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Standard Guide for Petroleum Measurement Tables[1]

This standard is issued under the fixed designation D 1250; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This guide has been approved by the sponsoring committees and accepted by the cooperating organizations in accordance with established procedures.

This guide has been adopted or use by government agencies to replace Method 9004.1 o Federal Test Method Standard No. 791b.

ε[1] NOTE—Section 6 was added editorially in October 1997.

1. Scope

1.1 These Petroleum Measurement Tables[2] are for use in the calculation of quantities of crude petroleum and petroleum products at reference conditions in any of three widely used systems of measurement. These tables are provided for standardized calculation of measured quantities of petroleum fluids regardless of point of origin, destination, or units of measure used by custom or statute.

1.2 The Petroleum Measurement Tables published in 1980, except for Tables 33 and Tables 34 (which are being reissued without change), represent a major conceptual departure from previous versions. Inherent in the Petroleum Measurement Tables is the recognition of the present and future position of computers in the petroleum industry. The actual standard represented by the Petroleum Measurement Tables 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 for Tables 5, Tables 6, Tables 23, Tables 24, Tables 53, and Tables 54. The standardization of an implementation procedure implies the standardization of the set of mathematical expressions, including calculational sequence and rounding 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.

NOTE 1—The present collection of tables supersedes all previous editions of the Petroleum Measurement Tables ANSI/ASTM D 1250, IP 200, and API Standard 2540.

2. Referenced Documents

2.1 *ASTM Standards:*

D 287 Test Method for API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method)[3]

3. Sponsorship

3.1 The complete collection of the new jointly issued ASTM-API-IP tables is the result of close cooperation between the American Society for Testing and Materials, American Petroleum Institute, and the Institute of Petroleum (London). To meet the objective of worldwide standardized measurement practices, the American National Standards Institute and the British Standards Institution have also been closely involved, resulting in the acceptance of the revised tables as an American National Standard and a British Standard. In addition, in their respective capacities as Secretariat of the International Organization for Standardization/TC 28 and of TC 28/SC 3, ANSI and BSI have been instrumental in progressing the revised tables toward their adoption as an International Standard by the International Organization for Standardization. The ASTM Designation D 1250 applies to all 35 tables described in

[1] This guide is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.02 on Static Petroleum Measurement.

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[2] When ordering from ASTM, request ADJD125001 for Vol 1; ADJD125002 for Vol II; ADJD125003 for Vol III; ADJD125004 for Vol IV; ADJD125005 for Vol V; ADJD125006 for Vol VI; ADJD125007 for Vol VII; ADJD125008 for Vol VIII; ADJD125009 for Vol IX; ADJD125010 for Vol X; and for Vol XI/XII–ADJD125011. The adnjunct number for the complete set is ADJD1250CS.

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

Section 5. The Institute of Petroleum designation for the complete set of tables is 200/81.

4. Significance and Use

4.1 This guide is expected to apply to crude petroleum regardless of source and to all normally liquid petroleum products derived therefrom. There are three primary sets of tables in current use. These are in terms of °API (Tables 5 and Tables 6), relative density (Tables 23 and Tables 24), and density in kilogram per cubic metre (Tables 53 and Tables 54). To maximize accuracy and maintain convenience of use in primary tables (Tables 5, Tables 6, Tables 23, Tables 24, Tables 53, and Tables 54), crude oils and products are presented in separate tables. For example, for Table 6 there are: Table 6A, Generalized Crude Oils; Table 6B, Generalized Products; and Table 6C, Volume Correction Factors for Individual and Special Applications. The subsidiary tables are based on averages of the crude oil and product volume correction factors obtained from the primary tables and, hence are not included in the precision statement that encompass the primary tables.

4.2 The ranges for the primary tables are as follows:

Table A

°API	°F
0 to 40	0 to 300
40 to 50	0 to 250
50 to 100	0 to 200

Table B

°API	°F
0 to 40	0 to 300
40 to 50	0 to 250
50 to 85	0 to 200

Table C

α^A	°F
270 to 510 × 10^{-6}	0 to 300
510 to 530	0 to 250
530 to 930	0 to 200

[A]Alpha is the coefficient of thermal expansion at 60°F.

The ranges of the subsidiary tables, except Tables 33 and Tables 34, encompass the range of Table A.

4.3 All tables that involve reduction of gravity to standard temperature are based on the assumption that the measurement has been made by means of a glass hydrometer (Test Method D 287), and that correction for the thermal expansion of standard hydrometer glass has been incorporated. To accommodate the growing use of on-line densitometers, which are not dependent on hydrometer corrections, the computer subroutines optionally allow for the exclusion of the hydrometer correction.

5. Available Tables

Volume I:

Table 5A—Generalized Crude Oils, Correction of Observed API Gravity to API Gravity at 60°F

Table 6A—Generalized Crude Oils, Correction of Volume to 60°F Against API Gravity at 60°F

Volume II:

Table 5B—Generalized Products, Correction of Observed API Gravity to API Gravity at 60°F

Table 6B—Generalized Products, Correction of Volume to 60°F Against API Gravity at 60°F

Volume III:

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

Volume IV:

Table 23A—Generalized Crude Oils, Correction of Observed Relative Density to Relative Density 60/60°F

Table 24A—Generalized Crude Oils, Correction of Volume to 60°F Against Relative Density 60/60°F

Volume V:

Table 23B—Generalized Products, Correction of Observed Relative Density to Relative Density 60/60°F

Table 24B—Generalized Products, Correction of Volume to 60°F Against Relative Density 60/60°F

Volume VI:

Table 24C—Volume Correction Factors for Individual and Special Applications, Volume Correction to 60°F Against Thermal Expansion Coefficients at 60°F

Volume VII:

Table 53A—Generalized Crude Oils, Correction of Observed Density to Density at 15°C

Table 54A—Generalized Crude Oils, Correction of Volume to 15°C Against Density at 15°C

Volume VIII:

Table 53B—Generalized Products, Correction of Observed Density to Density at 15°C

Table 54B—Generalized Products, Correction of Volume to 15°C Against Density at 15°C

Volume IX:

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

Volume X:

Background, Development, and Implementation Procedures

Volumes XI and XII:

Tables 2, Tables 3, Tables 4, Tables 8, Tables 9, Tables 10, Tables 11, Tables 12, Tables 13, Tables 14, Tables 21, Tables 22, Tables 26, Tables 27, Tables 28, Tables 29, Tables 30, Tables 31, Tables 51, Tables 52, and Tables 58

Reissued Without Change:

Table 33—Specific Gravity Reduction to 60°F for Liquefied Petroleum Gases and Natural Gas

Table 34—Reduction of Volume to 60°F Against Specific Gravity 60/60°F for Liquefied Petroleum Gases

6. Keywords

6.1 density; gravity; hydrometer; temperature; volume correction