	1.0056	1.0056	40.5
41.0	1.0051	1.0052	1.0052	1.0052	1.0053	1.0053	1.0053	1.0054	1.0054	1.0055	1.0055	41.0
41.5	1.0050	1.0050	1.0051	1.0051	1.0051	1.0052	1.0052	1.0052	1.0053	1.0053	1.0054	41.5
42.0	1.0049	1.0049	1.0049	1.0050	1.0050	1.0050	1.0051	1.0051	1.0051	1.0052	1.0052	42.0
42.5	1.0047	1.0048	1.0048	1.0048	1.0049	1.0049	1.0049	1.0050	1.0050	1.0050	1.0051	42.5
43.0	1.0046	1.0046	1.0047	1.0047	1.0047	1.0048	1.0048	1.0048	1.0049	1.0049	1.0049	43.0
43.5	1.0044	1.0045	1.0045	1.0045	1.0046	1.0046	1.0046	1.0047	1.0047	1.0047	1.0048	43.5
44.0	1.0043	1.0043	1.0044	1.0044	1.0044	1.0045	1.0045	1.0045	1.0046	1.0046	1.0046	44.0
44.5	1.0042	1.0042	1.0042	1.0043	1.0043	1.0043	1.0044	1.0044	1.0044	1.0045	1.0045	44.5
45.0	1.0040	1.0041	1.0041	1.0041	1.0042	1.0042	1.0042	1.0043	1.0043	1.0043	1.0043	45.0

* DENOTES EXTRAPOLATED VALUE

ALPHA = 270.0 TO 290.0

TABLE 6C. VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP. F	
	270.0	272.0	274.0	276.0	278.0	280.0	282.0	284.0	286.0	288.0		290.0
45.0	1.0040	1.0041	1.0041	1.0041	1.0042	1.0042	1.0042	1.0043	1.0043	1.0043	1.0043	45.0
45.5	1.0039	1.0039	1.0040	1.0040	1.0040	1.0041	1.0041	1.0041	1.0041	1.0042	1.0042	45.5
46.0	1.0038	1.0038	1.0038	1.0039	1.0039	1.0039	1.0039	1.0040	1.0040	1.0040	1.0041	46.0
46.5	1.0036	1.0037	1.0037	1.0037	1.0037	1.0038	1.0038	1.0038	1.0039	1.0039	1.0039	46.5
47.0	1.0035	1.0035	1.0036	1.0036	1.0036	1.0036	1.0037	1.0037	1.0037	1.0037	1.0038	47.0
47.5	1.0034	1.0034	1.0034	1.0034	1.0035	1.0035	1.0035	1.0035	1.0036	1.0036	1.0036	47.5
48.0	1.0032	1.0033	1.0033	1.0033	1.0033	1.0034	1.0034	1.0034	1.0034	1.0035	1.0035	48.0
48.5	1.0031	1.0031	1.0031	1.0032	1.0032	1.0032	1.0032	1.0033	1.0033	1.0033	1.0033	48.5
49.0	1.0030	1.0030	1.0030	1.0030	1.0031	1.0031	1.0031	1.0031	1.0031	1.0032	1.0032	49.0
49.5	1.0028	1.0029	1.0029	1.0029	1.0029	1.0029	1.0030	1.0030	1.0030	1.0030	1.0030	49.5
50.0	1.0027	1.0027	1.0027	1.0028	1.0028	1.0028	1.0028	1.0028	1.0029	1.0029	1.0029	50.0
50.5	1.0026	1.0026	1.0026	1.0026	1.0026	1.0027	1.0027	1.0027	1.0027	1.0027	1.0028	50.5
51.0	1.0024	1.0024	1.0025	1.0025	1.0025	1.0025	1.0025	1.0026	1.0026	1.0026	1.0026	51.0
51.5	1.0023	1.0023	1.0023	1.0023	1.0024	1.0024	1.0024	1.0024	1.0024	1.0024	1.0025	51.5
52.0	1.0022	1.0022	1.0022	1.0022	1.0022	1.0022	1.0023	1.0023	1.0023	1.0023	1.0023	52.0
52.5	1.0020	1.0020	1.0021	1.0021	1.0021	1.0021	1.0021	1.0021	1.0021	1.0022	1.0022	52.5
53.0	1.0019	1.0019	1.0019	1.0019	1.0020	1.0020	1.0020	1.0020	1.0020	1.0020	1.0020	53.0
53.5	1.0018	1.0018	1.0018	1.0018	1.0018	1.0018	1.0018	1.0018	1.0019	1.0019	1.0019	53.5
54.0	1.0016	1.0016	1.0016	1.0017	1.0017	1.0017	1.0017	1.0017	1.0017	1.0017	1.0017	54.0
54.5	1.0015	1.0015	1.0015	1.0015	1.0015	1.0015	1.0016	1.0016	1.0016	1.0016	1.0016	54.5
55.0	1.0013	1.0014	1.0014	1.0014	1.0014	1.0014	1.0014	1.0014	1.0014	1.0014	1.0014	55.0
55.5	1.0012	1.0012	1.0012	1.0012	1.0013	1.0013	1.0013	1.0013	1.0013	1.0013	1.0013	55.5
56.0	1.0011	1.0011	1.0011	1.0011	1.0011	1.0011	1.0011	1.0011	1.0011	1.0012	1.0012	56.0
56.5	1.0009	1.0010	1.0010	1.0010	1.0010	1.0010	1.0010	1.0010	1.0010	1.0010	1.0010	56.5
57.0	1.0008	1.0008	1.0008	1.0008	1.0008	1.0008	1.0008	1.0009	1.0009	1.0009	1.0009	57.0
57.5	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	57.5
58.0	1.0005	1.0005	1.0005	1.0006	1.0006	1.0006	1.0006	1.0006	1.0006	1.0006	1.0006	58.0
58.5	1.0004	1.0004	1.0004	1.0004	1.0004	1.0004	1.0004	1.0004	1.0004	1.0004	1.0004	58.5
59.0	1.0003	1.0003	1.0003	1.0003	1.0003	1.0003	1.0003	1.0003	1.0003	1.0003	1.0003	59.0
59.5	1.0001	1.0001	1.0001	1.0001	1.0001	1.0001	1.0001	1.0001	1.0001	1.0001	1.0001	59.5
60.0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	60.0

* DENOTES EXTRAPOLATED VALUE

ALPHA = 270.0 TO 290.0

TABLE 6C, VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP. F	
	270.0	272.0	274.0	276.0	278.0	280.0	282.0	284.0	286.0	288.0		290.0
60.0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	60.0
60.5	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	60.5
61.0	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	61.0
61.5	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	61.5
62.0	0.9995	0.9995	0.9995	0.9994	0.9994	0.9994	0.9994	0.9994	0.9994	0.9994	0.9994	62.0
62.5	0.9993	0.9993	0.9993	0.9993	0.9993	0.9993	0.9993	0.9993	0.9993	0.9993	0.9993	62.5
63.0	0.9992	0.9992	0.9992	0.9992	0.9992	0.9992	0.9991	0.9991	0.9991	0.9991	0.9991	63.0
63.5	0.9991	0.9990	0.9990	0.9990	0.9990	0.9990	0.9990	0.9990	0.9990	0.9990	0.9990	63.5
64.0	0.9989	0.9989	0.9989	0.9989	0.9989	0.9989	0.9989	0.9989	0.9989	0.9988	0.9988	64.0
64.5	0.9988	0.9988	0.9988	0.9988	0.9987	0.9987	0.9987	0.9987	0.9987	0.9987	0.9987	64.5
65.0	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9985	65.0
65.5	0.9985	0.9985	0.9985	0.9985	0.9985	0.9984	0.9984	0.9984	0.9984	0.9984	0.9984	65.5
66.0	0.9984	0.9984	0.9984	0.9983	0.9983	0.9983	0.9983	0.9983	0.9983	0.9983	0.9983	66.0
66.5	0.9982	0.9982	0.9982	0.9982	0.9982	0.9982	0.9982	0.9982	0.9981	0.9981	0.9981	66.5
67.0	0.9981	0.9981	0.9981	0.9981	0.9980	0.9980	0.9980	0.9980	0.9980	0.9980	0.9980	67.0
67.5	0.9980	0.9980	0.9979	0.9979	0.9979	0.9979	0.9979	0.9979	0.9979	0.9978	0.9978	67.5
68.0	0.9978	0.9978	0.9978	0.9978	0.9978	0.9978	0.9977	0.9977	0.9977	0.9977	0.9977	68.0
68.5	0.9977	0.9977	0.9977	0.9977	0.9976	0.9976	0.9976	0.9976	0.9976	0.9976	0.9975	68.5
69.0	0.9976	0.9976	0.9975	0.9975	0.9975	0.9975	0.9975	0.9974	0.9974	0.9974	0.9974	69.0
69.5	0.9974	0.9974	0.9974	0.9974	0.9974	0.9973	0.9973	0.9973	0.9973	0.9973	0.9972	69.5
70.0	0.9973	0.9973	0.9973	0.9972	0.9972	0.9972	0.9972	0.9972	0.9971	0.9971	0.9971	70.0
70.5	0.9972	0.9971	0.9971	0.9971	0.9971	0.9970	0.9970	0.9970	0.9970	0.9970	0.9970	70.5
71.0	0.9970	0.9970	0.9970	0.9970	0.9969	0.9969	0.9969	0.9969	0.9969	0.9968	0.9968	71.0
71.5	0.9969	0.9969	0.9968	0.9968	0.9968	0.9968	0.9967	0.9967	0.9967	0.9967	0.9967	71.5
72.0	0.9968	0.9967	0.9967	0.9967	0.9966	0.9966	0.9966	0.9966	0.9966	0.9965	0.9965	72.0
72.5	0.9966	0.9966	0.9966	0.9965	0.9965	0.9965	0.9964	0.9964	0.9964	0.9964	0.9964	72.5
73.0	0.9965	0.9965	0.9964	0.9964	0.9964	0.9963	0.9963	0.9963	0.9963	0.9963	0.9962	73.0
73.5	0.9964	0.9963	0.9963	0.9963	0.9962	0.9962	0.9962	0.9962	0.9961	0.9961	0.9961	73.5
74.0	0.9962	0.9962	0.9962	0.9961	0.9961	0.9960	0.9960	0.9960	0.9960	0.9960	0.9959	74.0
74.5	0.9961	0.9961	0.9960	0.9960	0.9959	0.9959	0.9959	0.9958	0.9958	0.9958	0.9958	74.5
75.0	0.9959	0.9959	0.9959	0.9959	0.9958	0.9958	0.9958	0.9957	0.9957	0.9957	0.9956	75.0

* DENOTES EXTRAPOLATED VALUE

ALPHA = 270.0 TO 290.0

TABLE 6C, VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP. F	
	270.0	272.0	274.0	276.0	278.0	280.0	282.0	284.0	286.0	288.0		290.0
75.0	0.9959	0.9959	0.9959	0.9959	0.9958	0.9958	0.9958	0.9957	0.9957	0.9957	0.9956	75.0
75.5	0.9958	0.9958	0.9957	0.9957	0.9957	0.9957	0.9956	0.9956	0.9956	0.9955	0.9955	75.5
76.0	0.9957	0.9956	0.9956	0.9956	0.9955	0.9955	0.9955	0.9954	0.9954	0.9954	0.9954	76.0
76.5	0.9955	0.9955	0.9955	0.9954	0.9954	0.9954	0.9953	0.9953	0.9953	0.9952	0.9952	76.5
77.0	0.9954	0.9954	0.9953	0.9953	0.9953	0.9952	0.9952	0.9952	0.9951	0.9951	0.9951	77.0
77.5	0.9953	0.9952	0.9952	0.9952	0.9951	0.9951	0.9951	0.9950	0.9950	0.9950	0.9949	77.5
78.0	0.9951	0.9951	0.9951	0.9950	0.9950	0.9950	0.9949	0.9949	0.9948	0.9948	0.9948	78.0
78.5	0.9950	0.9950	0.9949	0.9949	0.9948	0.9948	0.9948	0.9947	0.9947	0.9947	0.9946	78.5
79.0	0.9949	0.9948	0.9948	0.9947	0.9947	0.9947	0.9946	0.9946	0.9946	0.9945	0.9945	79.0
79.5	0.9947	0.9947	0.9946	0.9946	0.9946	0.9945	0.9945	0.9945	0.9944	0.9944	0.9943	79.5
80.0	0.9946	0.9946	0.9945	0.9945	0.9944	0.9944	0.9944	0.9943	0.9943	0.9942	0.9942	80.0
80.5	0.9945	0.9944	0.9944	0.9943	0.9943	0.9943	0.9942	0.9942	0.9941	0.9941	0.9940	80.5
81.0	0.9943	0.9943	0.9942	0.9942	0.9942	0.9941	0.9941	0.9940	0.9940	0.9939	0.9939	81.0
81.5	0.9942	0.9941	0.9941	0.9941	0.9940	0.9940	0.9939	0.9939	0.9938	0.9938	0.9938	81.5
82.0	0.9940	0.9940	0.9940	0.9939	0.9939	0.9938	0.9938	0.9937	0.9937	0.9937	0.9936	82.0
82.5	0.9939	0.9939	0.9938	0.9938	0.9937	0.9937	0.9936	0.9936	0.9936	0.9935	0.9935	82.5
83.0	0.9938	0.9937	0.9937	0.9936	0.9936	0.9935	0.9935	0.9935	0.9934	0.9934	0.9933	83.0
83.5	0.9936	0.9936	0.9935	0.9935	0.9935	0.9934	0.9934	0.9933	0.9933	0.9932	0.9932	83.5
84.0	0.9935	0.9935	0.9934	0.9934	0.9933	0.9933	0.9932	0.9932	0.9931	0.9931	0.9930	84.0
84.5	0.9934	0.9933	0.9933	0.9932	0.9932	0.9931	0.9931	0.9930	0.9930	0.9929	0.9929	84.5
85.0	0.9932	0.9932	0.9931	0.9931	0.9930	0.9930	0.9929	0.9929	0.9928	0.9928	0.9927	85.0
85.5	0.9931	0.9930	0.9930	0.9929	0.9929	0.9928	0.9928	0.9927	0.9927	0.9926	0.9926	85.5
86.0	0.9930	0.9929	0.9929	0.9928	0.9928	0.9927	0.9927	0.9926	0.9925	0.9925	0.9924	86.0
86.5	0.9928	0.9928	0.9927	0.9927	0.9926	0.9926	0.9925	0.9925	0.9924	0.9924	0.9923	86.5
87.0	0.9927	0.9926	0.9926	0.9925	0.9925	0.9924	0.9924	0.9923	0.9923	0.9922	0.9922	87.0
87.5	0.9926	0.9925	0.9924	0.9924	0.9923	0.9923	0.9922	0.9922	0.9921	0.9921	0.9920	87.5
88.0	0.9924	0.9924	0.9923	0.9923	0.9922	0.9921	0.9921	0.9920	0.9920	0.9919	0.9919	88.0
88.5	0.9923	0.9922	0.9922	0.9921	0.9921	0.9920	0.9919	0.9919	0.9918	0.9918	0.9917	88.5
89.0	0.9922	0.9921	0.9920	0.9920	0.9919	0.9919	0.9918	0.9917	0.9917	0.9916	0.9916	89.0
89.5	0.9920	0.9920	0.9919	0.9918	0.9918	0.9917	0.9917	0.9916	0.9915	0.9915	0.9914	89.5
90.0	0.9919	0.9918	0.9918	0.9917	0.9916	0.9916	0.9915	0.9915	0.9914	0.9913	0.9913	90.0

ALPHA = 270.0 TO 290.0

* DENOTES EXTRAPOLATED VALUE

TABLE 6C, VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F											TEMP. F
	270.0	272.0	274.0	276.0	278.0	280.0	282.0	284.0	286.0	288.0	290.0	
90.0	0.9919	0.9918	0.9918	0.9917	0.9916	0.9916	0.9915	0.9915	0.9914	0.9913	0.9913	90.0
90.5	0.9917	0.9917	0.9916	0.9916	0.9915	0.9914	0.9914	0.9913	0.9913	0.9912	0.9911	90.5
91.0	0.9916	0.9915	0.9915	0.9914	0.9914	0.9913	0.9912	0.9912	0.9911	0.9910	0.9910	91.0
91.5	0.9915	0.9914	0.9913	0.9913	0.9912	0.9912	0.9911	0.9910	0.9910	0.9909	0.9908	91.5
92.0	0.9913	0.9913	0.9912	0.9911	0.9911	0.9910	0.9910	0.9909	0.9908	0.9908	0.9907	92.0
92.5	0.9912	0.9911	0.9911	0.9910	0.9909	0.9909	0.9908	0.9907	0.9907	0.9906	0.9905	92.5
93.0	0.9911	0.9910	0.9909	0.9909	0.9908	0.9907	0.9907	0.9906	0.9905	0.9905	0.9904	93.0
93.5	0.9909	0.9909	0.9908	0.9907	0.9907	0.9906	0.9905	0.9905	0.9904	0.9903	0.9903	93.5
94.0	0.9908	0.9907	0.9907	0.9906	0.9905	0.9905	0.9904	0.9903	0.9902	0.9902	0.9901	94.0
94.5	0.9907	0.9906	0.9905	0.9905	0.9904	0.9903	0.9902	0.9902	0.9901	0.9900	0.9900	94.5
95.0	0.9905	0.9905	0.9904	0.9903	0.9902	0.9902	0.9901	0.9900	0.9900	0.9899	0.9898	95.0
95.5	0.9904	0.9903	0.9902	0.9902	0.9901	0.9900	0.9900	0.9899	0.9898	0.9897	0.9897	95.5
96.0	0.9903	0.9902	0.9901	0.9900	0.9900	0.9899	0.9898	0.9897	0.9897	0.9896	0.9895	96.0
96.5	0.9901	0.9900	0.9900	0.9899	0.9898	0.9897	0.9897	0.9896	0.9895	0.9895	0.9894	96.5
97.0	0.9900	0.9899	0.9898	0.9898	0.9897	0.9896	0.9895	0.9895	0.9894	0.9893	0.9892	97.0
97.5	0.9898	0.9898	0.9897	0.9896	0.9895	0.9895	0.9894	0.9893	0.9892	0.9892	0.9891	97.5
98.0	0.9897	0.9896	0.9896	0.9895	0.9894	0.9893	0.9893	0.9892	0.9891	0.9890	0.9889	98.0
98.5	0.9896	0.9895	0.9894	0.9893	0.9893	0.9892	0.9891	0.9890	0.9889	0.9888	0.9887	98.5
99.0	0.9894	0.9894	0.9893	0.9892	0.9891	0.9890	0.9890	0.9889	0.9888	0.9887	0.9887	99.0
99.5	0.9893	0.9892	0.9891	0.9891	0.9890	0.9889	0.9888	0.9887	0.9887	0.9886	0.9885	99.5
100.0	0.9892	0.9891	0.9890	0.9889	0.9888	0.9888	0.9887	0.9886	0.9885	0.9884	0.9884	100.0
100.5	0.9890	0.9889	0.9889	0.9888	0.9887	0.9886	0.9885	0.9885	0.9884	0.9883	0.9882	100.5
101.0	0.9889	0.9888	0.9888	0.9887	0.9886	0.9885	0.9884	0.9883	0.9882	0.9882	0.9881	101.0
101.5	0.9888	0.9887	0.9887	0.9886	0.9885	0.9884	0.9883	0.9882	0.9881	0.9880	0.9879	101.5
102.0	0.9886	0.9885	0.9885	0.9884	0.9883	0.9882	0.9881	0.9880	0.9879	0.9879	0.9878	102.0
102.5	0.9885	0.9884	0.9884	0.9883	0.9882	0.9881	0.9880	0.9879	0.9878	0.9877	0.9876	102.5
103.0	0.9884	0.9883	0.9883	0.9882	0.9881	0.9880	0.9878	0.9877	0.9877	0.9876	0.9875	103.0
103.5	0.9882	0.9881	0.9880	0.9880	0.9879	0.9878	0.9877	0.9876	0.9875	0.9874	0.9873	103.5
104.0	0.9881	0.9880	0.9879	0.9878	0.9877	0.9876	0.9875	0.9874	0.9873	0.9873	0.9872	104.0
104.5	0.9879	0.9879	0.9878	0.9877	0.9876	0.9875	0.9874	0.9873	0.9872	0.9871	0.9870	104.5
105.0	0.9878	0.9877	0.9876	0.9875	0.9874	0.9874	0.9873	0.9872	0.9871	0.9870	0.9869	105.0

* DENOTES EXTRAPOLATED VALUE

ALPHA = 270.0 TO 290.0

TABLE 6C, VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP. F	
	270.0	272.0	274.0	276.0	278.0	280.0	282.0	284.0	286.0	288.0		290.0
105.0	0.9878	0.9877	0.9876	0.9875	0.9874	0.9874	0.9873	0.9872	0.9871	0.9870	0.9869	105.0
105.5	0.9877	0.9876	0.9875	0.9874	0.9873	0.9872	0.9871	0.9870	0.9869	0.9868	0.9868	105.5
106.0	0.9875	0.9874	0.9873	0.9873	0.9872	0.9871	0.9870	0.9869	0.9868	0.9867	0.9866	106.0
106.5	0.9874	0.9873	0.9872	0.9871	0.9870	0.9869	0.9868	0.9867	0.9866	0.9866	0.9865	106.5
107.0	0.9873	0.9872	0.9871	0.9870	0.9869	0.9868	0.9867	0.9866	0.9865	0.9864	0.9863	107.0
107.5	0.9871	0.9870	0.9869	0.9868	0.9867	0.9866	0.9866	0.9865	0.9864	0.9863	0.9862	107.5
108.0	0.9870	0.9869	0.9868	0.9867	0.9866	0.9865	0.9864	0.9863	0.9862	0.9861	0.9860	108.0
108.5	0.9869	0.9868	0.9867	0.9866	0.9865	0.9864	0.9863	0.9862	0.9861	0.9860	0.9859	108.5
109.0	0.9867	0.9866	0.9865	0.9864	0.9863	0.9862	0.9861	0.9860	0.9859	0.9858	0.9857	109.0
109.5	0.9866	0.9865	0.9864	0.9863	0.9862	0.9861	0.9860	0.9859	0.9858	0.9857	0.9856	109.5
110.0	0.9864	0.9863	0.9862	0.9861	0.9860	0.9859	0.9858	0.9857	0.9856	0.9855	0.9854	110.0
110.5	0.9863	0.9862	0.9861	0.9860	0.9859	0.9858	0.9857	0.9856	0.9855	0.9854	0.9853	110.5
111.0	0.9862	0.9861	0.9860	0.9859	0.9858	0.9857	0.9856	0.9855	0.9854	0.9852	0.9851	111.0
111.5	0.9860	0.9859	0.9858	0.9857	0.9856	0.9855	0.9854	0.9853	0.9852	0.9851	0.9850	111.5
112.0	0.9859	0.9858	0.9857	0.9856	0.9855	0.9854	0.9853	0.9852	0.9851	0.9850	0.9849	112.0
112.5	0.9858	0.9857	0.9856	0.9854	0.9853	0.9852	0.9851	0.9850	0.9849	0.9848	0.9847	112.5
113.0	0.9856	0.9855	0.9854	0.9853	0.9852	0.9851	0.9850	0.9849	0.9848	0.9847	0.9846	113.0
113.5	0.9855	0.9854	0.9853	0.9852	0.9851	0.9850	0.9848	0.9847	0.9846	0.9845	0.9844	113.5
114.0	0.9854	0.9852	0.9851	0.9850	0.9849	0.9848	0.9847	0.9846	0.9845	0.9844	0.9843	114.0
114.5	0.9852	0.9851	0.9850	0.9849	0.9848	0.9847	0.9846	0.9845	0.9843	0.9842	0.9841	114.5
115.0	0.9851	0.9850	0.9849	0.9848	0.9846	0.9845	0.9844	0.9843	0.9842	0.9841	0.9840	115.0
115.5	0.9849	0.9848	0.9847	0.9846	0.9845	0.9844	0.9843	0.9842	0.9841	0.9839	0.9838	115.5
116.0	0.9848	0.9847	0.9846	0.9845	0.9844	0.9842	0.9841	0.9840	0.9839	0.9838	0.9837	116.0
116.5	0.9847	0.9846	0.9844	0.9843	0.9842	0.9841	0.9840	0.9839	0.9838	0.9837	0.9835	116.5
117.0	0.9845	0.9844	0.9843	0.9842	0.9841	0.9840	0.9839	0.9837	0.9836	0.9835	0.9834	117.0
117.5	0.9844	0.9843	0.9842	0.9841	0.9839	0.9838	0.9837	0.9836	0.9835	0.9834	0.9832	117.5
118.0	0.9843	0.9842	0.9840	0.9839	0.9838	0.9837	0.9836	0.9834	0.9833	0.9832	0.9831	118.0
118.5	0.9841	0.9840	0.9839	0.9838	0.9837	0.9835	0.9834	0.9833	0.9832	0.9831	0.9830	118.5
119.0	0.9840	0.9839	0.9838	0.9836	0.9835	0.9834	0.9833	0.9832	0.9830	0.9829	0.9828	119.0
119.5	0.9839	0.9837	0.9836	0.9835	0.9834	0.9833	0.9831	0.9830	0.9829	0.9828	0.9827	119.5
120.0	0.9837	0.9836	0.9835	0.9834	0.9832	0.9831	0.9830	0.9829	0.9828	0.9826	0.9825	120.0

* DENOTES EXTRAPOLATED VALUE

ALPHA = 270.0 TO 290.0

TABLE 6C, VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP. F	
	270.0	272.0	274.0	276.0	278.0	280.0	282.0	284.0	286.0	288.0		290.0
120.0	0.9837	0.9836	0.9835	0.9834	0.9832	0.9831	0.9830	0.9829	0.9828	0.9826	0.9825	120.0
120.5	0.9836	0.9835	0.9833	0.9832	0.9831	0.9830	0.9829	0.9827	0.9826	0.9825	0.9824	120.5
121.0	0.9835	0.9833	0.9832	0.9831	0.9830	0.9828	0.9827	0.9826	0.9825	0.9823	0.9822	121.0
121.5	0.9833	0.9832	0.9831	0.9829	0.9828	0.9827	0.9826	0.9824	0.9823	0.9822	0.9821	121.5
122.0	0.9832	0.9831	0.9829	0.9828	0.9827	0.9826	0.9824	0.9823	0.9822	0.9821	0.9819	122.0
122.5	0.9830	0.9829	0.9828	0.9827	0.9825	0.9824	0.9823	0.9822	0.9820	0.9819	0.9818	122.5
123.0	0.9829	0.9828	0.9827	0.9825	0.9824	0.9823	0.9821	0.9820	0.9819	0.9818	0.9816	123.0
123.5	0.9828	0.9826	0.9825	0.9824	0.9823	0.9821	0.9820	0.9819	0.9817	0.9816	0.9815	123.5
124.0	0.9826	0.9825	0.9824	0.9822	0.9821	0.9820	0.9819	0.9817	0.9816	0.9815	0.9813	124.0
124.5	0.9825	0.9824	0.9822	0.9821	0.9820	0.9818	0.9817	0.9816	0.9815	0.9813	0.9812	124.5
125.0	0.9824	0.9822	0.9821	0.9820	0.9818	0.9817	0.9816	0.9814	0.9813	0.9812	0.9810	125.0
125.5	0.9822	0.9821	0.9820	0.9818	0.9817	0.9816	0.9814	0.9813	0.9812	0.9810	0.9809	125.5
126.0	0.9821	0.9820	0.9818	0.9817	0.9816	0.9814	0.9813	0.9812	0.9810	0.9809	0.9808	126.0
126.5	0.9820	0.9818	0.9817	0.9815	0.9814	0.9813	0.9811	0.9810	0.9809	0.9807	0.9806	126.5
127.0	0.9818	0.9817	0.9815	0.9814	0.9813	0.9811	0.9810	0.9809	0.9807	0.9806	0.9805	127.0
127.5	0.9817	0.9815	0.9814	0.9813	0.9811	0.9810	0.9809	0.9807	0.9806	0.9805	0.9803	127.5
128.0	0.9815	0.9814	0.9813	0.9811	0.9810	0.9809	0.9807	0.9806	0.9804	0.9803	0.9802	128.0
128.5	0.9814	0.9813	0.9811	0.9810	0.9809	0.9807	0.9806	0.9804	0.9803	0.9802	0.9800	128.5
129.0	0.9813	0.9811	0.9810	0.9809	0.9807	0.9806	0.9804	0.9803	0.9802	0.9800	0.9799	129.0
129.5	0.9811	0.9810	0.9809	0.9807	0.9806	0.9804	0.9803	0.9801	0.9800	0.9799	0.9797	129.5
130.0	0.9810	0.9809	0.9807	0.9806	0.9804	0.9803	0.9801	0.9800	0.9799	0.9797	0.9796	130.0
130.5	0.9809	0.9807	0.9806	0.9804	0.9803	0.9801	0.9800	0.9799	0.9797	0.9796	0.9794	130.5
131.0	0.9807	0.9806	0.9804	0.9803	0.9801	0.9800	0.9799	0.9797	0.9796	0.9794	0.9793	131.0
131.5	0.9806	0.9804	0.9803	0.9802	0.9800	0.9799	0.9797	0.9796	0.9794	0.9793	0.9791	131.5
132.0	0.9805	0.9803	0.9802	0.9800	0.9799	0.9797	0.9796	0.9794	0.9793	0.9791	0.9790	132.0
132.5	0.9803	0.9802	0.9800	0.9799	0.9797	0.9796	0.9794	0.9793	0.9791	0.9790	0.9788	132.5
133.0	0.9802	0.9800	0.9799	0.9797	0.9796	0.9794	0.9793	0.9791	0.9790	0.9788	0.9787	133.0
133.5	0.9800	0.9799	0.9797	0.9796	0.9794	0.9793	0.9791	0.9790	0.9789	0.9787	0.9786	133.5
134.0	0.9799	0.9798	0.9796	0.9795	0.9793	0.9792	0.9790	0.9789	0.9787	0.9786	0.9784	134.0
134.5	0.9798	0.9796	0.9795	0.9793	0.9792	0.9790	0.9789	0.9787	0.9786	0.9784	0.9783	134.5
135.0	0.9796	0.9795	0.9793	0.9792	0.9790	0.9789	0.9787	0.9786	0.9784	0.9783	0.9781	135.0

* DENOTES EXTRAPOLATED VALUE

ALPHA = 270.0 TO 290.0

TABLE 6C, VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP. F	
	274.0	276.0	278.0	280.0	282.0	284.0	286.0	288.0	290.0		288.0	290.0
135.0	0.9793	0.9792	0.9790	0.9789	0.9787	0.9786	0.9784	0.9783	0.9781		0.9783	0.9781
135.5	0.9792	0.9790	0.9789	0.9787	0.9786	0.9784	0.9783	0.9781	0.9780		0.9781	0.9780
136.0	0.9791	0.9789	0.9787	0.9786	0.9784	0.9783	0.9781	0.9780	0.9778		0.9780	0.9778
136.5	0.9789	0.9788	0.9786	0.9785	0.9783	0.9782	0.9780	0.9778	0.9777		0.9778	0.9777
137.0	0.9788	0.9786	0.9785	0.9783	0.9782	0.9780	0.9778	0.9777	0.9775		0.9777	0.9775
137.5	0.9786	0.9785	0.9783	0.9782	0.9780	0.9779	0.9777	0.9775	0.9774		0.9775	0.9774
138.0	0.9785	0.9783	0.9782	0.9780	0.9779	0.9777	0.9775	0.9774	0.9772		0.9774	0.9772
138.5	0.9784	0.9782	0.9780	0.9779	0.9777	0.9776	0.9774	0.9773	0.9771		0.9772	0.9771
139.0	0.9782	0.9781	0.9779	0.9777	0.9776	0.9774	0.9773	0.9771	0.9769		0.9771	0.9769
139.5	0.9781	0.9779	0.9778	0.9776	0.9774	0.9773	0.9771	0.9770	0.9768		0.9770	0.9768
140.0	0.9779	0.9778	0.9776	0.9775	0.9773	0.9772	0.9770	0.9768	0.9766		0.9768	0.9766
140.5	0.9778	0.9776	0.9775	0.9773	0.9772	0.9770	0.9768	0.9767	0.9765		0.9767	0.9765
141.0	0.9777	0.9775	0.9773	0.9772	0.9770	0.9769	0.9767	0.9765	0.9764		0.9765	0.9764
141.5	0.9775	0.9774	0.9772	0.9770	0.9769	0.9767	0.9766	0.9764	0.9762		0.9764	0.9762
142.0	0.9774	0.9772	0.9771	0.9769	0.9767	0.9766	0.9764	0.9762	0.9761		0.9762	0.9761
142.5	0.9772	0.9771	0.9769	0.9767	0.9766	0.9764	0.9762	0.9761	0.9759		0.9761	0.9759
143.0	0.9771	0.9769	0.9768	0.9766	0.9764	0.9763	0.9761	0.9759	0.9758		0.9759	0.9758
143.5	0.9770	0.9768	0.9766	0.9765	0.9763	0.9761	0.9760	0.9758	0.9756		0.9758	0.9756
144.0	0.9768	0.9767	0.9765	0.9763	0.9762	0.9760	0.9758	0.9756	0.9755		0.9756	0.9755
144.5	0.9767	0.9765	0.9764	0.9762	0.9760	0.9758	0.9757	0.9755	0.9753		0.9755	0.9753
145.0	0.9766	0.9764	0.9762	0.9760	0.9759	0.9757	0.9755	0.9753	0.9752		0.9753	0.9752
145.5	0.9764	0.9762	0.9761	0.9759	0.9757	0.9756	0.9754	0.9752	0.9750		0.9752	0.9750
146.0	0.9763	0.9761	0.9759	0.9758	0.9756	0.9754	0.9752	0.9751	0.9749		0.9751	0.9749
146.5	0.9761	0.9760	0.9758	0.9756	0.9754	0.9753	0.9751	0.9749	0.9747		0.9749	0.9747
147.0	0.9760	0.9758	0.9756	0.9755	0.9753	0.9751	0.9749	0.9748	0.9746		0.9748	0.9746
147.5	0.9759	0.9757	0.9755	0.9753	0.9752	0.9750	0.9748	0.9746	0.9744		0.9746	0.9744
148.0	0.9757	0.9755	0.9754	0.9752	0.9750	0.9748	0.9747	0.9745	0.9743		0.9745	0.9743
148.5	0.9756	0.9754	0.9752	0.9750	0.9749	0.9747	0.9745	0.9743	0.9741		0.9743	0.9741
149.0	0.9754	0.9753	0.9751	0.9749	0.9747	0.9745	0.9744	0.9742	0.9740		0.9742	0.9740
149.5	0.9753	0.9751	0.9749	0.9748	0.9746	0.9744	0.9742	0.9740	0.9739		0.9740	0.9739
150.0	0.9752	0.9750	0.9748	0.9746	0.9744	0.9743	0.9741	0.9739	0.9737		0.9739	0.9737

* DENOTES EXTRAPOLATED VALUE

ALPHA = 270.0 TO 290.0

TABLE 6C, VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP. F	
	270.0	272.0	274.0	276.0	278.0	280.0	282.0	284.0	286.0	288.0		290.0
150.0	0.9755	0.9753	0.9752	0.9750	0.9748	0.9747	0.9746	0.9744	0.9743	0.9741	0.9737	150.0
150.5	0.9754	0.9752	0.9750	0.9748	0.9747	0.9747	0.9745	0.9743	0.9741	0.9739	0.9736	150.5
151.0	0.9753	0.9751	0.9749	0.9747	0.9745	0.9745	0.9743	0.9742	0.9740	0.9738	0.9734	151.0
151.5	0.9751	0.9749	0.9748	0.9746	0.9744	0.9744	0.9742	0.9740	0.9738	0.9736	0.9733	151.5
152.0	0.9750	0.9748	0.9746	0.9744	0.9742	0.9742	0.9741	0.9739	0.9737	0.9735	0.9731	152.0
152.5	0.9748	0.9747	0.9745	0.9743	0.9741	0.9741	0.9739	0.9737	0.9735	0.9733	0.9730	152.5
153.0	0.9747	0.9745	0.9743	0.9741	0.9740	0.9740	0.9738	0.9736	0.9734	0.9732	0.9728	153.0
153.5	0.9746	0.9744	0.9742	0.9740	0.9738	0.9738	0.9736	0.9734	0.9732	0.9731	0.9727	153.5
154.0	0.9744	0.9742	0.9741	0.9739	0.9737	0.9737	0.9735	0.9733	0.9731	0.9729	0.9725	154.0
154.5	0.9743	0.9741	0.9739	0.9737	0.9735	0.9735	0.9733	0.9731	0.9730	0.9728	0.9724	154.5
155.0	0.9742	0.9740	0.9738	0.9736	0.9734	0.9734	0.9732	0.9730	0.9728	0.9726	0.9722	155.0
155.5	0.9740	0.9738	0.9736	0.9734	0.9733	0.9733	0.9731	0.9729	0.9727	0.9725	0.9721	155.5
156.0	0.9739	0.9737	0.9735	0.9733	0.9731	0.9731	0.9729	0.9727	0.9725	0.9723	0.9719	156.0
156.5	0.9738	0.9736	0.9734	0.9732	0.9730	0.9730	0.9728	0.9726	0.9724	0.9722	0.9718	156.5
157.0	0.9736	0.9734	0.9732	0.9730	0.9728	0.9728	0.9726	0.9724	0.9722	0.9720	0.9716	157.0
157.5	0.9735	0.9733	0.9731	0.9729	0.9727	0.9727	0.9725	0.9723	0.9721	0.9719	0.9715	157.5
158.0	0.9733	0.9731	0.9729	0.9727	0.9725	0.9725	0.9723	0.9721	0.9719	0.9718	0.9714	158.0
158.5	0.9732	0.9730	0.9728	0.9726	0.9724	0.9724	0.9722	0.9720	0.9718	0.9716	0.9712	158.5
159.0	0.9731	0.9729	0.9727	0.9725	0.9723	0.9723	0.9721	0.9719	0.9717	0.9715	0.9711	159.0
159.5	0.9729	0.9727	0.9725	0.9723	0.9721	0.9721	0.9719	0.9717	0.9715	0.9713	0.9709	159.5
160.0	0.9728	0.9726	0.9724	0.9722	0.9720	0.9720	0.9718	0.9716	0.9714	0.9712	0.9708	160.0
160.5	0.9727	0.9725	0.9722	0.9720	0.9718	0.9718	0.9716	0.9714	0.9712	0.9710	0.9706	160.5
161.0	0.9725	0.9723	0.9721	0.9719	0.9717	0.9717	0.9715	0.9713	0.9711	0.9709	0.9705	161.0
161.5	0.9724	0.9722	0.9720	0.9718	0.9716	0.9716	0.9714	0.9711	0.9709	0.9707	0.9703	161.5
162.0	0.9722	0.9720	0.9718	0.9716	0.9714	0.9714	0.9712	0.9710	0.9708	0.9706	0.9702	162.0
162.5	0.9721	0.9719	0.9717	0.9715	0.9713	0.9713	0.9711	0.9709	0.9707	0.9704	0.9700	162.5
163.0	0.9720	0.9718	0.9716	0.9713	0.9711	0.9711	0.9709	0.9707	0.9705	0.9703	0.9699	163.0
163.5	0.9718	0.9716	0.9714	0.9712	0.9710	0.9710	0.9708	0.9706	0.9704	0.9702	0.9697	163.5
164.0	0.9717	0.9715	0.9713	0.9711	0.9709	0.9709	0.9706	0.9704	0.9702	0.9700	0.9696	164.0
164.5	0.9716	0.9713	0.9711	0.9709	0.9707	0.9707	0.9705	0.9703	0.9701	0.9699	0.9694	164.5
165.0	0.9714	0.9712	0.9710	0.9708	0.9706	0.9706	0.9704	0.9701	0.9699	0.9697	0.9693	165.0

* DENOTES EXTRAPOLATED VALUE

ALPHA = 270.0 TO 290.0

TABLE 6C, VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP. F	
	270.0	272.0	274.0	276.0	278.0	280.0	282.0	284.0	286.0	288.0		290.0
165.0	0.9714	0.9712	0.9710	0.9708	0.9706	0.9704	0.9701	0.9699	0.9697	0.9695	0.9693	165.0
165.5	0.9713	0.9711	0.9709	0.9706	0.9704	0.9702	0.9700	0.9698	0.9696	0.9694	0.9691	165.5
166.0	0.9711	0.9709	0.9707	0.9705	0.9703	0.9701	0.9699	0.9696	0.9694	0.9692	0.9690	166.0
166.5	0.9710	0.9708	0.9706	0.9704	0.9701	0.9699	0.9697	0.9695	0.9693	0.9691	0.9688	166.5
167.0	0.9709	0.9707	0.9704	0.9702	0.9700	0.9698	0.9696	0.9694	0.9691	0.9689	0.9687	167.0
167.5	0.9707	0.9705	0.9703	0.9701	0.9699	0.9696	0.9694	0.9692	0.9690	0.9688	0.9686	167.5
168.0	0.9706	0.9704	0.9702	0.9699	0.9697	0.9695	0.9693	0.9691	0.9688	0.9686	0.9684	168.0
168.5	0.9705	0.9702	0.9700	0.9698	0.9696	0.9694	0.9691	0.9689	0.9687	0.9685	0.9683	168.5
169.0	0.9703	0.9701	0.9699	0.9697	0.9694	0.9692	0.9690	0.9688	0.9686	0.9683	0.9681	169.0
169.5	0.9702	0.9700	0.9697	0.9695	0.9693	0.9691	0.9689	0.9686	0.9684	0.9682	0.9680	169.5
170.0	0.9701	0.9698	0.9696	0.9694	0.9692	0.9689	0.9687	0.9685	0.9683	0.9680	0.9678	170.0
170.5	0.9699	0.9697	0.9695	0.9692	0.9690	0.9688	0.9686	0.9683	0.9681	0.9679	0.9677	170.5
171.0	0.9698	0.9696	0.9693	0.9691	0.9689	0.9686	0.9684	0.9682	0.9680	0.9677	0.9675	171.0
171.5	0.9696	0.9694	0.9692	0.9690	0.9687	0.9685	0.9683	0.9681	0.9678	0.9676	0.9674	171.5
172.0	0.9695	0.9693	0.9690	0.9688	0.9686	0.9684	0.9681	0.9679	0.9677	0.9675	0.9672	172.0
172.5	0.9694	0.9691	0.9689	0.9687	0.9685	0.9682	0.9680	0.9678	0.9675	0.9673	0.9671	172.5
173.0	0.9692	0.9690	0.9688	0.9685	0.9683	0.9681	0.9678	0.9676	0.9674	0.9672	0.9669	173.0
173.5	0.9691	0.9689	0.9686	0.9684	0.9682	0.9679	0.9677	0.9675	0.9672	0.9670	0.9668	173.5
174.0	0.9690	0.9687	0.9685	0.9683	0.9680	0.9678	0.9676	0.9673	0.9671	0.9669	0.9666	174.0
174.5	0.9688	0.9686	0.9684	0.9681	0.9679	0.9677	0.9674	0.9672	0.9670	0.9667	0.9665	174.5
175.0	0.9687	0.9684	0.9682	0.9680	0.9677	0.9675	0.9673	0.9670	0.9668	0.9666	0.9663	175.0
175.5	0.9685	0.9683	0.9681	0.9678	0.9676	0.9674	0.9671	0.9669	0.9667	0.9664	0.9662	175.5
176.0	0.9684	0.9682	0.9679	0.9677	0.9675	0.9672	0.9670	0.9668	0.9665	0.9663	0.9660	176.0
176.5	0.9683	0.9680	0.9678	0.9676	0.9673	0.9671	0.9668	0.9666	0.9664	0.9661	0.9659	176.5
177.0	0.9681	0.9679	0.9677	0.9674	0.9672	0.9669	0.9667	0.9665	0.9662	0.9660	0.9657	177.0
177.5	0.9680	0.9678	0.9675	0.9673	0.9670	0.9668	0.9666	0.9663	0.9661	0.9658	0.9656	177.5
178.0	0.9679	0.9676	0.9674	0.9671	0.9669	0.9667	0.9664	0.9662	0.9659	0.9657	0.9655	178.0
178.5	0.9677	0.9675	0.9672	0.9670	0.9668	0.9665	0.9663	0.9660	0.9658	0.9655	0.9653	178.5
179.0	0.9676	0.9673	0.9671	0.9669	0.9666	0.9664	0.9661	0.9659	0.9656	0.9654	0.9652	179.0
179.5	0.9674	0.9672	0.9670	0.9667	0.9665	0.9662	0.9660	0.9657	0.9655	0.9653	0.9650	179.5
180.0	0.9673	0.9671	0.9668	0.9666	0.9663	0.9661	0.9658	0.9656	0.9654	0.9651	0.9649	180.0

ALPHA = 270.0 TO 290.0

* DENOTES EXTRAPOLATED VALUE

* DENOTES EXTRAPOLATED VALUE

ALPHA = 270.0 TO 290.0

TABLE 6C, VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP. F	
	270.0	272.0	274.0	276.0	278.0	280.0	282.0	284.0	286.0	288.0		290.0
180.0	0.9673	0.9671	0.9668	0.9666	0.9663	0.9661	0.9658	0.9656	0.9654	0.9651	0.9649	180.0
180.5	0.9672	0.9669	0.9667	0.9664	0.9662	0.9659	0.9657	0.9655	0.9652	0.9650	0.9647	180.5
181.0	0.9670	0.9668	0.9665	0.9663	0.9660	0.9658	0.9656	0.9653	0.9651	0.9648	0.9646	181.0
181.5	0.9669	0.9666	0.9664	0.9662	0.9659	0.9657	0.9654	0.9652	0.9649	0.9647	0.9644	181.5
182.0	0.9668	0.9665	0.9663	0.9660	0.9658	0.9655	0.9653	0.9650	0.9648	0.9645	0.9643	182.0
182.5	0.9666	0.9664	0.9661	0.9659	0.9656	0.9654	0.9651	0.9649	0.9646	0.9644	0.9641	182.5
183.0	0.9665	0.9662	0.9660	0.9657	0.9655	0.9652	0.9650	0.9647	0.9645	0.9642	0.9640	183.0
183.5	0.9663	0.9661	0.9658	0.9656	0.9653	0.9651	0.9648	0.9646	0.9643	0.9641	0.9638	183.5
184.0	0.9662	0.9660	0.9657	0.9654	0.9652	0.9649	0.9647	0.9644	0.9642	0.9639	0.9637	184.0
184.5	0.9661	0.9658	0.9656	0.9653	0.9651	0.9648	0.9645	0.9643	0.9640	0.9638	0.9635	184.5
185.0	0.9659	0.9657	0.9654	0.9652	0.9649	0.9647	0.9644	0.9642	0.9639	0.9636	0.9634	185.0
185.5	0.9658	0.9655	0.9653	0.9650	0.9648	0.9645	0.9643	0.9640	0.9637	0.9635	0.9632	185.5
186.0	0.9657	0.9654	0.9651	0.9649	0.9646	0.9644	0.9641	0.9639	0.9636	0.9633	0.9631	186.0
186.5	0.9655	0.9653	0.9650	0.9647	0.9645	0.9642	0.9640	0.9637	0.9635	0.9632	0.9629	186.5
187.0	0.9654	0.9651	0.9649	0.9646	0.9643	0.9641	0.9638	0.9636	0.9633	0.9631	0.9628	187.0
187.5	0.9652	0.9650	0.9647	0.9645	0.9642	0.9639	0.9637	0.9634	0.9632	0.9629	0.9626	187.5
188.0	0.9651	0.9648	0.9646	0.9643	0.9641	0.9638	0.9635	0.9633	0.9630	0.9628	0.9625	188.0
188.5	0.9650	0.9647	0.9644	0.9642	0.9639	0.9637	0.9634	0.9631	0.9629	0.9626	0.9624	188.5
189.0	0.9648	0.9646	0.9643	0.9640	0.9638	0.9635	0.9633	0.9630	0.9627	0.9625	0.9622	189.0
189.5	0.9647	0.9644	0.9642	0.9639	0.9636	0.9634	0.9631	0.9628	0.9626	0.9623	0.9621	189.5
190.0	0.9646	0.9643	0.9640	0.9638	0.9635	0.9632	0.9630	0.9627	0.9624	0.9622	0.9619	190.0
190.5	0.9644	0.9642	0.9639	0.9636	0.9634	0.9631	0.9628	0.9626	0.9623	0.9620	0.9618	190.5
191.0	0.9643	0.9640	0.9637	0.9635	0.9632	0.9629	0.9627	0.9624	0.9621	0.9619	0.9616	191.0
191.5	0.9641	0.9639	0.9636	0.9633	0.9631	0.9628	0.9625	0.9623	0.9620	0.9617	0.9615	191.5
192.0	0.9640	0.9637	0.9635	0.9632	0.9629	0.9627	0.9624	0.9621	0.9619	0.9616	0.9613	192.0
192.5	0.9639	0.9636	0.9633	0.9631	0.9628	0.9625	0.9622	0.9620	0.9617	0.9614	0.9612	192.5
193.0	0.9637	0.9635	0.9632	0.9629	0.9626	0.9624	0.9621	0.9618	0.9616	0.9613	0.9610	193.0
193.5	0.9636	0.9633	0.9631	0.9628	0.9625	0.9622	0.9620	0.9617	0.9614	0.9611	0.9609	193.5
194.0	0.9635	0.9632	0.9629	0.9626	0.9624	0.9621	0.9618	0.9615	0.9613	0.9610	0.9607	194.0
194.5	0.9633	0.9630	0.9628	0.9625	0.9622	0.9619	0.9617	0.9614	0.9611	0.9609	0.9606	194.5
195.0	0.9632	0.9629	0.9626	0.9624	0.9621	0.9618	0.9615	0.9613	0.9610	0.9607	0.9604	195.0

* DENOTES EXTRAPOLATED VALUE

ALPHA = 270.0 TO 290.0

TABLE 6C, VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP. F	
	270.0	272.0	274.0	276.0	278.0	280.0	282.0	284.0	286.0	288.0		290.0
195.0	0.9632	0.9629	0.9626	0.9624	0.9621	0.9618	0.9615	0.9613	0.9610	0.9607	0.9604	195.0
195.5	0.9630	0.9628	0.9625	0.9622	0.9619	0.9617	0.9614	0.9611	0.9608	0.9606	0.9603	195.5
196.0	0.9629	0.9626	0.9624	0.9621	0.9618	0.9615	0.9612	0.9610	0.9607	0.9604	0.9601	196.0
196.5	0.9628	0.9625	0.9622	0.9619	0.9617	0.9614	0.9611	0.9608	0.9605	0.9603	0.9600	196.5
197.0	0.9626	0.9624	0.9621	0.9618	0.9615	0.9612	0.9610	0.9607	0.9604	0.9601	0.9598	197.0
197.5	0.9625	0.9622	0.9619	0.9617	0.9614	0.9611	0.9608	0.9605	0.9602	0.9599	0.9596	197.5
198.0	0.9624	0.9621	0.9618	0.9615	0.9612	0.9609	0.9607	0.9604	0.9601	0.9598	0.9595	198.0
198.5	0.9622	0.9619	0.9617	0.9614	0.9611	0.9608	0.9605	0.9602	0.9600	0.9597	0.9594	198.5
199.0	0.9621	0.9618	0.9615	0.9612	0.9609	0.9607	0.9604	0.9601	0.9598	0.9595	0.9592	199.0
199.5	0.9619	0.9617	0.9614	0.9611	0.9608	0.9605	0.9602	0.9600	0.9597	0.9594	0.9591	199.5
200.0	0.9618	0.9615	0.9612	0.9609	0.9607	0.9604	0.9601	0.9598	0.9595	0.9592	0.9589	200.0
200.5	0.9617	0.9614	0.9611	0.9608	0.9605	0.9602	0.9599	0.9597	0.9594	0.9591	0.9588	200.5
201.0	0.9615	0.9612	0.9610	0.9607	0.9604	0.9601	0.9598	0.9595	0.9592	0.9589	0.9587	201.0
201.5	0.9614	0.9611	0.9608	0.9605	0.9602	0.9599	0.9597	0.9594	0.9591	0.9588	0.9585	201.5
202.0	0.9613	0.9610	0.9607	0.9604	0.9601	0.9598	0.9595	0.9592	0.9589	0.9586	0.9584	202.0
202.5	0.9611	0.9608	0.9605	0.9602	0.9600	0.9597	0.9594	0.9591	0.9588	0.9585	0.9582	202.5
203.0	0.9610	0.9607	0.9604	0.9601	0.9598	0.9595	0.9592	0.9589	0.9586	0.9584	0.9581	203.0
203.5	0.9608	0.9605	0.9603	0.9600	0.9597	0.9594	0.9591	0.9588	0.9585	0.9582	0.9579	203.5
204.0	0.9607	0.9604	0.9601	0.9598	0.9595	0.9592	0.9589	0.9586	0.9584	0.9581	0.9578	204.0
204.5	0.9606	0.9603	0.9600	0.9597	0.9594	0.9591	0.9588	0.9585	0.9582	0.9579	0.9576	204.5
205.0	0.9604	0.9601	0.9598	0.9595	0.9592	0.9589	0.9587	0.9584	0.9581	0.9578	0.9575	205.0
205.5	0.9603	0.9600	0.9597	0.9594	0.9591	0.9588	0.9585	0.9582	0.9579	0.9576	0.9573	205.5
206.0	0.9602	0.9599	0.9596	0.9593	0.9590	0.9587	0.9584	0.9581	0.9578	0.9575	0.9572	206.0
206.5	0.9600	0.9597	0.9594	0.9591	0.9588	0.9585	0.9582	0.9579	0.9576	0.9573	0.9570	206.5
207.0	0.9599	0.9596	0.9593	0.9590	0.9587	0.9584	0.9581	0.9578	0.9575	0.9572	0.9569	207.0
207.5	0.9597	0.9594	0.9591	0.9588	0.9585	0.9582	0.9579	0.9576	0.9573	0.9570	0.9567	207.5
208.0	0.9596	0.9593	0.9590	0.9587	0.9584	0.9581	0.9578	0.9575	0.9572	0.9569	0.9566	208.0
208.5	0.9595	0.9592	0.9589	0.9586	0.9583	0.9579	0.9576	0.9573	0.9570	0.9567	0.9564	208.5
209.0	0.9593	0.9590	0.9587	0.9584	0.9581	0.9578	0.9575	0.9572	0.9569	0.9566	0.9563	209.0
209.5	0.9592	0.9589	0.9586	0.9583	0.9580	0.9577	0.9574	0.9570	0.9567	0.9564	0.9561	209.5
210.0	0.9590	0.9587	0.9584	0.9581	0.9578	0.9575	0.9572	0.9569	0.9566	0.9563	0.9560	210.0

* DENOTES EXTRAPOLATED VALUE

ALPHA = 270.0 TO 290.0

* DENOTES EXTRAPOLATED VALUE

ALPHA = 270.0 TO 290.0

TABLE 6C, VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP. F	
	274.0	276.0	278.0	280.0	282.0	284.0	286.0	288.0	290.0	292.0	294.0	296.0
210.0	0.9584	0.9581	0.9578	0.9575	0.9572	0.9569	0.9566	0.9563	0.9560	0.9557	0.9554	0.9551
210.5	0.9589	0.9586	0.9583	0.9580	0.9577	0.9574	0.9571	0.9568	0.9565	0.9562	0.9559	0.9556
211.0	0.9588	0.9585	0.9582	0.9579	0.9576	0.9573	0.9570	0.9567	0.9564	0.9561	0.9558	0.9555
211.5	0.9586	0.9583	0.9580	0.9577	0.9574	0.9571	0.9568	0.9565	0.9562	0.9559	0.9556	0.9553
212.0	0.9585	0.9582	0.9579	0.9576	0.9573	0.9570	0.9567	0.9564	0.9561	0.9558	0.9555	0.9552
212.5	0.9584	0.9581	0.9578	0.9575	0.9572	0.9569	0.9566	0.9563	0.9560	0.9557	0.9554	0.9551
213.0	0.9582	0.9579	0.9576	0.9573	0.9570	0.9567	0.9564	0.9561	0.9558	0.9555	0.9552	0.9549
213.5	0.9581	0.9578	0.9575	0.9572	0.9569	0.9566	0.9563	0.9560	0.9557	0.9554	0.9551	0.9548
214.0	0.9579	0.9576	0.9573	0.9570	0.9567	0.9564	0.9561	0.9558	0.9555	0.9552	0.9549	0.9546
214.5	0.9578	0.9575	0.9572	0.9569	0.9566	0.9563	0.9560	0.9557	0.9554	0.9551	0.9548	0.9545
215.0	0.9577	0.9574	0.9571	0.9568	0.9565	0.9562	0.9559	0.9556	0.9553	0.9550	0.9547	0.9544
215.5	0.9575	0.9572	0.9569	0.9566	0.9563	0.9560	0.9557	0.9554	0.9551	0.9548	0.9545	0.9542
216.0	0.9574	0.9571	0.9568	0.9565	0.9562	0.9559	0.9556	0.9553	0.9550	0.9547	0.9544	0.9541
216.5	0.9573	0.9569	0.9566	0.9563	0.9560	0.9557	0.9554	0.9551	0.9548	0.9545	0.9542	0.9539
217.0	0.9571	0.9568	0.9565	0.9562	0.9559	0.9556	0.9553	0.9550	0.9547	0.9544	0.9541	0.9538
217.5	0.9570	0.9567	0.9564	0.9561	0.9558	0.9555	0.9552	0.9549	0.9546	0.9543	0.9540	0.9537
218.0	0.9568	0.9565	0.9562	0.9559	0.9556	0.9553	0.9550	0.9547	0.9544	0.9541	0.9538	0.9535
218.5	0.9567	0.9564	0.9561	0.9558	0.9555	0.9552	0.9549	0.9546	0.9543	0.9540	0.9537	0.9534
219.0	0.9566	0.9562	0.9559	0.9556	0.9553	0.9550	0.9547	0.9544	0.9541	0.9538	0.9535	0.9532
219.5	0.9564	0.9561	0.9558	0.9555	0.9552	0.9549	0.9546	0.9543	0.9540	0.9537	0.9534	0.9531
220.0	0.9563	0.9560	0.9557	0.9554	0.9551	0.9548	0.9545	0.9542	0.9539	0.9536	0.9533	0.9530
220.5	0.9562	0.9558	0.9555	0.9552	0.9549	0.9546	0.9543	0.9540	0.9537	0.9534	0.9531	0.9528
221.0	0.9560	0.9557	0.9554	0.9551	0.9548	0.9545	0.9542	0.9539	0.9536	0.9533	0.9530	0.9527
221.5	0.9559	0.9555	0.9552	0.9549	0.9546	0.9543	0.9540	0.9537	0.9534	0.9531	0.9528	0.9525
222.0	0.9557	0.9554	0.9551	0.9547	0.9544	0.9541	0.9538	0.9535	0.9532	0.9529	0.9526	0.9523
222.5	0.9556	0.9553	0.9550	0.9546	0.9543	0.9540	0.9537	0.9534	0.9531	0.9528	0.9525	0.9522
223.0	0.9555	0.9551	0.9548	0.9545	0.9542	0.9539	0.9536	0.9533	0.9530	0.9527	0.9524	0.9521
223.5	0.9553	0.9550	0.9547	0.9544	0.9541	0.9538	0.9535	0.9532	0.9529	0.9526	0.9523	0.9520
224.0	0.9552	0.9549	0.9546	0.9543	0.9540	0.9537	0.9534	0.9531	0.9528	0.9525	0.9522	0.9519
224.5	0.9550	0.9547	0.9544	0.9540	0.9537	0.9534	0.9531	0.9528	0.9525	0.9522	0.9519	0.9516
225.0	0.9549	0.9546	0.9542	0.9539	0.9536	0.9532	0.9529	0.9525	0.9522	0.9519	0.9515	0.9512

* DENOTES EXTRAPOLATED VALUE

ALPHA = 270.0 TO 290.0

TABLE 6C, VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP. F	
	270.0	272.0	274.0	276.0	278.0	280.0	282.0	284.0	286.0	288.0		290.0
225.0	0.9549	0.9546	0.9542	0.9539	0.9536	0.9532	0.9529	0.9525	0.9522	0.9519	0.9515	225.0
225.5	0.9548	0.9544	0.9541	0.9538	0.9534	0.9531	0.9527	0.9524	0.9521	0.9517	0.9514	225.5
226.0	0.9546	0.9543	0.9540	0.9536	0.9533	0.9529	0.9526	0.9523	0.9519	0.9516	0.9512	226.0
226.5	0.9545	0.9542	0.9538	0.9535	0.9531	0.9528	0.9525	0.9521	0.9518	0.9514	0.9511	226.5
227.0	0.9544	0.9540	0.9537	0.9533	0.9530	0.9526	0.9523	0.9520	0.9516	0.9513	0.9509	227.0
227.5	0.9542	0.9539	0.9535	0.9532	0.9528	0.9525	0.9522	0.9518	0.9515	0.9511	0.9508	227.5
228.0	0.9541	0.9537	0.9534	0.9530	0.9527	0.9524	0.9520	0.9517	0.9513	0.9510	0.9506	228.0
228.5	0.9539	0.9536	0.9533	0.9529	0.9526	0.9522	0.9519	0.9515	0.9512	0.9508	0.9505	228.5
229.0	0.9538	0.9535	0.9531	0.9528	0.9524	0.9521	0.9517	0.9514	0.9510	0.9507	0.9503	229.0
229.5	0.9537	0.9533	0.9530	0.9526	0.9523	0.9519	0.9516	0.9512	0.9509	0.9505	0.9502	229.5
230.0	0.9535	0.9532	0.9528	0.9525	0.9521	0.9518	0.9514	0.9511	0.9507	0.9504	0.9500	230.0
230.5	0.9534	0.9530	0.9527	0.9523	0.9520	0.9516	0.9513	0.9509	0.9506	0.9502	0.9499	230.5
231.0	0.9533	0.9529	0.9526	0.9522	0.9519	0.9515	0.9512	0.9508	0.9505	0.9501	0.9497	231.0
231.5	0.9531	0.9528	0.9524	0.9521	0.9517	0.9514	0.9510	0.9507	0.9503	0.9500	0.9496	231.5
232.0	0.9530	0.9526	0.9523	0.9519	0.9516	0.9512	0.9509	0.9505	0.9502	0.9498	0.9495	232.0
232.5	0.9528	0.9525	0.9521	0.9518	0.9514	0.9511	0.9507	0.9504	0.9500	0.9497	0.9493	232.5
233.0	0.9527	0.9523	0.9520	0.9516	0.9513	0.9509	0.9506	0.9502	0.9499	0.9495	0.9492	233.0
233.5	0.9526	0.9522	0.9519	0.9515	0.9511	0.9508	0.9504	0.9501	0.9497	0.9494	0.9490	233.5
234.0	0.9524	0.9521	0.9517	0.9514	0.9510	0.9506	0.9503	0.9499	0.9496	0.9492	0.9489	234.0
234.5	0.9523	0.9519	0.9516	0.9512	0.9509	0.9505	0.9501	0.9498	0.9494	0.9491	0.9487	234.5
235.0	0.9521	0.9518	0.9514	0.9511	0.9507	0.9504	0.9500	0.9496	0.9493	0.9489	0.9486	235.0
235.5	0.9520	0.9516	0.9513	0.9509	0.9506	0.9502	0.9499	0.9495	0.9491	0.9488	0.9484	235.5
236.0	0.9519	0.9515	0.9511	0.9508	0.9504	0.9501	0.9497	0.9493	0.9490	0.9486	0.9483	236.0
236.5	0.9517	0.9514	0.9510	0.9506	0.9503	0.9499	0.9496	0.9492	0.9488	0.9485	0.9481	236.5
237.0	0.9516	0.9512	0.9509	0.9505	0.9501	0.9498	0.9494	0.9491	0.9487	0.9483	0.9480	237.0
237.5	0.9515	0.9511	0.9507	0.9504	0.9500	0.9496	0.9493	0.9489	0.9485	0.9482	0.9478	237.5
238.0	0.9513	0.9510	0.9506	0.9502	0.9499	0.9495	0.9491	0.9488	0.9484	0.9480	0.9477	238.0
238.5	0.9512	0.9508	0.9504	0.9501	0.9497	0.9493	0.9490	0.9486	0.9483	0.9479	0.9475	238.5
239.0	0.9510	0.9507	0.9503	0.9499	0.9496	0.9492	0.9488	0.9485	0.9481	0.9477	0.9474	239.0
239.5	0.9509	0.9505	0.9502	0.9498	0.9494	0.9491	0.9487	0.9483	0.9480	0.9476	0.9472	239.5
240.0	0.9508	0.9504	0.9500	0.9497	0.9493	0.9489	0.9485	0.9482	0.9478	0.9474	0.9471	240.0

* DENOTES EXTRAPOLATED VALUE

ALPHA = 270.0 TO 290.0

TABLE 6C. VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 °F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP. F	
	270.0	272.0	274.0	276.0	278.0	280.0	282.0	284.0	286.0	288.0		290.0
2240.0	0.9508	0.9504	0.9500	0.9497	0.9493	0.9489	0.9485	0.9482	0.9478	0.9474	0.9471	240.0
2240.5	0.9506	0.9503	0.9499	0.9495	0.9491	0.9488	0.9484	0.9480	0.9477	0.9473	0.9469	240.5
2241.0	0.9505	0.9501	0.9497	0.9494	0.9490	0.9486	0.9483	0.9479	0.9475	0.9471	0.9468	241.0
2241.5	0.9503	0.9500	0.9496	0.9492	0.9489	0.9485	0.9481	0.9477	0.9474	0.9470	0.9466	241.5
2242.0	0.9502	0.9498	0.9495	0.9491	0.9487	0.9483	0.9480	0.9476	0.9472	0.9469	0.9465	242.0
2242.5	0.9501	0.9497	0.9493	0.9489	0.9486	0.9482	0.9478	0.9475	0.9471	0.9467	0.9463	242.5
2243.0	0.9499	0.9496	0.9492	0.9488	0.9484	0.9481	0.9477	0.9473	0.9469	0.9466	0.9462	243.0
2243.5	0.9498	0.9494	0.9490	0.9487	0.9483	0.9479	0.9475	0.9472	0.9468	0.9464	0.9460	243.5
2244.0	0.9497	0.9493	0.9489	0.9485	0.9481	0.9478	0.9474	0.9470	0.9466	0.9463	0.9459	244.0
2244.5	0.9495	0.9491	0.9488	0.9484	0.9480	0.9476	0.9472	0.9469	0.9465	0.9461	0.9457	244.5
2245.0	0.9494	0.9490	0.9486	0.9482	0.9479	0.9475	0.9471	0.9467	0.9463	0.9460	0.9456	245.0
2245.5	0.9492	0.9489	0.9485	0.9481	0.9477	0.9473	0.9470	0.9466	0.9462	0.9458	0.9454	245.5
2246.0	0.9491	0.9487	0.9483	0.9480	0.9476	0.9472	0.9468	0.9464	0.9461	0.9457	0.9453	246.0
2246.5	0.9490	0.9486	0.9482	0.9478	0.9474	0.9471	0.9467	0.9463	0.9459	0.9455	0.9451	246.5
2247.0	0.9488	0.9484	0.9481	0.9477	0.9473	0.9469	0.9465	0.9461	0.9458	0.9454	0.9450	247.0
2247.5	0.9487	0.9483	0.9479	0.9475	0.9471	0.9468	0.9464	0.9460	0.9456	0.9452	0.9448	247.5
2248.0	0.9485	0.9482	0.9478	0.9474	0.9470	0.9466	0.9462	0.9458	0.9455	0.9451	0.9447	248.0
2248.5	0.9484	0.9480	0.9476	0.9473	0.9469	0.9465	0.9461	0.9457	0.9453	0.9449	0.9445	248.5
2249.0	0.9483	0.9479	0.9475	0.9471	0.9467	0.9463	0.9459	0.9456	0.9452	0.9448	0.9444	249.0
2249.5	0.9481	0.9477	0.9474	0.9470	0.9466	0.9462	0.9458	0.9454	0.9450	0.9446	0.9442	249.5
250.0	0.9480	0.9476	0.9472	0.9468	0.9464	0.9460	0.9457	0.9453	0.9449	0.9445	0.9441	250.0
2250.5	0.9479*	0.9475*	0.9471*	0.9467*	0.9463*	0.9459*	0.9455*	0.9451*	0.9447*	0.9443*	0.9439*	250.5
2251.0	0.9477*	0.9473*	0.9469*	0.9465*	0.9462*	0.9458*	0.9454*	0.9450*	0.9446*	0.9442*	0.9438*	251.0
2251.5	0.9476*	0.9472*	0.9468*	0.9464*	0.9460*	0.9456*	0.9452*	0.9448*	0.9444*	0.9440*	0.9436*	251.5
2252.0	0.9474*	0.9470*	0.9467*	0.9463*	0.9459*	0.9455*	0.9451*	0.9447*	0.9443*	0.9439*	0.9435*	252.0
2252.5	0.9473*	0.9469*	0.9465*	0.9461*	0.9457*	0.9453*	0.9449*	0.9445*	0.9441*	0.9437*	0.9433*	252.5
2253.0	0.9472*	0.9468*	0.9464*	0.9460*	0.9456*	0.9452*	0.9448*	0.9444*	0.9440*	0.9436*	0.9432*	253.0
2253.5	0.9470*	0.9466*	0.9462*	0.9458*	0.9454*	0.9450*	0.9446*	0.9442*	0.9438*	0.9434*	0.9431*	253.5
2254.0	0.9469*	0.9465*	0.9461*	0.9457*	0.9453*	0.9449*	0.9445*	0.9441*	0.9437*	0.9433*	0.9429*	254.0
2254.5	0.9467*	0.9463*	0.9460*	0.9456*	0.9452*	0.9448*	0.9444*	0.9440*	0.9436*	0.9432*	0.9428*	254.5
2255.0	0.9466*	0.9462*	0.9458*	0.9454*	0.9450*	0.9446*	0.9442*	0.9438*	0.9434*	0.9430*	0.9426*	255.0

* DENOTES EXTRAPOLATED VALUE

ALPHA = 270.0 TO 290.0

TABLE 6C, VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F)													
FACTOR FOR CORRECTING VOLUME TO 60 F													
TEMP. F	270.0	272.0	274.0	276.0	278.0	280.0	282.0	284.0	286.0	288.0	290.0	TEMP. F	
255.0	0.9466*	0.9462*	0.9458*	0.9454*	0.9450*	0.9446*	0.9442*	0.9438*	0.9434*	0.9430*	0.9426*	255.0	
255.5	0.9465*	0.9461*	0.9457*	0.9453*	0.9449*	0.9445*	0.9441*	0.9437*	0.9433*	0.9429*	0.9425*	255.5	
256.0	0.9463*	0.9459*	0.9455*	0.9451*	0.9447*	0.9443*	0.9439*	0.9435*	0.9431*	0.9427*	0.9423*	256.0	
256.5	0.9462*	0.9458*	0.9454*	0.9450*	0.9446*	0.9442*	0.9438*	0.9434*	0.9430*	0.9426*	0.9422*	256.5	
257.0	0.9461*	0.9457*	0.9452*	0.9448*	0.9444*	0.9440*	0.9436*	0.9432*	0.9428*	0.9424*	0.9420*	257.0	
257.5	0.9459*	0.9455*	0.9451*	0.9447*	0.9443*	0.9439*	0.9435*	0.9431*	0.9427*	0.9423*	0.9419*	257.5	
258.0	0.9458*	0.9454*	0.9450*	0.9446*	0.9442*	0.9438*	0.9434*	0.9430*	0.9426*	0.9422*	0.9418*	258.0	
258.5	0.9456*	0.9452*	0.9448*	0.9444*	0.9440*	0.9436*	0.9432*	0.9428*	0.9424*	0.9420*	0.9416*	258.5	
259.0	0.9455*	0.9451*	0.9447*	0.9443*	0.9439*	0.9435*	0.9431*	0.9427*	0.9423*	0.9419*	0.9415*	259.0	
259.5	0.9454*	0.9450*	0.9445*	0.9441*	0.9437*	0.9433*	0.9429*	0.9425*	0.9421*	0.9417*	0.9413*	259.5	
260.0	0.9452*	0.9448*	0.9444*	0.9440*	0.9436*	0.9432*	0.9428*	0.9424*	0.9419*	0.9415*	0.9411*	260.0	
260.5	0.9451*	0.9447*	0.9443*	0.9439*	0.9435*	0.9431*	0.9427*	0.9423*	0.9418*	0.9414*	0.9410*	260.5	
261.0	0.9449*	0.9445*	0.9441*	0.9437*	0.9433*	0.9429*	0.9425*	0.9421*	0.9416*	0.9412*	0.9408*	261.0	
261.5	0.9448*	0.9444*	0.9440*	0.9436*	0.9432*	0.9427*	0.9423*	0.9419*	0.9415*	0.9411*	0.9407*	261.5	
262.0	0.9447*	0.9443*	0.9438*	0.9434*	0.9430*	0.9426*	0.9422*	0.9418*	0.9413*	0.9409*	0.9405*	262.0	
262.5	0.9445*	0.9441*	0.9437*	0.9433*	0.9429*	0.9425*	0.9420*	0.9416*	0.9412*	0.9408*	0.9404*	262.5	
263.0	0.9444*	0.9440*	0.9436*	0.9431*	0.9427*	0.9423*	0.9419*	0.9415*	0.9411*	0.9406*	0.9402*	263.0	
263.5	0.9443*	0.9438*	0.9434*	0.9430*	0.9426*	0.9422*	0.9417*	0.9413*	0.9409*	0.9405*	0.9401*	263.5	
264.0	0.9441*	0.9437*	0.9433*	0.9429*	0.9424*	0.9420*	0.9416*	0.9412*	0.9408*	0.9403*	0.9399*	264.0	
264.5	0.9440*	0.9436*	0.9431*	0.9427*	0.9423*	0.9419*	0.9415*	0.9410*	0.9406*	0.9402*	0.9398*	264.5	
265.0	0.9438*	0.9434*	0.9430*	0.9426*	0.9422*	0.9417*	0.9413*	0.9409*	0.9405*	0.9400*	0.9396*	265.0	
265.5	0.9437*	0.9433*	0.9429*	0.9424*	0.9420*	0.9416*	0.9412*	0.9407*	0.9403*	0.9399*	0.9395*	265.5	
266.0	0.9436*	0.9431*	0.9427*	0.9423*	0.9419*	0.9414*	0.9410*	0.9406*	0.9402*	0.9397*	0.9393*	266.0	
266.5	0.9434*	0.9430*	0.9426*	0.9421*	0.9417*	0.9413*	0.9409*	0.9404*	0.9400*	0.9396*	0.9392*	266.5	
267.0	0.9433*	0.9429*	0.9424*	0.9420*	0.9416*	0.9412*	0.9407*	0.9403*	0.9399*	0.9395*	0.9390*	267.0	
267.5	0.9431*	0.9427*	0.9423*	0.9419*	0.9414*	0.9410*	0.9406*	0.9402*	0.9397*	0.9393*	0.9389*	267.5	
268.0	0.9430*	0.9426*	0.9422*	0.9417*	0.9413*	0.9409*	0.9404*	0.9400*	0.9396*	0.9392*	0.9387*	268.0	
268.5	0.9429*	0.9424*	0.9420*	0.9416*	0.9412*	0.9407*	0.9403*	0.9399*	0.9394*	0.9390*	0.9386*	268.5	
269.0	0.9427*	0.9423*	0.9419*	0.9414*	0.9410*	0.9406*	0.9401*	0.9397*	0.9393*	0.9389*	0.9384*	269.0	
269.5	0.9426*	0.9422*	0.9417*	0.9413*	0.9409*	0.9404*	0.9400*	0.9396*	0.9391*	0.9387*	0.9383*	269.5	
270.0	0.9425*	0.9420*	0.9416*	0.9412*	0.9407*	0.9403*	0.9399*	0.9394*	0.9390*	0.9386*	0.9381*	270.0	

* DENOTES EXTRAPOLATED VALUE

ALPHA = 270.0 TO 290.0

TABLE 6C. VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP. F	
	270.0	272.0	274.0	276.0	278.0	280.0	282.0	284.0	286.0	288.0	290.0	TEMP. F
270.0	0.9425*	0.9420*	0.9416*	0.9412*	0.9407*	0.9403*	0.9399*	0.9394*	0.9390*	0.9386*	0.9381*	270.0
270.5	0.9423*	0.9419*	0.9414*	0.9410*	0.9406*	0.9401*	0.9397*	0.9393*	0.9388*	0.9384*	0.9380*	270.5
271.0	0.9422*	0.9417*	0.9413*	0.9409*	0.9404*	0.9400*	0.9396*	0.9391*	0.9387*	0.9383*	0.9378*	271.0
271.5	0.9420*	0.9416*	0.9412*	0.9407*	0.9403*	0.9399*	0.9394*	0.9390*	0.9386*	0.9381*	0.9377*	271.5
272.0	0.9419*	0.9415*	0.9410*	0.9406*	0.9402*	0.9397*	0.9393*	0.9388*	0.9384*	0.9380*	0.9375*	272.0
272.5	0.9418*	0.9413*	0.9409*	0.9404*	0.9400*	0.9396*	0.9391*	0.9387*	0.9383*	0.9378*	0.9374*	272.5
273.0	0.9416*	0.9412*	0.9407*	0.9403*	0.9399*	0.9394*	0.9390*	0.9385*	0.9381*	0.9377*	0.9372*	273.0
273.5	0.9415*	0.9410*	0.9406*	0.9402*	0.9397*	0.9393*	0.9388*	0.9384*	0.9380*	0.9375*	0.9371*	273.5
274.0	0.9413*	0.9409*	0.9405*	0.9400*	0.9396*	0.9391*	0.9387*	0.9383*	0.9378*	0.9374*	0.9369*	274.0
274.5	0.9412*	0.9408*	0.9403*	0.9399*	0.9394*	0.9390*	0.9386*	0.9381*	0.9377*	0.9372*	0.9368*	274.5
275.0	0.9411*	0.9406*	0.9402*	0.9397*	0.9393*	0.9389*	0.9384*	0.9380*	0.9375*	0.9371*	0.9366*	275.0
275.5	0.9409*	0.9405*	0.9400*	0.9396*	0.9391*	0.9387*	0.9383*	0.9378*	0.9374*	0.9369*	0.9365*	275.5
276.0	0.9408*	0.9403*	0.9399*	0.9395*	0.9390*	0.9386*	0.9381*	0.9377*	0.9372*	0.9368*	0.9363*	276.0
276.5	0.9406*	0.9402*	0.9398*	0.9393*	0.9389*	0.9384*	0.9380*	0.9375*	0.9371*	0.9366*	0.9362*	276.5
277.0	0.9405*	0.9401*	0.9396*	0.9392*	0.9387*	0.9383*	0.9378*	0.9374*	0.9369*	0.9365*	0.9360*	277.0
277.5	0.9404*	0.9399*	0.9395*	0.9390*	0.9386*	0.9381*	0.9377*	0.9372*	0.9368*	0.9363*	0.9359*	277.5
278.0	0.9402*	0.9398*	0.9393*	0.9389*	0.9384*	0.9380*	0.9375*	0.9371*	0.9366*	0.9362*	0.9357*	278.0
278.5	0.9401*	0.9396*	0.9392*	0.9387*	0.9383*	0.9378*	0.9374*	0.9369*	0.9365*	0.9360*	0.9356*	278.5
279.0	0.9400*	0.9395*	0.9390*	0.9386*	0.9381*	0.9377*	0.9372*	0.9368*	0.9363*	0.9359*	0.9354*	279.0
279.5	0.9398*	0.9394*	0.9389*	0.9385*	0.9380*	0.9376*	0.9371*	0.9366*	0.9362*	0.9357*	0.9353*	279.5
280.0	0.9397*	0.9392*	0.9388*	0.9383*	0.9379*	0.9374*	0.9370*	0.9365*	0.9360*	0.9356*	0.9351*	280.0
280.5	0.9395*	0.9391*	0.9386*	0.9382*	0.9377*	0.9373*	0.9368*	0.9364*	0.9359*	0.9354*	0.9350*	280.5
281.0	0.9394*	0.9389*	0.9385*	0.9380*	0.9376*	0.9371*	0.9367*	0.9362*	0.9358*	0.9353*	0.9348*	281.0
281.5	0.9393*	0.9388*	0.9383*	0.9379*	0.9374*	0.9370*	0.9365*	0.9361*	0.9356*	0.9352*	0.9347*	281.5
282.0	0.9391*	0.9387*	0.9382*	0.9377*	0.9373*	0.9368*	0.9364*	0.9359*	0.9355*	0.9350*	0.9345*	282.0
282.5	0.9390*	0.9385*	0.9381*	0.9376*	0.9371*	0.9367*	0.9362*	0.9358*	0.9353*	0.9349*	0.9344*	282.5
283.0	0.9388*	0.9384*	0.9379*	0.9375*	0.9370*	0.9365*	0.9361*	0.9356*	0.9352*	0.9347*	0.9342*	283.0
283.5	0.9387*	0.9382*	0.9378*	0.9373*	0.9369*	0.9364*	0.9359*	0.9355*	0.9350*	0.9346*	0.9341*	283.5
284.0	0.9386*	0.9381*	0.9376*	0.9372*	0.9367*	0.9363*	0.9358*	0.9353*	0.9349*	0.9344*	0.9339*	284.0
284.5	0.9384*	0.9380*	0.9375*	0.9370*	0.9366*	0.9361*	0.9356*	0.9352*	0.9347*	0.9343*	0.9338*	284.5
285.0	0.9383*	0.9378*	0.9374*	0.9369*	0.9364*	0.9360*	0.9355*	0.9350*	0.9346*	0.9341*	0.9336*	285.0

ALPHA = 270.0 TO 290.0

* DENOTES EXTRAPOLATED VALUE

TABLE 6C, VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP. F	
	274.0	276.0	278.0	280.0	282.0	284.0	286.0	288.0	290.0		288.0	290.0
285.0	0.9374*	0.9378*	0.9383*	0.9387*	0.9391*	0.9395*	0.9399*	0.9403*	0.9407*	0.9411*	0.9346*	0.9336*
285.5	0.9372*	0.9377*	0.9381*	0.9385*	0.9389*	0.9393*	0.9397*	0.9401*	0.9405*	0.9409*	0.9344*	0.9335*
286.0	0.9371*	0.9375*	0.9380*	0.9384*	0.9388*	0.9392*	0.9396*	0.9400*	0.9404*	0.9408*	0.9343*	0.9333*
286.5	0.9370*	0.9374*	0.9379*	0.9383*	0.9387*	0.9391*	0.9395*	0.9399*	0.9403*	0.9407*	0.9341*	0.9332*
287.0	0.9368*	0.9373*	0.9377*	0.9381*	0.9385*	0.9389*	0.9393*	0.9397*	0.9401*	0.9405*	0.9340*	0.9330*
287.5	0.9367*	0.9371*	0.9376*	0.9380*	0.9384*	0.9388*	0.9392*	0.9396*	0.9400*	0.9404*	0.9338*	0.9329*
288.0	0.9365*	0.9370*	0.9375*	0.9379*	0.9383*	0.9387*	0.9391*	0.9395*	0.9399*	0.9403*	0.9337*	0.9328*
288.5	0.9364*	0.9368*	0.9373*	0.9377*	0.9381*	0.9385*	0.9389*	0.9393*	0.9397*	0.9401*	0.9335*	0.9326*
289.0	0.9362*	0.9367*	0.9372*	0.9376*	0.9380*	0.9384*	0.9388*	0.9392*	0.9396*	0.9400*	0.9334*	0.9325*
289.5	0.9361*	0.9366*	0.9370*	0.9375*	0.9379*	0.9383*	0.9387*	0.9391*	0.9395*	0.9399*	0.9332*	0.9323*
290.0	0.9359*	0.9364*	0.9369*	0.9373*	0.9377*	0.9381*	0.9385*	0.9389*	0.9393*	0.9397*	0.9331*	0.9322*
290.5	0.9358*	0.9363*	0.9368*	0.9372*	0.9376*	0.9380*	0.9384*	0.9388*	0.9392*	0.9396*	0.9330*	0.9320*
291.0	0.9357*	0.9361*	0.9366*	0.9370*	0.9374*	0.9378*	0.9382*	0.9386*	0.9390*	0.9394*	0.9328*	0.9319*
291.5	0.9355*	0.9360*	0.9365*	0.9369*	0.9373*	0.9377*	0.9381*	0.9385*	0.9389*	0.9393*	0.9327*	0.9317*
292.0	0.9354*	0.9359*	0.9363*	0.9367*	0.9371*	0.9375*	0.9379*	0.9383*	0.9387*	0.9391*	0.9325*	0.9316*
292.5	0.9352*	0.9357*	0.9362*	0.9366*	0.9370*	0.9374*	0.9378*	0.9382*	0.9386*	0.9390*	0.9324*	0.9314*
293.0	0.9351*	0.9356*	0.9361*	0.9365*	0.9369*	0.9373*	0.9377*	0.9381*	0.9385*	0.9389*	0.9322*	0.9313*
293.5	0.9350*	0.9354*	0.9359*	0.9363*	0.9367*	0.9371*	0.9375*	0.9379*	0.9383*	0.9387*	0.9321*	0.9311*
294.0	0.9348*	0.9353*	0.9358*	0.9362*	0.9366*	0.9370*	0.9374*	0.9378*	0.9382*	0.9386*	0.9319*	0.9310*
294.5	0.9347*	0.9352*	0.9356*	0.9360*	0.9364*	0.9368*	0.9372*	0.9376*	0.9380*	0.9384*	0.9318*	0.9308*
295.0	0.9345*	0.9350*	0.9355*	0.9359*	0.9363*	0.9367*	0.9371*	0.9375*	0.9379*	0.9383*	0.9316*	0.9307*
295.5	0.9344*	0.9349*	0.9354*	0.9358*	0.9362*	0.9366*	0.9370*	0.9374*	0.9378*	0.9382*	0.9315*	0.9305*
296.0	0.9343*	0.9347*	0.9352*	0.9356*	0.9360*	0.9364*	0.9368*	0.9372*	0.9376*	0.9380*	0.9313*	0.9304*
296.5	0.9341*	0.9346*	0.9351*	0.9355*	0.9359*	0.9363*	0.9367*	0.9371*	0.9375*	0.9379*	0.9312*	0.9302*
297.0	0.9340*	0.9345*	0.9349*	0.9353*	0.9357*	0.9361*	0.9365*	0.9369*	0.9373*	0.9377*	0.9310*	0.9301*
297.5	0.9338*	0.9343*	0.9348*	0.9352*	0.9356*	0.9360*	0.9364*	0.9368*	0.9372*	0.9376*	0.9309*	0.9299*
298.0	0.9337*	0.9342*	0.9347*	0.9351*	0.9355*	0.9359*	0.9363*	0.9367*	0.9371*	0.9375*	0.9307*	0.9298*
298.5	0.9335*	0.9340*	0.9345*	0.9349*	0.9353*	0.9357*	0.9361*	0.9365*	0.9369*	0.9373*	0.9306*	0.9296*
299.0	0.9334*	0.9339*	0.9344*	0.9348*	0.9352*	0.9356*	0.9360*	0.9364*	0.9368*	0.9372*	0.9304*	0.9295*
299.5	0.9333*	0.9338*	0.9343*	0.9347*	0.9351*	0.9355*	0.9359*	0.9363*	0.9367*	0.9371*	0.9303*	0.9293*
300.0	0.9331*	0.9336*	0.9341*	0.9345*	0.9349*	0.9353*	0.9357*	0.9361*	0.9365*	0.9369*	0.9302*	0.9292*

* DENOTES EXTRAPOLATED VALUE

ALPHA = 270.0 TO 290.0

TABLE 6C, VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP. F	
	290.0	292.0	294.0	296.0	298.0	300.0	302.0	304.0	306.0	308.0		310.0
0.0	1.0173	1.0174	1.0175	1.0177	1.0178	1.0179	1.0180	1.0181	1.0183	1.0184	1.0185	0.0
0.5	1.0172	1.0173	1.0174	1.0175	1.0176	1.0178	1.0179	1.0180	1.0181	1.0182	1.0183	0.5
1.0	1.0170	1.0171	1.0173	1.0174	1.0175	1.0176	1.0177	1.0178	1.0180	1.0181	1.0182	1.0
1.5	1.0169	1.0170	1.0171	1.0172	1.0173	1.0175	1.0176	1.0177	1.0178	1.0179	1.0180	1.5
2.0	1.0167	1.0168	1.0170	1.0171	1.0172	1.0173	1.0174	1.0175	1.0176	1.0178	1.0179	2.0
2.5	1.0166	1.0167	1.0168	1.0169	1.0170	1.0172	1.0173	1.0174	1.0175	1.0176	1.0177	2.5
3.0	1.0164	1.0166	1.0167	1.0168	1.0169	1.0170	1.0171	1.0172	1.0173	1.0175	1.0176	3.0
3.5	1.0163	1.0164	1.0165	1.0166	1.0167	1.0169	1.0170	1.0171	1.0172	1.0173	1.0174	3.5
4.0	1.0162	1.0163	1.0164	1.0165	1.0166	1.0167	1.0168	1.0169	1.0170	1.0172	1.0173	4.0
4.5	1.0160	1.0161	1.0162	1.0163	1.0165	1.0166	1.0167	1.0168	1.0169	1.0170	1.0171	4.5
5.0	1.0159	1.0160	1.0161	1.0162	1.0163	1.0164	1.0165	1.0166	1.0167	1.0169	1.0170	5.0
5.5	1.0157	1.0158	1.0159	1.0161	1.0162	1.0163	1.0164	1.0165	1.0166	1.0167	1.0168	5.5
6.0	1.0156	1.0157	1.0158	1.0159	1.0160	1.0161	1.0162	1.0163	1.0164	1.0165	1.0167	6.0
6.5	1.0154	1.0155	1.0157	1.0158	1.0159	1.0160	1.0161	1.0162	1.0163	1.0164	1.0165	6.5
7.0	1.0153	1.0154	1.0155	1.0156	1.0157	1.0158	1.0159	1.0160	1.0161	1.0162	1.0163	7.0
7.5	1.0152	1.0153	1.0154	1.0155	1.0156	1.0157	1.0158	1.0159	1.0160	1.0161	1.0162	7.5
8.0	1.0150	1.0151	1.0152	1.0153	1.0154	1.0155	1.0156	1.0157	1.0158	1.0159	1.0160	8.0
8.5	1.0149	1.0150	1.0151	1.0152	1.0153	1.0154	1.0155	1.0156	1.0157	1.0158	1.0159	8.5
9.0	1.0147	1.0148	1.0149	1.0150	1.0151	1.0152	1.0153	1.0154	1.0155	1.0156	1.0157	9.0
9.5	1.0146	1.0147	1.0148	1.0149	1.0150	1.0151	1.0152	1.0153	1.0154	1.0155	1.0156	9.5
10.0	1.0144	1.0145	1.0146	1.0147	1.0148	1.0149	1.0150	1.0151	1.0152	1.0153	1.0154	10.0
10.5	1.0143	1.0144	1.0145	1.0146	1.0147	1.0148	1.0149	1.0150	1.0151	1.0152	1.0153	10.5
11.0	1.0141	1.0142	1.0143	1.0144	1.0145	1.0146	1.0147	1.0148	1.0149	1.0150	1.0151	11.0
11.5	1.0140	1.0141	1.0142	1.0143	1.0144	1.0145	1.0146	1.0147	1.0148	1.0149	1.0150	11.5
12.0	1.0139	1.0140	1.0141	1.0141	1.0142	1.0143	1.0144	1.0145	1.0146	1.0147	1.0148	12.0
12.5	1.0137	1.0138	1.0139	1.0140	1.0141	1.0142	1.0143	1.0144	1.0145	1.0146	1.0147	12.5
13.0	1.0136	1.0137	1.0138	1.0139	1.0139	1.0140	1.0141	1.0142	1.0143	1.0144	1.0145	13.0
13.5	1.0134	1.0135	1.0136	1.0137	1.0138	1.0139	1.0140	1.0141	1.0142	1.0143	1.0144	13.5
14.0	1.0133	1.0134	1.0135	1.0136	1.0136	1.0137	1.0138	1.0139	1.0140	1.0141	1.0142	14.0
14.5	1.0131	1.0132	1.0133	1.0134	1.0135	1.0136	1.0137	1.0138	1.0139	1.0140	1.0140	14.5
15.0	1.0130	1.0131	1.0132	1.0133	1.0134	1.0134	1.0135	1.0136	1.0137	1.0138	1.0139	15.0

* DENOTES EXTRAPOLATED VALUE

ALPHA = 290.0 TO 310.0

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DENOTES EXTRAPOLATED VALUE

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TABLE 6C. VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP. F
	290.0	292.0	294.0	296.0	298.0	300.0	302.0	304.0	306.0	308.0	
30.0	1.0087	1.0087	1.0088	1.0089	1.0089	1.0090	1.0090	1.0091	1.0092	1.0092	1.0093
30.5	1.0085	1.0086	1.0087	1.0087	1.0088	1.0088	1.0089	1.0089	1.0090	1.0091	1.0091
31.0	1.0084	1.0084	1.0085	1.0086	1.0086	1.0087	1.0087	1.0088	1.0088	1.0089	1.0090
31.5	1.0082	1.0083	1.0084	1.0084	1.0085	1.0085	1.0086	1.0086	1.0087	1.0088	1.0088
32.0	1.0081	1.0082	1.0082	1.0083	1.0083	1.0084	1.0084	1.0085	1.0085	1.0086	1.0087
32.5	1.0080	1.0080	1.0081	1.0081	1.0082	1.0082	1.0083	1.0083	1.0084	1.0084	1.0085
33.0	1.0078	1.0079	1.0079	1.0080	1.0080	1.0081	1.0081	1.0082	1.0082	1.0083	1.0083
33.5	1.0077	1.0077	1.0078	1.0078	1.0079	1.0079	1.0080	1.0080	1.0081	1.0081	1.0082
34.0	1.0075	1.0076	1.0076	1.0077	1.0077	1.0078	1.0078	1.0079	1.0079	1.0080	1.0080
34.5	1.0074	1.0074	1.0075	1.0075	1.0076	1.0076	1.0077	1.0077	1.0078	1.0078	1.0079
35.0	1.0072	1.0073	1.0073	1.0074	1.0074	1.0075	1.0075	1.0076	1.0076	1.0077	1.0077
35.5	1.0071	1.0071	1.0072	1.0072	1.0073	1.0073	1.0074	1.0074	1.0075	1.0075	1.0076
36.0	1.0069	1.0070	1.0070	1.0071	1.0071	1.0072	1.0072	1.0073	1.0073	1.0074	1.0074
36.5	1.0068	1.0068	1.0069	1.0069	1.0070	1.0070	1.0071	1.0071	1.0072	1.0072	1.0073
37.0	1.0067	1.0067	1.0067	1.0068	1.0068	1.0069	1.0069	1.0070	1.0070	1.0071	1.0071
37.5	1.0065	1.0066	1.0066	1.0066	1.0067	1.0067	1.0068	1.0068	1.0069	1.0069	1.0070
38.0	1.0064	1.0064	1.0065	1.0065	1.0065	1.0066	1.0066	1.0067	1.0067	1.0068	1.0068
38.5	1.0062	1.0063	1.0063	1.0064	1.0064	1.0064	1.0065	1.0065	1.0066	1.0066	1.0067
39.0	1.0061	1.0061	1.0062	1.0062	1.0062	1.0063	1.0063	1.0064	1.0064	1.0065	1.0065
39.5	1.0059	1.0060	1.0060	1.0061	1.0061	1.0061	1.0062	1.0062	1.0063	1.0063	1.0063
40.0	1.0058	1.0058	1.0059	1.0059	1.0059	1.0060	1.0060	1.0061	1.0061	1.0061	1.0062
40.5	1.0056	1.0057	1.0057	1.0058	1.0058	1.0058	1.0059	1.0059	1.0060	1.0060	1.0060
41.0	1.0055	1.0055	1.0056	1.0056	1.0057	1.0057	1.0057	1.0058	1.0058	1.0058	1.0059
41.5	1.0054	1.0054	1.0054	1.0055	1.0055	1.0055	1.0056	1.0056	1.0057	1.0057	1.0057
42.0	1.0052	1.0052	1.0053	1.0053	1.0054	1.0054	1.0054	1.0055	1.0055	1.0055	1.0056
42.5	1.0051	1.0051	1.0051	1.0052	1.0052	1.0052	1.0053	1.0053	1.0053	1.0054	1.0054
43.0	1.0049	1.0050	1.0050	1.0050	1.0051	1.0051	1.0051	1.0052	1.0052	1.0052	1.0053
43.5	1.0048	1.0048	1.0048	1.0049	1.0049	1.0049	1.0050	1.0050	1.0050	1.0051	1.0051
44.0	1.0046	1.0047	1.0047	1.0047	1.0048	1.0048	1.0048	1.0049	1.0049	1.0049	1.0050
44.5	1.0045	1.0045	1.0046	1.0046	1.0046	1.0046	1.0047	1.0047	1.0047	1.0048	1.0048
45.0	1.0043	1.0044	1.0044	1.0044	1.0045	1.0045	1.0045	1.0046	1.0046	1.0046	1.0046

* DENOTES EXTRAPOLATED VALUE

ALPHA = 290.0 TO 310.0

TABLE 6C, VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP. F	
	290.0	292.0	294.0	296.0	298.0	300.0	302.0	304.0	306.0	308.0		310.0
45.0	1.0043	1.0044	1.0044	1.0044	1.0045	1.0045	1.0045	1.0046	1.0046	1.0046	1.0046	45.0
45.5	1.0042	1.0042	1.0043	1.0043	1.0043	1.0043	1.0044	1.0044	1.0044	1.0045	1.0045	45.5
46.0	1.0041	1.0041	1.0041	1.0041	1.0042	1.0042	1.0042	1.0043	1.0043	1.0043	1.0043	46.0
46.5	1.0039	1.0039	1.0040	1.0040	1.0040	1.0040	1.0041	1.0041	1.0041	1.0042	1.0042	46.5
47.0	1.0038	1.0038	1.0038	1.0038	1.0039	1.0039	1.0039	1.0040	1.0040	1.0040	1.0040	47.0
47.5	1.0036	1.0036	1.0037	1.0037	1.0037	1.0037	1.0038	1.0038	1.0038	1.0038	1.0039	47.5
48.0	1.0035	1.0035	1.0035	1.0035	1.0036	1.0036	1.0036	1.0036	1.0037	1.0037	1.0037	48.0
48.5	1.0033	1.0034	1.0034	1.0034	1.0034	1.0034	1.0035	1.0035	1.0035	1.0035	1.0036	48.5
49.0	1.0032	1.0032	1.0032	1.0033	1.0033	1.0033	1.0033	1.0033	1.0034	1.0034	1.0034	49.0
49.5	1.0030	1.0031	1.0031	1.0031	1.0031	1.0031	1.0032	1.0032	1.0032	1.0032	1.0033	49.5
50.0	1.0029	1.0029	1.0029	1.0030	1.0030	1.0030	1.0030	1.0030	1.0031	1.0031	1.0031	50.0
50.5	1.0028	1.0028	1.0028	1.0028	1.0028	1.0028	1.0029	1.0029	1.0029	1.0029	1.0029	50.5
51.0	1.0026	1.0026	1.0026	1.0027	1.0027	1.0027	1.0027	1.0027	1.0028	1.0028	1.0028	51.0
51.5	1.0025	1.0025	1.0025	1.0025	1.0025	1.0025	1.0026	1.0026	1.0026	1.0026	1.0026	51.5
52.0	1.0023	1.0023	1.0024	1.0024	1.0024	1.0024	1.0024	1.0024	1.0024	1.0025	1.0025	52.0
52.5	1.0022	1.0022	1.0022	1.0022	1.0022	1.0022	1.0023	1.0023	1.0023	1.0023	1.0023	52.5
53.0	1.0020	1.0020	1.0021	1.0021	1.0021	1.0021	1.0021	1.0021	1.0021	1.0022	1.0022	53.0
53.5	1.0019	1.0019	1.0019	1.0019	1.0019	1.0019	1.0020	1.0020	1.0020	1.0020	1.0020	53.5
54.0	1.0017	1.0018	1.0018	1.0018	1.0018	1.0018	1.0018	1.0018	1.0018	1.0018	1.0019	54.0
54.5	1.0016	1.0016	1.0016	1.0016	1.0016	1.0016	1.0017	1.0017	1.0017	1.0017	1.0017	54.5
55.0	1.0014	1.0015	1.0015	1.0015	1.0015	1.0015	1.0015	1.0015	1.0015	1.0015	1.0015	55.0
55.5	1.0013	1.0013	1.0013	1.0013	1.0013	1.0013	1.0014	1.0014	1.0014	1.0014	1.0014	55.5
56.0	1.0012	1.0012	1.0012	1.0012	1.0012	1.0012	1.0012	1.0012	1.0012	1.0012	1.0012	56.0
56.5	1.0010	1.0010	1.0010	1.0010	1.0010	1.0010	1.0011	1.0011	1.0011	1.0011	1.0011	56.5
57.0	1.0009	1.0009	1.0009	1.0009	1.0009	1.0009	1.0009	1.0009	1.0009	1.0009	1.0009	57.0
57.5	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0008	1.0008	1.0008	1.0008	1.0008	57.5
58.0	1.0006	1.0006	1.0006	1.0006	1.0006	1.0006	1.0006	1.0006	1.0006	1.0006	1.0006	58.0
58.5	1.0004	1.0004	1.0004	1.0004	1.0004	1.0004	1.0005	1.0005	1.0005	1.0005	1.0005	58.5
59.0	1.0003	1.0003	1.0003	1.0003	1.0003	1.0003	1.0003	1.0003	1.0003	1.0003	1.0003	59.0
59.5	1.0001	1.0001	1.0001	1.0001	1.0001	1.0001	1.0002	1.0002	1.0002	1.0002	1.0002	59.5
60.0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	60.0

* DENOTES EXTRAPOLATED VALUE

ALPHA = 290.0 TO 310.0

TABLE 6C, VCF FOR INDIVIDUAL AND SPECIAL APPLICATIONS
VOLUME CORRECTION TO 60 F

TEMP. F	COEFFICIENT OF THERMAL EXPANSION * 1000000. (1/DEG F) FACTOR FOR CORRECTING VOLUME TO 60 F										TEMP. F
	294.0	296.0	298.0	300.0	302.0	304.0	306.0	308.0	310.0		
60.0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000		60.0
60.5	0.9999	0.9999	0.9999	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998		60.5
61.0	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997		61.0
61.5	0.9996	0.9996	0.9996	0.9995	0.9995	0.9995	0.9995	0.9995	0.9995		61.5
62.0	0.9994	0.9994	0.9994	0.9994	0.9994	0.9994	0.9994	0.9994	0.9994		62.0
62.5	0.9993	0.9993	0.9993	0.9992	0.9992	0.9992	0.9992	0.9992	0.9992		62.5
63.0	0.9991	0.9991	0.9991	0.9991	0.9991	0.9991	0.9991	0.9991	0.9991		63.0
63.5	0.9990	0.9990	0.9990	0.9989	0.9989	0.9989	0.9989	0.9989	0.9989		63.5
64.0	0.9988	0.9988	0.9988	0.9988	0.9988	0.9988	0.9988	0.9988	0.9988		64.0
64.5	0.9987	0.9987	0.9987	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986		64.5
65.0	0.9985	0.9985	0.9985	0.9985	0.9985	0.9985	0.9985	0.9985	0.9985		65.0
65.5	0.9984	0.9984	0.9984	0.9983	0.9983	0.9983	0.9983	0.9983	0.9983		65.5
66.0	0.9983	0.9982	0.9982	0.9982	0.9982	0.9982	0.9982	0.9982	0.9981		66.0
66.5	0.9981	0.9981	0.9981	0.9980	0.9980	0.9980	0.9980	0.9980	0.9980		66.5
67.0	0.9980	0.9979	0.9979	0.9979	0.9979	0.9979	0.9979	0.9978	0.9978		67.0
67.5	0.9978	0.9978	0.9978	0.9977	0.9977	0.9977	0.9977	0.9977	0.9977		67.5
68.0	0.9977	0.9976	0.9976	0.9976	0.9976	0.9976	0.9976	0.9975	0.9975		68.0
68.5	0.9975	0.9975	0.9975	0.9974	0.9974	0.9974	0.9974	0.9974	0.9974		68.5
69.0	0.9974	0.9974	0.9973	0.9973	0.9973	0.9973	0.9972	0.9972	0.9972		69.0
69.5	0.9972	0.9972	0.9972	0.9971	0.9971	0.9971	0.9971	0.9971	0.9971		69.5
70.0	0.9971	0.9970	0.9970	0.9970	0.9970	0.9970	0.9969	0.9969	0.9969		70.0
70.5	0.9970	0.9969	0.9969	0.9968	0.9968	0.9968	0.9968	0.9968	0.9967		70.5
71.0	0.9968	0.9968	0.9967	0.9967	0.9967	0.9967	0.9966	0.9966	0.9966		71.0
71.5	0.9967	0.9966	0.9966	0.9965	0.9965	0.9965	0.9965	0.9965	0.9964		71.5
72.0	0.9965	0.9965	0.9964	0.9964	0.9964	0.9963	0.9963	0.9963	0.9963		72.0
72.5	0.9964	0.9963	0.9963	0.9962	0.9962	0.9962	0.9962	0.9961	0.9961		72.5
73.0	0.9962	0.9962	0.9961	0.9961	0.9960	0.9960	0.9960	0.9960	0.9960		73.0
73.5	0.9961	0.9960	0.9960	0.9959	0.9959	0.9959	0.9959	0.9958	0.9958		73.5
74.0	0.9959	0.9959	0.9958	0.9958	0.9957	0.9957	0.9957	0.9957	0.9957		74.0
74.5	0.9958	0.9958	0.9957	0.9956	0.9956	0.9956	0.9956	0.9955	0.9955		74.5
75.0	0.9956	0.9956	0.9955	0.9955	0.9955	0.9954	0.9954	0.9954	0.9953		75.0

* DENOTES EXTRAPOLATED VALUE

ALPHA = 290.0 TO 310.0