Manual of Petroleum Measurement Standards Chapter 11 – Physical Properties Data

Section 2, Part 4 – Temperature Correction for the Volume NGL and LPG

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Foreword

For custody transfer purposes, natural gas liquid (NGL) and liquefied petroleum gas (LPG) volumes are generally stated at a fixed base temperature and saturation pressure. As most volume transfers occur at temperatures and pressures other than standard conditions, these volumes are adjusted to standard conditions through the use of correction factors.

This document presents a new method to calculate temperature correction factors. With the publication of this document, previous API, ASTM and GPA documents containing NGL and LPG temperature correction factors should no longer be used. The document is specifically titled as being suitable for NGL and LPG liquids. Light hydrocarbon mixtures containing significant quantities of methane, carbon dioxide and nitrogen which have density ranges which overlap those contained in these tables can be encountered. However, the two-fluid correlation which is the basis of these tables was not calibrated for such mixtures.

The actual Standard represented by this report consists of the explicit implementation procedures. Sample tables and other examples created from a computerized version of these implementation procedures are presented within. However, these are for examples only and do not represent the Standard.

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Summary of Changes from Chapter 11.2.4, 1st edition to Chapter 11.2.4, 2nd edition.

This 2nd edition revision addressed several editorial errors and issues that needed clarification. There are no changes in the 2nd edition which would change the implementation guidelines.

Table of Contents

Nomenclature

A, B, C	parameters in Section 5.1.2 quadratic equation
C_{TL}	temperature correction factor
h_2	scaling factor
k_1, k_2, k_3, k_4	parameters in saturation density equation
T_B	base temperature (60°F, 15°C, or 20°C)
T_{BK}	base temperature (288.15 K, or 293.15 K)
T_c	fluid critical temperature (K)
$T_{c,ref}$	reference fluid critical temperature (K)
T_F	observed measurement temperature (°F or °C)
$T_{r,x}$	reduced observed temperature
T_x	observed temperature (K)
V_{60}/V_{Tx}	ratio of volume at 60°F to volume at temperature T_x. Is the basic definition of C_{TL}
X	interpolating factor
Z_c	critical compressibility factor
α, β, ϕ	parameters in Section 5.1.2 quadratic equation
δ	interpolation variable
τ	parameter in saturation density equation
τ_x	parameter in saturation density equation at observed temperature
γ_x	relative density at observed temperature
$\gamma_{x,high}$	relative density at the observed temperature corresponding to the upper boundary for the 60°F relative density
$\gamma_{x,low}$	relative density at the observed temperature corresponding to the lower boundary for the 60°F relative density
$\gamma_{x,mid}$	relative density at the observed temperature corresponding to the intermediate 60° relative density used in Section 5.1.2 iteration procedure
$\gamma_{x,trial}$	trial relative density at the observed temperature used in Section 5.1.2 iteration procedure
γ_{TB}	relative density at the base temperature, T_B
γ_{60}	relative density at a base temperature of 60°F
γ_{Tx}	relative density at the observed temperature, T_x
$\gamma_{60,high}$	upper bound for the observed fluid's 60°F relative density
$\gamma_{60,low}$	lower bound for the observed fluid's 60°F relative density
$\gamma_{60,mid}$	intermediate 60°F relative density value used in Section 5.1.2 iteration procedure
$\gamma_{60,trial}$	trial 60°F relative density value used in Section 5.1.2 iteration procedure
ρ_c	critical molar density (gram-mole/L)
ρ_{60}	density at a base temperature of 60°F (kg/m^3)
ρ_{15}	density at a base temperature of 15°C (kg/m^3)

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ρ_{20}	density at a base temperature of 20°C (kg/m^3)
ρ^{sat}	saturation molar density (gram-mole/L)
ρ^{sat}_{60}	saturation molar density at 60°F (gram-mole/L)
ρ^{sat}_{T}	saturation molar density at observed temperature (gram-mole/L)
ρ_{w60}	density of water at 60°F (kg/m^3)

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Temperature Correction for the Volume of NGL and LPG
Tables 23E, 24E, 53E, 54E, 59E, and 60E

0 Implementation Guidelines

This Revised Standard/~~Technical Publication~~ is effective upon the date of publication and supersedes the ASTM-IP 1952 Petroleum Measurement Tables, GPA 2142, GPA TP-16, Tables 33 and 34 of API MPMS Chapter 11.1-1980 Volumes XI/XII (Adjuncts to ASTM D1250-80 and IP 200/80),~~ API MPMS Chapter 11.2.2/11.2.2M,~~ and API/ASTM/GPA 8217/8117. However, due to the nature of the changes in this Revised Standard/~~Technical Publication~~ and the fact that it is or may be incorporated by reference in various regulations, it is recognized that guidance concerning an implementation period may be needed in order to avoid disruptions within the industry and ensure proper application. ~~As a result, it is recommended that this Revised Standard/Technical Publication be utilizeused on all new and existing applications no later than TWO YEARS after the publication date.~~ An application, for this purpose, is defined as the point where the calculation is applied.

Once the Revised Standard/~~Technical Publication~~ is implemented in a particular application, the Previous Standard/ ~~Technical Publication~~ will no longer be used in that application.

However, the use of API standards ~~and ASTM and GPA technical publications~~ remains voluntary, and the decision on when to ~~utilize~~use a standard/technical publication is an issue that is subject to the negotiations between the parties involved in the transaction.

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1 Introduction

For custody transfer purposes, natural gas liquid (NGL) and liquefied petroleum gas (LPG) volumes are generally stated at a fixed base temperature and saturation pressure. As most volume transfers occur at temperatures and pressures other than standard conditions, these volumes are adjusted to standard conditions through the use of correction factors. Separate factors for temperature (C_{TL}) and pressure (C_{PL}) are used to make these corrections. This document presents a new method to calculate temperature correction factors. Pressure correction factors are not within the scope of this document, but can be calculated using American Petroleum Institute *Manual of Petroleum Measurement Standards* (*MPMS*) Chapter 11.1-2004[1] (which superseded Chapter 11.2.1-1984[2] and 11.2.1M-1984[3]), Chapter 11.2.2-1986/GPA 8286-86[4] or Chapter 11.2.2M-1986/GPA 8286-86[5], depending on product type.

Previously, most NGL and LPG temperature correction factors have been obtained from a variety of sources:

- ASTM-IP "Petroleum Measurement Tables"[6], published in 1952. This publication is limited to a 60°F relative density range of 0.500 and higher.

- GPA Standard 2142, "Standard Factors for Volume Correction and Specific Gravity Conversion of Liquefied Petroleum Gases"[7], published in 1957, also contains the same correction factors as the 1982 ASTM-IP document.

- GPA TP-16 "Composite Pressure and Temperature Volume Correction Factor Tables for Liquefied Petroleum Gas (LPG) and Natural Gasoline"[8], published in 1988. It is limited to the following products: HD-5 Propane with a relative densities of 0.501, 0.505, and 0.510; iso-butane at a relative density of 0.565; normal butane at a relative density of 0.585; and natural gasoline (12-14 psia RVP) at a relative density of 0.664.

- API *MPMS* Chapter 11.1-1980/ASTM D1250-80 Volume XII, Table 33 "Specific Gravity Reduction to 60°F For Liquefied Petroleum Gases and Natural Gasoline"[9].

- API *MPMS* Chapter 11.1-1980/ASTM D1250-80 Volume XII, Table 34 "Reduction of Volume to 60°F Against Specific Gravity 60/60°F For Liquefied Petroleum Gases"[9].

- API/ASTM/GPA 8117 "Temperature Correction for the Volume of Light Hydrocarbons"[10].

- API/ASTM/GPA 8217 "Temperature Correction for the Volume of NGL and LPG"[14]

With the publication of this document, the above API, ASTM and GPA documents should no longer be used for NGL and LPG temperature correction factors. Text for GPA 821~~5~~7 as approved is included without technical change in this present document. Some edits have been made to align flow charts with examples shown so that they may be consistent.

2 Scope

The actual Standard represented by this report consists of the explicit implementation procedures. Sample tables, flow charts, and specific examples created from a computerized version of these implementation procedures are presented within. The examples are to provide guides and check points to those who wish to implement a computerized procedure to represent the Standard, however these are not a part of the actual Standard.

This Standard covers a 60°F relative density range of 0.3500 to 0.6880 which nominally equates to a density at 15°C of 351.7 to 687.8 kg/m^3 and a density at 20°C of 331.7 to 683.6 kg/m^3. The temperature range of this Standard is –50.8 to 199.4°F (–46 to 93°C). At all conditions, the pressure is assumed to be at saturation conditions (also known as bubble point or saturation vapor pressure).

Note that these are nominal ranges which are further refined within the standard by correlation limits to be the ranges bounded by the points in the following table:

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Table 1: MPMS 11.2.4 Correlation Limits

Relative Density (60°F/60°F)	Lower Temperature Limit (°F)	Upper Temperature Limit (°F)	Lower Temperature Limit (°C)	Upper Temperature Limit (°C)	Lower Temperature Limit (K)	Upper Temperature Limit (K)
0.35000	-50.8	87.4	-46.0	30.8	227.15	303.93
0.35599	-50.8	89.9	-46.0	32.2	227.15	305.32
0.42928	-50.8	140.9	-46.0	60.5	227.15	333.65
0.47038	-50.8	174.8	-46.0	79.3	227.15	352.48
0.49935	-50.8	199.4	-46.0	93.0	227.15	366.15
0.68800	-50.8	199.4	-46.0	93.0	227.15	366.15

As shown in the following figure:

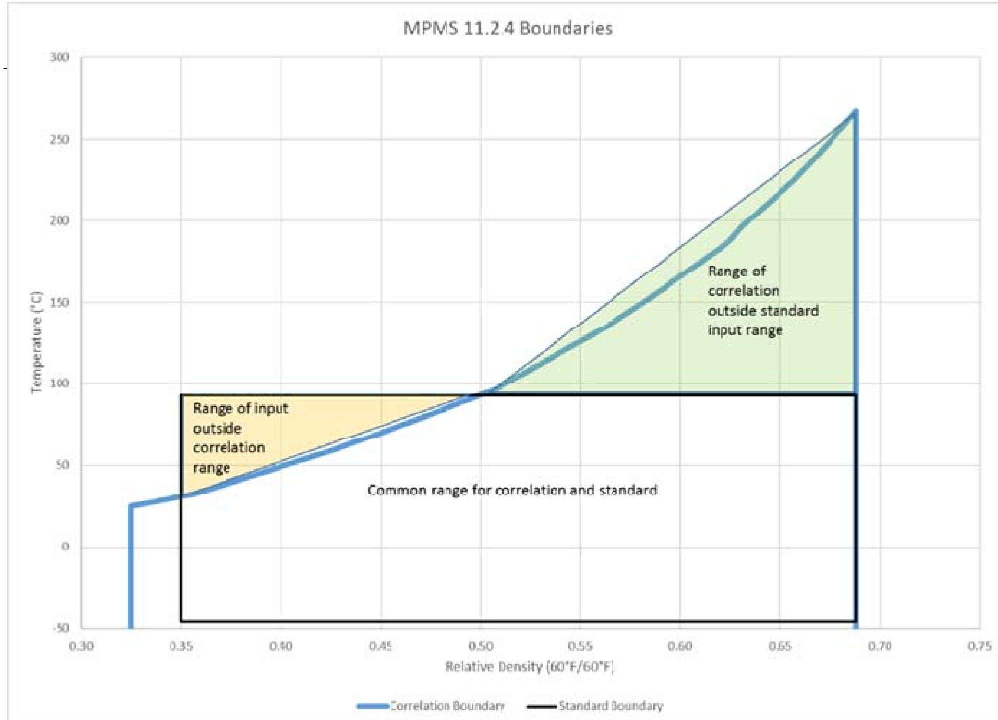


Figure 1: MPMS 11.2.4 Boundaries

Input range – the box defined in the scope of the standard as a (60 °F/60 °F) relative density of 0.35 to 0.688 and -46 to 93 °C.

Correlation range – the polygon defined by line segments connecting the relative densities and critical temperatures of the reference fluids in Table 1 of the standard for the upper boundary, -46 °C for the lower temperature boundary, the relative density of EE (68/32) for the lower relative density boundary and the relative density of n-heptane for the upper relative density boundary. See Figure 1 in this document for an illustration.

The calculation method was developed from GPA RR-148 "Volume Correction Factors for Natural Gas Liquids – Phase II"[11] and API/ASTM/GPA Technical Publication, TP-25, September, 1998[10]. The implementation procedures for Tables 23 and 24 are entirely consistent with those presented in API/ASTM/GPA Technical Publication, TP-275. Supporting data can be found in GPA RR-147 "Density Measurements on Natural Gas Liquids"[12]. GPA RR-133 "Volume Correction Factors for Natural Gas Liquids – Phase I"[13] should no longer be used, as GPA RR-148 completely replaced it.

The implementation procedures describe how to:

1) calculate the C_{TL} given an appropriate density factor at the basis temperature and an observed temperature, and

2) calculate the appropriate density factor at basis temperature given a relative density at an observed temperature.

The implementation procedures are presented in pairs by base temperature. First the procedures for Tables 23 and 24 at a 60°F base temperature are given. The procedure for Table 23 makes use of the procedure described in Table 24 thus Table 24 is presented first. These are followed by procedures for Tables 54 and 53 at a base temperature of 15°C which themselves make use of procedures in described in Tables 23 and 24; these in turn are followed by the procedures for Tables 60 and 59 at a base temperature of 20°C which also make use of procedures in described in Tables 23 and 24.

It is important to note that this standard assumes all fluids covered by this standard are at a fixed base temperature and saturation pressure. When a RHOtp is measured at an **elevated pressure, an iterative procedure to solve for base density is required for fiscal purposes.** The following expression shall be used to determine base density RHOb)

$$\left|\delta\rho_o^{(m)}\right| < 0.000001 \text{ kg/m}^3 \quad \text{where} \quad \delta\rho_o^{(m)} \equiv \rho_o - \rho_{60}^{(m)} \cdot C_{TPL}^{(m)}$$

The computation for correcting from density at flowing conditions (RHOtp) to density at base conditions (RHOb) may be carried out continuously if mutually agreed between the parties.

3 Significant Digits

It is intended that all future temperature correction factors be ~~utilized~~ used with five decimal digits (e.g., 0.xxxxx or 1.xxxxx). As a result, this document contains C_{TL} values with only five decimal digits. This is a departure from both the 1952 “ASTM-IP Petroleum Measurement Tables” and GPA TP-16, which give either 3 or 4 decimal digits.

4 Comparison to the Previous Standards

As the 1952 ASTM-IP standard is limited to a low-end relative density of 0.50, a comparison can only be made at higher relative densities. The following figures show how the standards compare. The calculations are performed at 10°F and 5°C increments. It can be noted that the deviation plots for the 0.50 to 0.59 relative densities (500 to 590 kg/m^3 densities) are “ragged” in appearance, while the deviation plots for the higher relative densities are “smooth.” This can mostly be attributed to the 1952 ASTM-IP Standard's rounding method: C_{TL} values under relative density 0.60 contain 3 decimal digits while C_{TL} values greater than 0.600 contain 4 decimal digits.

Note: Negative deviations indicate that the new table C_{TL} is lower than the old (1952) ASTM table C_{TL}. Positive deviations indicate that the new table C_{TL} is higher than the old (1952) ASTM table C_{TL}.

Chart 1: C_{TL} Deviations of New Table 24 Values Compared to Old Table 24 Values

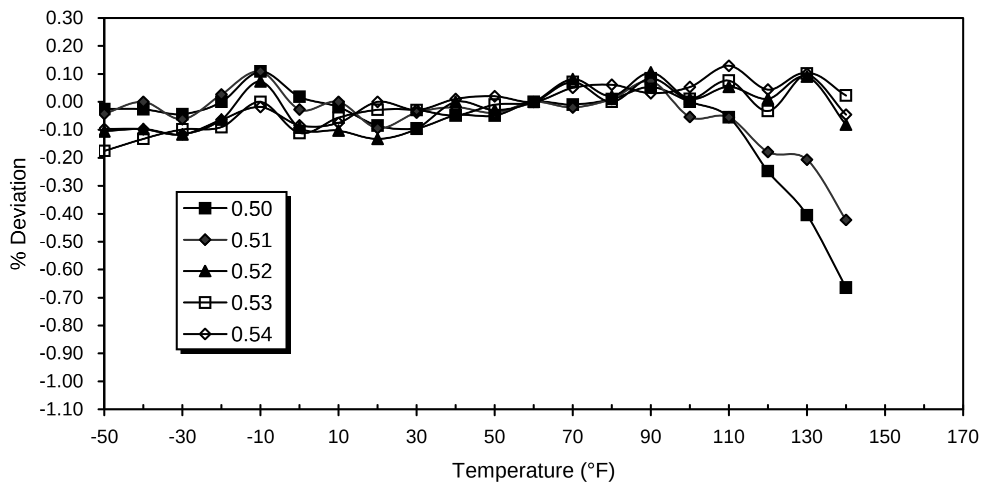


Chart 2: C_{TL} Deviations of New Table 24 Values Compared to Old Table 24 Values

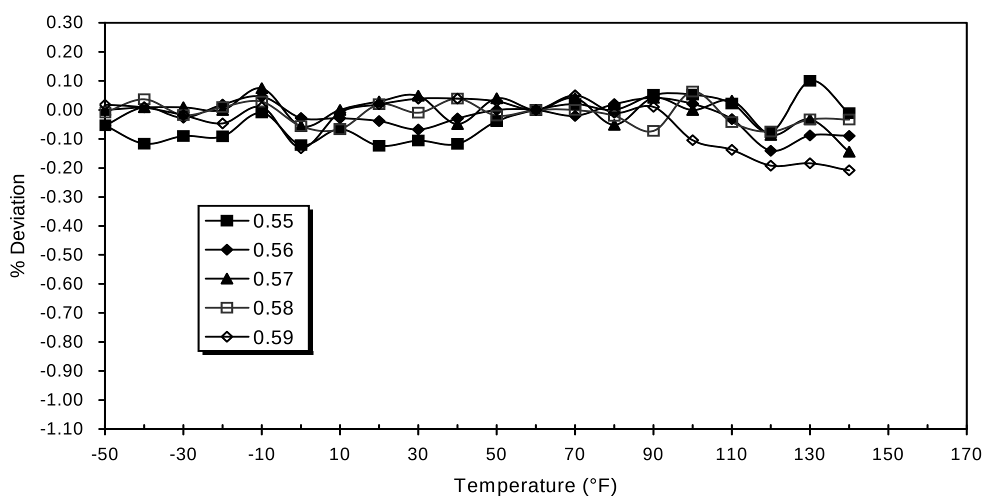


Chart 3: C_{TL} Deviations of New Table 24 Values Compared to Old Table 24 Values

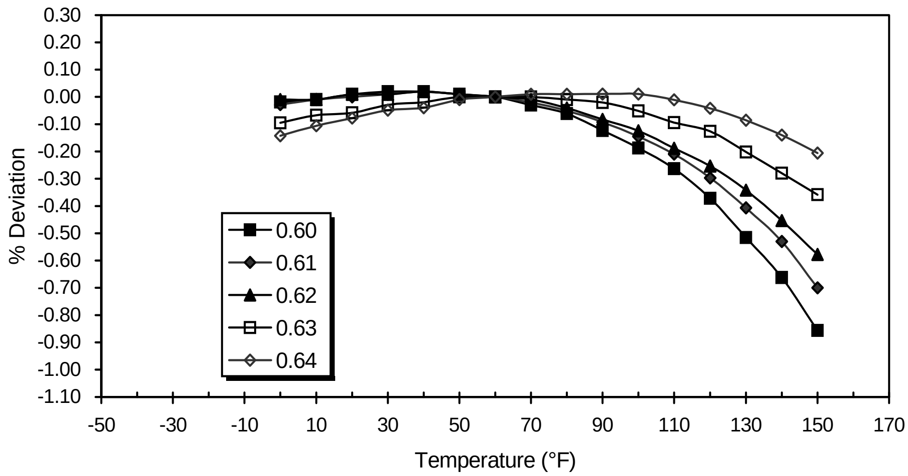
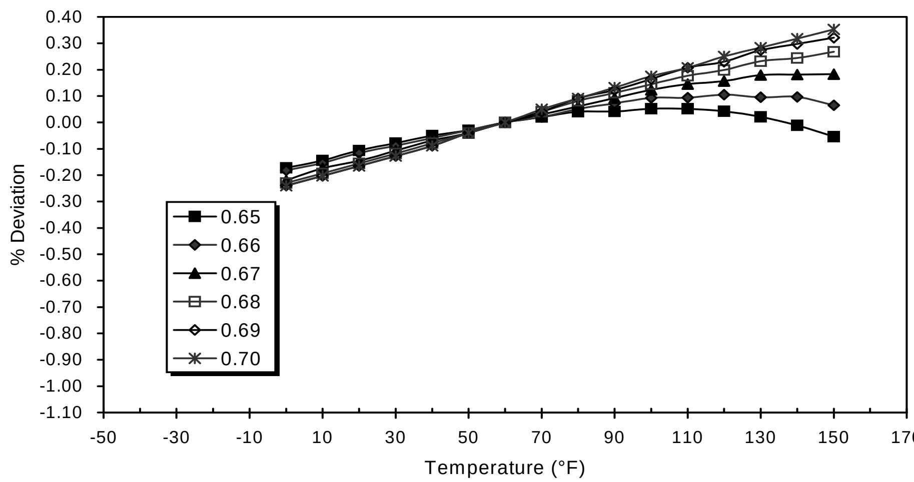


Chart 4: C_{TL} Deviations of New Table 24 Values Compared to Old Table 24 Values



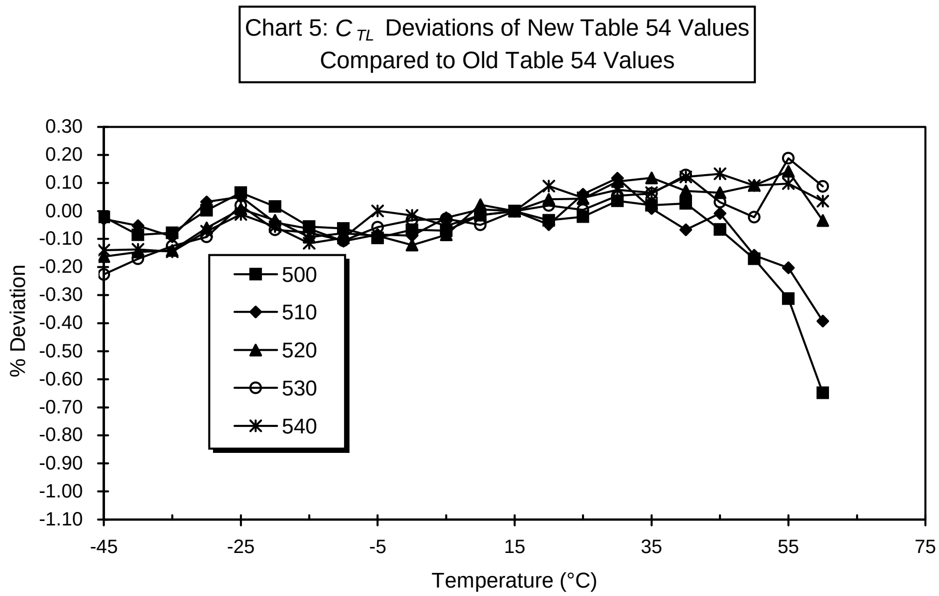


Chart 5: C_{TL} Deviations of New Table 54 Values Compared to Old Table 54 Values
% Deviation
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-0.60
-0.70
-0.80
-0.90
-1.00
-1.10
-45
-25
-5
15
35
55
75
Temperature (°C)
500
510
520
530
540

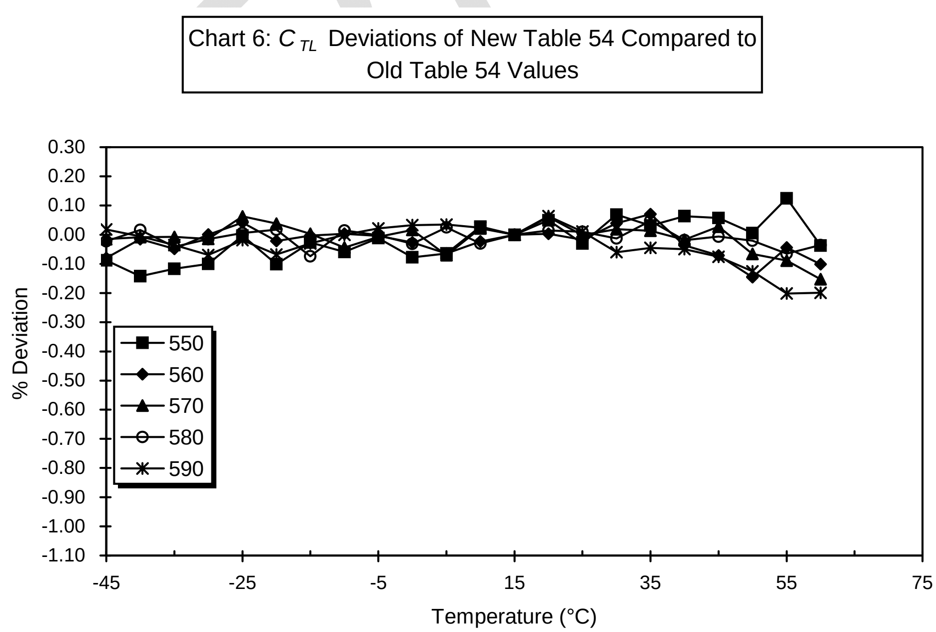


Chart 6: C_{TL} Deviations of New Table 54 Compared to Old Table 54 Values
% Deviation
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-0.60
-0.70
-0.80
-0.90
-1.00
-1.10
-45
-25
-5
15
35
55
75
Temperature (°C)
550
560
570
580
590

Chart 7: C_{TL} Deviations of New Table 54 Values Compared to Old Table 54 Values

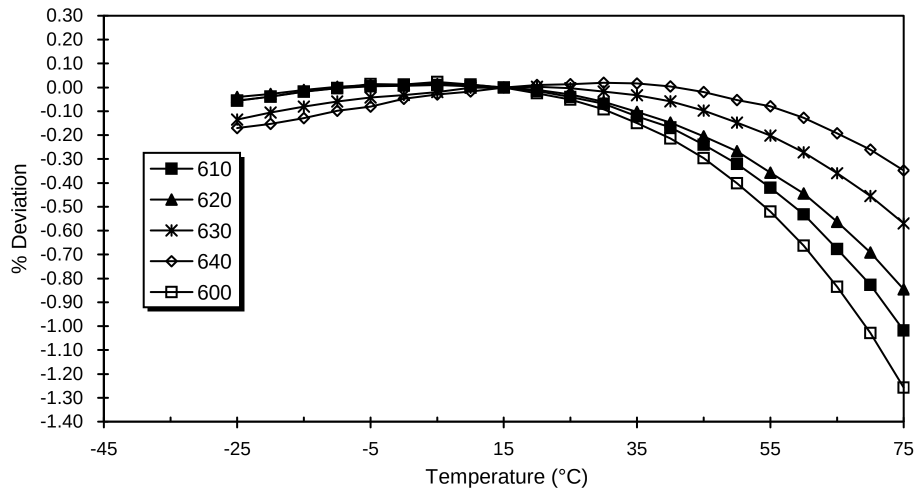
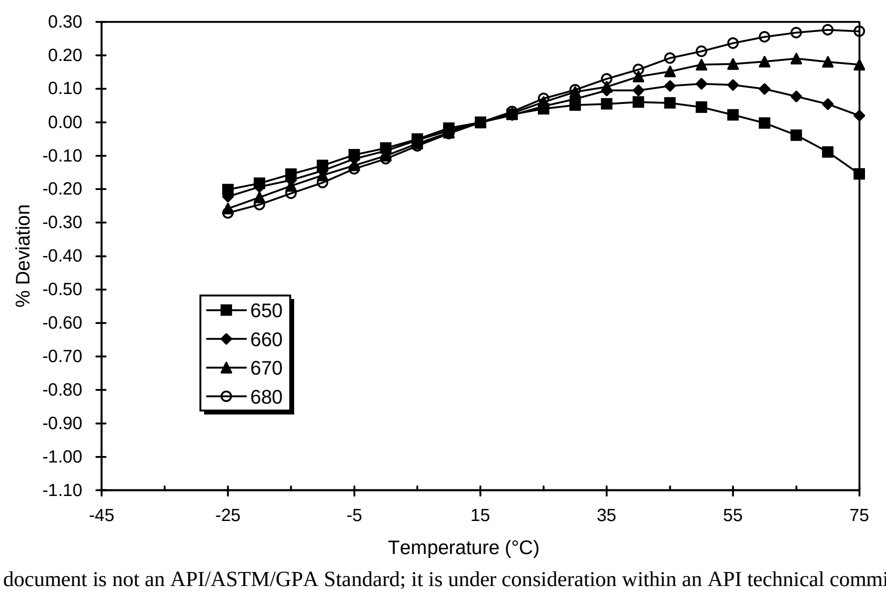


Chart 8: C_{TL} Deviations of New Table 54 Values Compared to Old Table 54 Values



5 Implementation Procedures

The methods to calculate C_{TL} from Tables 24E, 54E, and 60E and relative density at the base temperature from Tables 23E, 53E and 59E follow. These methods are called implementation procedures, which are similar to the methods described and found in American Petroleum Institute *MPMS* Chapter 11.1. The new API 11.1-2004 uses the Newton Iteration Method which is not employed or applicable for this standard.

All calculations are to be performed using double precision (i.e., long floating point, eight byte, or 64-bit) arithmetic. This should allow the computer program to recognize the difference between 1.0 and $1.0+\varepsilon$ for absolute values of ε on the order of 10^{-16}. This also means that approximately 16 decimal digits are used for all calculations.

Examples are presented for each of the procedures described, they cover the range of the tables. Even though double precision was used for these example calculations only twelve decimal digits are printed here. If one uses these examples to test their own computer implementation of these procedures, it is suggested that at least eight of the significant digits be matched. The exceptions to this are for the variables α, β, A, B, and C of Table 23 (Section 5.1.2). These may show greater deviation, but the resulting $\gamma_{60,trial}$ and $\gamma_{x,trial}$ values should match within eight significant digits.

5.1 CTL (Table 24) and Relative Density (Table 23) for NGL and LPG using a 60°F Base Temperature

5.1.1 Implementation Procedure for Table 24E (60°F Basis)

This section presents the implementation procedure T24 for the computation of Temperature Correction Factor, C_{TL}. The C_{TL} is used to calculate volumes of fluid at the base temperature from volumes at some known measurement temperature. The fluids are characterized by the specification of relative density at the base temperature, 60°F.

5.1.1.1 Inputs and Outputs

Inputs: Relative density at 60°F, γ_{60}
Observed temperature, T_F (°F)

Output: Temperature Correction Factor, C_{TL} (from T_F to T_B)

5.1.1.2 Outline of Calculations

The calculations are performed using an extended two-fluid corresponding states equation. By comparing densities at 60°F, two reference fluids are selected so that one is slightly more dense and one is slightly less dense than the observed fluid. The densities of these reference fluids are then scaled to the observed reduced temperature (reduced by the critical temperature of the fluid of interest). The Temperature Correction Factor is then computed from the reference fluid densities. See Figure 1 for a general flow chart of the calculation procedure.

5.1.1.3 T24 Implementation Procedure

T24/Step Number Operation/Procedure at that step

T24/1: Round the relative density γ_{60} to the nearest 0.0001 and round the observed temperature T_F to the nearest 0.1°F.

Temperature rounding examples: –0.05 rounds to –0.1; –0.049 rounds to 0.0, –0.051 rounds to –0.1. Density rounding examples follow: 0.35555 rounds to 0.3556, 0.355549 rounds to 0.3555, 0.40289 rounds to 0.4029.

T24/2: Convert the rounded observed temperature to units of Kelvin, T_x:

$$T_x = \frac{T_F + 459.67}{1.8}$$

T24/3: The resultant temperature T_x and relative density γ_{60} must fall within the following ~~boundaries~~ranges:

Temperature between 227.15 and 366.15 K, inclusive (equivalent to –46 to 93°C, or –50.8 to 199.4°F)
Relative density between 0.3500 and 0.6880, inclusive

If these values do not fall in these ranges, then the standard does not apply. Flag this result (possibly by returning a –1 for C_{TL}) and exit this procedure.

T24/4: Determine the two adjacent reference fluids to be used for the calculations. The rounded 60°F relative density γ_{60} will fit between two reference fluids' 60°F relative densities as listed in ~~Table 1~~Table 2. Choose the lowest density reference fluid that has a density value greater than or equal to γ_{60} and refer to this fluid using the subscript "2." Also use the next lowest density reference fluid and refer to this fluid using the subscript "1."

T24/5: Using ~~Table 1~~Table 2, 60°F relative densities, compute the interpolation variable, δ:

$$\delta = \frac{\gamma_{60} - \gamma_{60,1}}{\gamma_{60,2} - \gamma_{60,1}}$$

T24/6: From ~~Table 1~~Table 2 critical temperatures, calculate the fluid critical temperature, T_c:

$$T_c = T_{c,1} + \delta(T_{c,2} - T_{c,1})$$

T24/7: Compute the fluid's reduced observed temperature, $T_{r,x}$:

$$T_{r,x} = \frac{T_x}{T_c}$$

If the reduced temperature $T_{r,x}$ is greater than 1.0, then the fluid is at supercritical conditions and cannot exist as a liquid. Flag this result (possibly by returning a –1 for C_{TL}) and exit this procedure.

T24/8: Compute the reduced temperature at 60°F, $T_{r,60}$:

$$T_{r,60} = \frac{519.67}{1.8T_c}$$

T24/9: From ~~Table 1~~Table 2 critical compressibility factors, Z_c, and critical densities, ρ_c, calculate the scaling factor, h_2:

$$h_2 = \frac{Z_{c,1} \times \rho_{c,1}}{Z_{c,2} \times \rho_{c,2}}$$

T24/10: Calculate the saturation density for both reference fluids at 60°F using the 60° reduced temperature, $T_{r,60}$. For each fluid, the equations to calculate the saturation density at any reduced temperature T_r are:

$$\tau = 1 - T_r$$

$$\rho^{sat} = \rho_c\left(1 + \frac{\left(k_1 \times \tau^{0.35}\right) + \left(k_3 \times \tau^2\right) + \left(k_4 \times \tau^3\right)}{1 + \left(k_2 \times \tau^{0.65}\right)}\right)$$

where the k_1, k_2, k_3, and k_4 parameters are different for each reference fluid and are listed in ~~Table 1~~Table 2. Refer to the calculated density for the first reference fluid as $\rho_{60,1}^{sat}$
and for the second reference fluid as $\rho_{60,2}^{sat}$.

T24/11: Calculate the interpolating factor X:

$$X = \frac{\rho_{60,1}^{sat}}{1 + \delta\left[\left(\frac{\rho_{60,1}^{sat}}{h_2 \times \rho_{60,2}^{sat}}\right) - 1\right]}$$

T24/12: Obtain the saturation density for both reference fluids at reduced observed temperature $T_{r,x}$ using the procedure in Step T24/10. Refer to the calculated density for the first reference fluid as $\rho_{x,1}^{sat}$ and that for the second reference fluid a~~t~~s $\rho_{x,2}^{sat}$.

T24/13: Calculate the Temperature Correction Factor at the observed temperature, C_{TL}:

$$C_{TL} = \frac{\rho_{x,1}^{sat}}{X\left[1 + \delta\left(\frac{\rho_{x,1}^{sat}}{h_2 \times \rho_{x,2}^{sat}} - 1\right)\right]}$$

T24/14: Round the Temperature Correction Factor C_{TL} to the nearest 0.00001. Exit this procedure.

~~Table 1~~Table 2: Reference Fluid Parameters

No.	Fluid Name	γ_{60}	T_c	Z_c	ρ_c	k_1	k_2	k_3	k_4
1	EE (68/32)[(1)]	0.325022	298.11	0.27998	6.250	2.54616855327	–0.058244177754	0.803398090807	–0.745720314137
2	Ethane	0.355994	305.33	0.28220	6.870	1.89113042610	–0.370305782347	–0.544867288720	0.337876634952
3	EP (65/35)[(2)]	0.429277	333.67	0.28060	5.615	2.20970078464	–0.294253708172	–0.405754420098	0.319443433421
4	EP (35/65)[(3)]	0.470381	352.46	0.27930	5.110	2.25341981320	–0.266542138024	–0.372756711655	0.384734185665
5	Propane	0.507025	369.78	0.27626	5.000	1.96568366933	–0.327662435541	–0.417979702538	0.303271602831
6	i-Butane	0.562827	407.85	0.28326	3.860	2.04748034410	–0.289734363425	–0.330345036434	0.291757103132
7	n-Butane	0.584127	425.16	0.27536	3.920	2.03734743118	–0.299059145695	–0.418883095671	0.380367738748
8	i-Pentane	0.624285	460.44	0.27026	3.247	2.06541640707	–0.238366208840	–0.161440492247	0.258681568613
9	n-Pentane	0.631054	469.65	0.27235	3.200	2.11263474494	–0.261269413560	–0.291923445075	0.308344290017
10	i-Hexane	0.657167	498.05	0.26706	2.727	2.02382197871	–0.423550090067	–1.152810982570	0.950139001678
11	n-Hexane	0.664064	507.35	0.26762	2.704	2.17134547773	–0.232997313405	–0.267019794036	0.378629524102
12	n-Heptane	0.688039	540.15	0.26312	2.315	2.19773533433	–0.275056764147	–0.447144095029	0.493770995799

Table Notes:

γ_{60} is the fluid relative density at 60°F and saturation pressure

T_c is the fluid critical temperature in Kelvin

Z_c is the fluid critical compressibility factor

ρ_c is the fluid critical density in gram-moles per liter

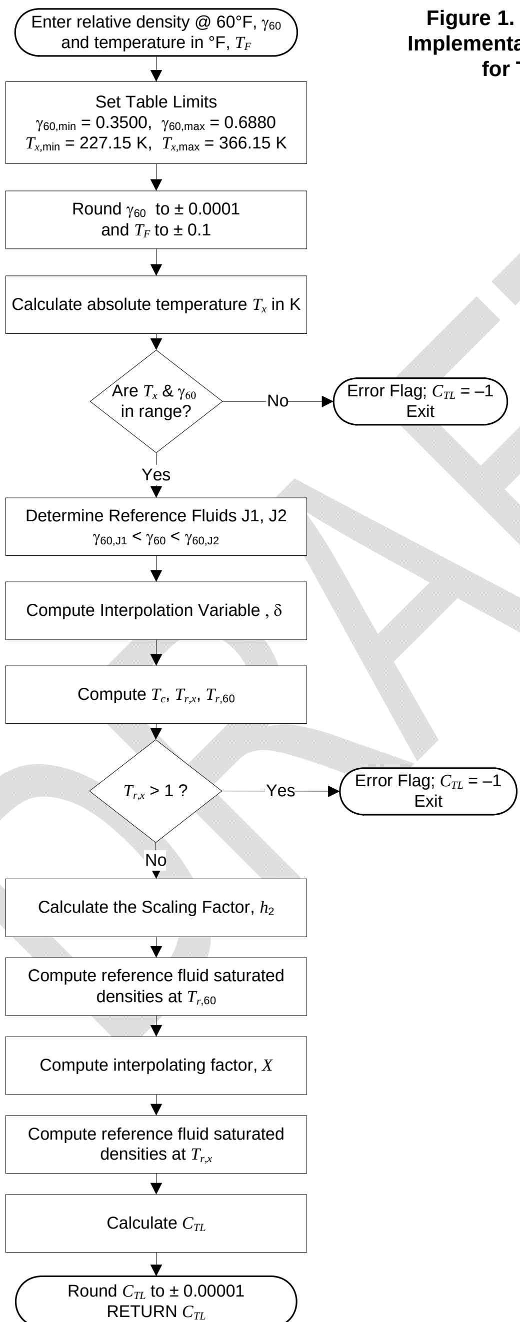
k_1, k_2, k_3, and k_4 are saturation density fitting parameters

(1) EE (68/32) denotes a 68 mole % ethane + 32 % ethylene mixture

(2) EP (65/35) denotes a 65 mole % ethane + 35 % propane mixture

(3) EP (35/65) denotes a 35 mole % ethane + 65 % propane mixture

Figure 1. Flow Chart of Implementation Procedure for Table 24



5.1.1.4 Examples for Section 5.1.1 (Table 24E)

(See ~~Table 1~~Table 2 for properties of the Reference Fluids)

Example 24/1 – ~~Utilize~~Use EE (68/32) and Ethane

```
    Input Data
Relative density @ 60°F (γ60)......... Relative density @ 60°F RD60 ...   0.350130
Observed temperature, °F (Tf TF1) °F .... -48.0200
    Computed Data – last digit is rounded
  T24/1
    Input Data – rounded
γ60 RD60, r rounded to 0.0001. ......... 0.3501
TF Tf, °F, rounded to 0.1... ........ -48.0
  T24/2
Tx Tx, Kelvin... ...................... 228.705555555556

  T24/3
Input data within range
  T24/4
Reference Fluid 1..... ............. EE (68/32)
Reference Fluid 2..... ............. Ethane
  T24/5
Delta (δ). ......................... 0.809699083043

  T24/6
Critical temperature (Tc Tc). ....... 303.956027379569

  T24/7

Reduced observed temp. (Tr,x).... .... 0.752429742971

  T24/8
Reduced temp. at 60°F (Tr,60)..... ..... 0.949826716859

  T24/9
Scaling factor (h2)... ............. 0.902595741301

  T24/10
Tau for fluid at 60°F (τ). .......... 0.050173283141

Sat den fluid 1 at 60°F (ρ^sat_60,1) ........ 11.892882208216

Sat den fluid 2 at 60°F (ρ^sat_60,2) ........ 11.673968376914

  T24/11
Interpolating factor (X).... ........ 10.770572039296

  T24/12
Tau for fluid at obs. temp. (τx) .... 0.247570257029
```

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Sat den fluid 1 at obs. temp. ($\rho_{x,1}^{sat}$) .. 16.490243357324

Sat den fluid 2 at obs. temp. ($\rho_{x,2}^{sat}$) .. 16.012272020935

T24/13
C_{TL} 1.374174158511

T24/14
~~CTL rounded~~C_{TL} (rounded) 1.37417

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Example 24/2 – ~~Utilize~~Use Ethane and EP (65/35)

Input Data
Relative density @ 60°F (γ_{60}) .... ~~Relative density @ 60°F RD60 ...~~ 0.399950
Observed temperature, °F (T_F) .... ~~Observed temperature Tf, °F ....~~ 24.9500
Computed Data – last digit is rounded
T24/1
Input Data – rounded
γ_{60} rounded to 0.0001.................. ~~RD60, rounded to 0.0001 ....~~ 0.4000
T_F rounded to 0.1 .... ~~Tf, °F, rounded to 0.1 ....~~ 25.0
T24/2
T_X, Kelvin .... ~~Tx, Kelvin ....~~
269.261111111111

T24/3
Input data within range
T24/4
Reference Fluid 1 ~~.............~~ ~~.~~ Ethane
Reference Fluid 2 ~~Reference Fluid 2 ....~~ EP (65/35)
T24/5
Delta (δ) .... ~~Delta ....~~
0.600493975410

T24/6
Critical temperature (T_c) .... ~~Critical temperature Tc ....~~
322.347999263131

T24/7
Reduced observed temp. ($T_{r,x}$) .... ~~Reduced observed temp. Tr,x ....~~
0.835311873276

T24/8
Reduced temp. at 60°F ($T_{r,60}$) .... ~~Reduced temp. at 60°F Tr,60 ....~~
0.895633154899

T24/9
Scaling factor (h_2) .... ~~Scaling factor h2 ....~~
1.230484986694

T24/10
Tau for fluid at 60°F (τ) .... ~~Tau for fluid at 60°F ....~~
0.104366845101

Sat den fluid 1 at 60°F ($\rho^{sat}_{60,1}$) .... ~~Sat den fluid 1 at 60°F ....~~
13.268022876946

Sat den fluid 2 at 60°F ($\rho^{sat}_{60,2}$) .... ~~Sat den fluid 2 at 60°F ....~~
11.625034524899

T24/11
Interpolating factor (X)............. ~~Interpolating factor X ....~~
13.871545440974

T24/12

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Tau for fluid at obs. temp. (τ_x) ..... ~~Tau for fluid at obs. temp. ....~~
0.164688126724

Sat den fluid 1 at obs. temp. ($\rho_{x,1}^{sat}$) . ~~Sat den fluid 1 at obs. temp. ..~~
14.572475327916

Sat den fluid 2 at obs. temp. ($\rho_{x,2}^{sat}$) . ~~Sat den fluid 2 at obs. temp. ..~~
12.816926793350

T24/13
C_{TL} .... ~~CTL ....~~
1.100764647588

T24/14
~~CTL rounded ..~~C_{TL} (rounded) 1.10076

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Example 24/3 – ~~Utilize~~Use EP (65/35) and EP (35/65)

Input Data
Relative density @ 60°F (γ_{60}) .... ~~Relative density @ 60°F RD60 ...~~ 0.451530
Observed temperature, °F (T_F) .... ~~Observed temperature Tf, °F ....~~ 87.4200
Computed Data – last digit is rounded
T24/1
Input Data – rounded
γ_{60} rounded to 0.0001................. ~~RD60, rounded to 0.0001 ....~~ 0.4515
T_F rounded to 0.1 .... ~~Tf, °F, rounded to 0.1 ....~~ 87.4
T24/2
T_x, Kelvin .... ~~Tx, Kelvin ....~~
303.927777777778

T24/3
Input data within range
T24/4
Reference Fluid 1.................... ~~Reference Fluid 1 ....~~ EP (65
Reference Fluid 2.................... ~~Reference Fluid 2 ....~~ EP (35
T24/5
Delta (δ) .... ~~Delta ....~~
0.540652977812

T24/6
Critical temperature (T_c) .... ~~Critical temperature Tc ....~~
343.828869453095

T24/7
Reduced observed temp. ($T_{r,x}$)......... ~~Reduced observed temp. Tr,x ....~~
0.883950723106

T24/8
Reduced temp. at 60°F ($T_{r,60}$) .... ~~Reduced temp. at 60°F Tr,60 ....~~
0.839678052674

T24/9
Scaling factor (h_2) .... ~~Scaling factor h2 ....~~
1.103940309258

T24/10
Tau for fluid at 60°F (τ) .... ~~Tau for fluid at 60°F ....~~
0.160321947326

Sat den fluid 1 at 60°F ($\rho^{sat}_{60,1}$)....... ~~Sat den fluid 1 at 60°F ....~~
12.739470807395

Sat den fluid 2 at 60°F ($\rho^{sat}_{60,2}$)....... ~~Sat den fluid 2 at 60°F ....~~
11.668538966703

T24/11
Interpolating factor (X)............. ~~Interpolating factor X ....~~
12.815798776833

T24/12

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Tau for fluid at obs. temp. (τ_x) ..... Tau for fluid at obs. temp. ....
0.116049276894

Sat den fluid 1 at obs. temp. ($\rho_{x,1}^{sat}$) . Sat den fluid 1 at obs. temp. ..
11.880371290411

Sat den fluid 2 at obs. temp. ($\rho_{x,2}^{sat}$) . Sat den fluid 2 at obs. temp. ..
10.885682581443

T24/13
C_{TL} .... CTL ....
0.932749411288

T24/14
CTL rounded ..C_{TL} (rounded) 0.93275

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Example 24/4 – ~~Utilize~~Use EP (35/65) and Propane

Input Data

Relative density @ 60°F (γ_{60}) .... ~~Relative density @ 60°F RD60 ...~~ 0.490400

Observed temperature, °F (T_F) .... ~~Observed temperature Tf, °F ....~~ 184.9700

Computed Data – last digit is rounded

T24/1

Input Data – rounded

γ_{60} rounded to 0.0001.................. ~~RD60, rounded to 0.0001 ....~~ 0.4904

T_F rounded to 0.1 .... ~~Tf, °F, rounded to 0.1 ....~~ 185.0

T24/2

T_x, Kelvin .... ~~Tx, Kelvin ....~~

358.150000000000

T24/3

Input data within range

T24/4

Reference Fluid 1.................... ~~Reference Fluid 1 ....~~ EP (35

Reference Fluid 2.................... ~~Reference Fluid 2 ....~~ Propan

T24/5

Delta (δ) .... ~~Delta ....~~

0.546310446458

T24/6

Critical temperature (T_c) .... ~~Critical temperature Tc ....~~

361.922096932649

T24/7

Reduced observed temp. ($T_{r,x}$)........ ~~Reduced observed temp. Tr,x ....~~

0.989577599808

T24/8

Reduced temp. at 60°F ($T_{r,60}$) .... ~~Reduced temp. at 60°F Tr,60 ....~~

0.797700825682

T24/9

Scaling factor (h_2) .... ~~Scaling factor h2 ....~~

1.033246217331

T24/10

Tau for fluid at 60°F (τ) .... ~~Tau for fluid at 60°F ....~~

0.202299174318

Sat den fluid 1 at 60°F ($\rho^{sat}_{60,1}$)....... ~~Sat den fluid 1 at 60°F ....~~

12.309519597134

Sat den fluid 2 at 60°F ($\rho^{sat}_{60,2}$)....... ~~Sat den fluid 2 at 60°F ....~~

11.272394278161

T24/11

Interpolating factor (X)............. ~~Interpolating factor X ....~~

11.938610116810

T24/12

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Tau for fluid at obs. temp. (τ_x) ..... Tau for fluid at obs. temp. ....
0.010422400192

Sat den fluid 1 at obs. temp. ($\rho_{x,1}^{sat}$) . Sat den fluid 1 at obs. temp. ..
7.473276954765

Sat den fluid 2 at obs. temp. ($\rho_{x,2}^{sat}$) . Sat den fluid 2 at obs. temp. ..
7.023541210265

T24/13
C_{TL} .... CTL ....
0.615949186930

T24/14
CTL rounded ..C_{TL} (rounded) 0.61595

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Example 24/5 – ~~Utilize~~Use Propane and i-Butane

Input Data
Relative density @ 60°F (γ_{60}) .... ~~Relative density @ 60°F RD60 ...~~ 0.540020
Observed temperature, °F (T_F) .... ~~Observed temperature Tf, °F ....~~ 155.0400
Computed Data – last digit is rounded
T24/1
Input Data – rounded
γ_{60} rounded to 0.0001................. ~~RD60, rounded to 0.0001 ....~~ 0.5400
T_F rounded to 0.1 .... ~~Tf, °F, rounded to 0.1 ....~~ 155.0
T24/2
T_x, Kelvin .... ~~Tx, Kelvin ....~~
341.483333333333

T24/3
Input data within range
T24/4
Reference Fluid 1..................... ~~Reference Fluid 1 ....~~ Propa
Reference Fluid 2..................... ~~Reference Fluid 2 ....~~ i-Buta
T24/5
Delta (δ)............................. ~~Delta ....~~
0.590928640551

T24/6
Critical temperature (T_c) .... ~~Critical temperature Tc ....~~
392.276653345758

T24/7
Reduced observed temp. ($T_{r,x}$)......... ~~Reduced observed temp. Tr,x ....~~
0.870516586753

T24/8
Reduced temp. at 60°F ($T_{r,60}$) .... ~~Reduced temp. at 60°F Tr,60 ....~~
0.735974351502

T24/9
Scaling factor (h_2) .... ~~Scaling factor h2 ....~~
1.263326064155

T24/10
Tau for fluid at 60°F (τ)............ ~~Tau for fluid at 60°F ....~~
0.264025648498

Sat den fluid 1 at 60°F ($\rho^{sat}_{60,1}$)....... ~~Sat den fluid 1 at 60°F ....~~
12.016437691588

Sat den fluid 2 at 60°F ($\rho^{sat}_{60,2}$)....... ~~Sat den fluid 2 at 60°F ....~~
9.429772887863

T24/11
Interpolating factor (X)............. ~~Interpolating factor X ....~~
11.955024717591

T24/12

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Tau for fluid at obs. temp. (τ_x) ..... ~~Tau for fluid at obs. temp. ....~~
0.129483413247

Sat den fluid 1 at obs. temp. ($\rho_{x,1}^{sat}$) . ~~Sat den fluid 1 at obs. temp. ..~~
10.227566043346

Sat den fluid 2 at obs. temp. ($\rho_{x,2}^{sat}$) . ~~Sat den fluid 2 at obs. temp. ..~~
8.025028872910

T24/13
C_{TL} .... ~~CTL ....~~
0.851071799690

T24/14
~~CTL rounded ..~~ C_{TL} (rounded) .... ~~..................~~ 0.85107

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Example 24/6 – ~~Utilize~~Use i-Butane and n-Butane

Input Data
Relative density @ 60°F (γ_{60}) .... ~~Relative density @ 60°F RD60 ...~~ 0.569980
Observed temperature, °F (T_F) .... ~~Observed temperature Tf, °F ....~~ 3.0330
Computed Data – last digit is rounded
T24/1
Input Data – rounded
γ_{60} rounded to 0.0001.................. ~~RD60, rounded to 0.0001 ....~~ 0.5700
T_F rounded to 0.1 .... ~~Tf, °F, rounded to 0.1 ....~~ 3.0
T24/2
T_x, Kelvin .... ~~Tx, Kelvin ....~~
257.038888888889

T24/3
Input data within range
T24/4
Reference Fluid 1.................... ~~Reference Fluid 1 ....~~ i-Buta
Reference Fluid 2.................... ~~Reference Fluid 2 ....~~ n-Buta
T24/5
Delta (δ) .... ~~Delta ....~~
0.336760563380

T24/6
Critical temperature (T_c) .... ~~Critical temperature Tc ....~~
413.679325352113

T24/7
Reduced observed temp. ($T_{r,x}$)........ ~~Reduced observed temp. Tr,x ....~~
0.621348163025

T24/8
Reduced temp. at 60°F ($T_{r,60}$) .... ~~Reduced temp. at 60°F Tr,60 ....~~
0.697896988954

T24/9
Scaling factor (h_2) .... ~~Scaling factor h2 ....~~
1.012944464538

T24/10
Tau for fluid at 60°F (τ)............ ~~Tau for fluid at 60°F ....~~
0.302103011046

Sat den fluid 1 at 60°F ($\rho^{sat}_{60,1}$)....... ~~Sat den fluid 1 at 60°F ....~~
9.757836502218

Sat den fluid 2 at 60°F ($\rho^{sat}_{60,2}$)....... ~~Sat den fluid 2 at 60°F ....~~
9.883346486657

T24/11
Interpolating factor (X)............. ~~Interpolating factor X ....~~
9.841741258063

T24/12

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Tau for fluid at obs. temp. (τ_x) ..... Tau for fluid at obs. temp. ....
0.378651836975

Sat den fluid 1 at obs. temp. ($\rho_{x,1}^{sat}$) . Sat den fluid 1 at obs. temp. ..
10.367065629858

Sat den fluid 2 at obs. temp. ($\rho_{x,2}^{sat}$) . Sat den fluid 2 at obs. temp. ..
10.496815949474

T24/13
C_{TL} .... CTL ....
1.062314380669

T24/14
CTL rounded ..C_{TL} (rounded) 1.06231

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Example 24/7 – ~~Utilize~~Use n-Butane and i-Pentane

Input Data

Relative density @ 60°F (γ_{60}) .... ~~Relative density @ 60°F RD60 ...~~ 0.599970

Observed temperature, °F (T_F) .... ~~Observed temperature Tf, °F ....~~ 110.0400

Computed Data – last digit is rounded

T24/1

Input Data – rounded

γ_{60} rounded to 0.0001................. ~~RD60, rounded to 0.0001 ....~~ 0.6000

T_F rounded to 0.1 .... ~~Tf, °F, rounded to 0.1 ....~~ 110.0

T24/2

T_X, Kelvin .... ~~Tx, Kelvin ....~~

316.483333333333

T24/3

Input data within range

T24/4

Reference Fluid 1.................... ~~Reference Fluid 1 ....~~ n-Buta

Reference Fluid 2.................... ~~Reference Fluid 2 ....~~ i-Pent

T24/5

Delta (δ)............................ ~~Delta ....~~

0.395263708352

T24/6

Critical temperature (T_c) .... ~~Critical temperature Tc ....~~

439.104903630659

T24/7

Reduced observed temp. ($T_{r,x}$)......... ~~Reduced observed temp. Tr,x ....~~

0.720746524843

T24/8

Reduced temp. at 60°F ($T_{r,60}$) .... ~~Reduced temp. at 60°F Tr,60 ....~~

0.657486521258

T24/9

Scaling factor (h_2) .... ~~Scaling factor h2 ....~~

1.230050265162

T24/10

Tau for fluid at 60°F (τ)............ ~~Tau for fluid at 60°F ....~~

0.342513478742

Sat den fluid 1 at 60°F ($\rho_{60,1}^{sat}$)....... ~~Sat den fluid 1 at 60°F ....~~

10.214309417120

Sat den fluid 2 at 60°F ($\rho_{60,2}^{sat}$)....... ~~Sat den fluid 2 at 60°F ....~~

8.446076234558

T24/11

Interpolating factor (X)............. ~~Interpolating factor X ....~~

10.282689503192

T24/12

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Tau for fluid at obs. temp. (τ_x) ..... ~~Tau for fluid at obs. temp. ....~~
0.279253475157

Sat den fluid 1 at obs. temp. ($\rho_{x,1}^{sat}$) . ~~Sat den fluid 1 at obs. temp. ..~~
9.687510842155

Sat den fluid 2 at obs. temp. ($\rho_{x,2}^{sat}$) . ~~Sat den fluid 2 at obs. temp. ..~~
8.011335247961

T24/13
C_{TL} .... ~~CTL ....~~
0.948465346003

T24/14
~~CTL rounded ..~~ C_{TL} (rounded) 0.94847

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Example 24/8 – ~~Utilize~~Use i-Pentane and n-Pentane

Input Data
Relative density @ 60°F (γ_{60}) .... ~~Relative density @ 60°F RD60 ...~~ 0.625020
Observed temperature, °F (T_F) .... ~~Observed temperature Tf, °F ....~~ 169.9700
Computed Data – last digit is rounded
T24/1
Input Data – rounded
γ_{60}~~RD60~~, rounded to 0.0001... .... 0.6250
T_F rounded to 0.1 .... ~~Tf, °F, rounded to 0.1 ....~~ 170.0
T24/2
T_x, Kelvin .... ~~Tx, Kelvin ....~~
349.816666666667

T24/3
Input data within range
T24/4
Reference Fluid 1.................... ~~Reference Fluid 1 ....~~ i-Pent
Reference Fluid 2.................... ~~Reference Fluid 2 ....~~ n-Pent
T24/5
Delta (δ) .... ~~Delta ....~~
0.105628600975

T24/6
Critical temperature (T_c) .... ~~Critical temperature Tc ....~~
461.412839414980

T24/7
Reduced observed temp. ($T_{r,x}$)......... ~~Reduced observed temp. Tr,x ....~~
0.758142463288

T24/8
Reduced temp. at 60°F ($T_{r,60}$) .... ~~Reduced temp. at 60°F Tr,60 ....~~
0.625699007253

T24/9
Scaling factor (h_2) .... ~~Scaling factor h2 ....~~
1.006900839912

T24/10
Tau for fluid at 60°F (τ) .... ~~Tau for fluid at 60°F ....~~
0.374300992747

Sat den fluid 1 at 60°F ($\rho^{sat}_{60,1}$) .... ~~Sat den fluid 1 at 60°F ....~~
8.652500418110

Sat den fluid 2 at 60°F ($\rho^{sat}_{60,2}$) .... ~~Sat den fluid 2 at 60°F ....~~
8.668052899178

T24/11
Interpolating factor (X)............. ~~Interpolating factor X ....~~
8.660400031891

T24/12

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Tau for fluid at obs. temp. (τ_x) ..... Tau for fluid at obs. temp. ....
0.241857536712

Sat den fluid 1 at obs. temp. ($\rho_{x,1}^{sat}$) . Sat den fluid 1 at obs. temp. ..
7.734059015744

Sat den fluid 2 at obs. temp. ($\rho_{x,2}^{sat}$) . Sat den fluid 2 at obs. temp. ..
7.744880148272

T24/13
C_{TL} .... CTL ....
0.893815224960

T24/14
CTL rounded ..C_{TL} (rounded) 0.89382

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Example 24/9 – ~~Utilize~~Use n-Pentane and i-Hexane

Input Data
Relative density @ 60°F (γ_{60}) .... ~~Relative density @ 60°F RD60 ...~~ 0.640040
Observed temperature, °F (T_F) .... ~~Observed temperature Tf, °F ....~~ -12.0200
Computed Data – last digit is rounded
T24/1
Input Data – rounded
γ_{60} rounded to 0.0001.................. ~~RD60, rounded to 0.0001 ....~~ 0.6400
T_F rounded to 0.1 .... ~~Tf, °F, rounded to 0.1 ....~~ -12.0
T24/2
T_x, Kelvin .... ~~Tx, Kelvin ....~~
248.705555555556

T24/3
Input data within range
T24/4
Reference Fluid 1..................... ~~Reference Fluid 1 ....~~ n-Pent
Reference Fluid 2..................... ~~Reference Fluid 2 ....~~ i-Hexa
T24/5
Delta (δ) .... ~~Delta ....~~
0.342587982997

T24/6
Critical temperature (T_c) .... ~~Critical temperature Tc ....~~
479.379498717114

T24/7
Reduced observed temp. ($T_{r,x}$)......... ~~Reduced observed temp. Tr,x ....~~
0.518807241906

T24/8
Reduced temp. at 60°F ($T_{r,60}$) .... ~~Reduced temp. at 60°F Tr,60 ....~~
0.602248440595

T24/9
Scaling factor (h_2) .... ~~Scaling factor h2 ....~~
1.196694721271

T24/10
Tau for fluid at 60°F (τ) .... ~~Tau for fluid at 60°F ....~~
0.397751559405

Sat den fluid 1 at 60°F ($\rho_{60,1}^{sat}$) .... ~~Sat den fluid 1 at 60°F ....~~
8.816158414827

Sat den fluid 2 at 60°F ($\rho_{60,2}^{sat}$) .... ~~Sat den fluid 2 at 60°F ....~~
7.499847998980

T24/11
Interpolating factor (X)............. ~~Interpolating factor X ....~~
8.869948165069

T24/12

```
Tau for fluid at obs. temp. (τx) ..... Tau for fluid at obs. temp. ....
0.481192758094

Sat den fluid 1 at obs. temp. (ρ^sat_x,1) . Sat den fluid 1 at obs. temp. ..
9.321161815695

Sat den fluid 2 at obs. temp. (ρ^sat_x,2) . Sat den fluid 2 at obs. temp. ..
7.929963121410

  T24/13
CTL ................................... CTL ............................
1.057304685863

  T24/14
CTL rounded ..CTL (rounded) ..........  .................   1.05730
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Example 24/10 – ~~Utilize~~Use i-Hexane and n-Hexane

```
    Input Data
Relative density @ 60°F (γ60)......... Relative density @ 60°F RD60 ...  0.660033
Observed temperature, °F (TF) ........ Observed temperature Tf, °F ....  177.0450
    Computed Data – last digit is rounded
  T24/1
    Input Data – rounded
γ60 rounded to 0.0001................. RD60, rounded to 0.0001 ........  0.6600
TF rounded to 0.1 .................... Tf, °F, rounded to 0.1 .........  177.0
  T24/2
Tx, Kelvin ........................... Tx, Kelvin .....................
353.705555555556

  T24/3
Input data within range
  T24/4
Reference Fluid 1....................      Reference Fluid 1 ............. i-Hexa
Reference Fluid 2....................      Reference Fluid 2 ............. n-Hexa
  T24/5
Delta (δ)............................ Delta ..........................
0.410758300710

  T24/6
Critical temperature (Tc) ............ Critical temperature Tc ........
501.870052196607

  T24/7
Reduced observed temp. (Tr,x)......... Reduced observed temp. Tr,x ....
0.704775178370

  T24/8
Reduced temp. at 60°F (Tr,60) ........ Reduced temp. at 60°F Tr,60 ....
0.575259580228

  T24/9
Scaling factor (h2) .................. Scaling factor h2 ..............
1.006395599121

  T24/10
Tau for fluid at 60°F (τ)............ Tau for fluid at 60°F ..........
0.424740419772

Sat den fluid 1 at 60°F (ρ^sat_60,1)....... Sat den fluid 1 at 60°F ........

7.641170665754

Sat den fluid 2 at 60°F (ρ^sat_60,2)....... Sat den fluid 2 at 60°F ........

7.665708531720

  T24/11
Interpolating factor (X)............. Interpolating factor X .........
7.671217510578

  T24/12
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```
Tau for fluid at obs. temp. (τx) ..... Tau for fluid at obs. temp. ....
0.295224821630

Sat den fluid 1 at obs. temp. (ρ^sat_x,1) . Sat den fluid 1 at obs. temp. ..
6.925133823039

Sat den fluid 2 at obs. temp. (ρ^sat_x,2) . Sat den fluid 2 at obs. temp. ..
6.945363609083

  T24/13
CTL ................................... CTL .............................
0.906185214223

  T24/14
CTL rounded ..CTL (rounded) .......... .................. 0.90619
```

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Example 24/11 – ~~Utilize~~Use n-Hexane and n-Heptane

Input Data

Relative density @ 60°F (γ_{60}) .... ~~Relative density @ 60°F RD60 ...~~ 0.670042

Observed temperature, °F (T_F) .... ~~Observed temperature Tf, °F ....~~ 181.0300

Computed Data – last digit is rounded

T24/1

Input Data – rounded

γ_{60} rounded to 0.0001................. ~~RD60, rounded to 0.0001 ....~~ 0.6700

T_F rounded to 0.1 .... ~~Tf, °F, rounded to 0.1 ....~~ 181.0

T24/2

T_X, Kelvin .... ~~Tx, Kelvin ....~~

355.927777777778

T24/3

Input data within range

T24/4

Reference Fluid 1.................... ~~Reference Fluid 1 ....~~ n-Hexa

Reference Fluid 2.................... ~~Reference Fluid 2 ....~~ n-Hept

T24/5

Delta (δ) .... ~~Delta ....~~

0.247591240876

T24/6

Critical temperature (T_c) .... ~~Critical temperature Tc ....~~

515.470992700730

T24/7

Reduced observed temp. ($T_{r,x}$)........ ~~Reduced observed temp. Tr,x ....~~

0.690490411328

T24/8

Reduced temp. at 60°F ($T_{r,60}$) .... ~~Reduced temp. at 60°F Tr,60 ....~~

0.560081090195

T24/9

Scaling factor (h_2) .... ~~Scaling factor h2 ....~~

1.188010824747

T24/10

Tau for fluid at 60°F (τ) .... ~~Tau for fluid at 60°F ....~~

0.439918909805

Sat den fluid 1 at 60°F ($\rho^{sat}_{60,1}$)....... ~~Sat den fluid 1 at 60°F ....~~

7.744857153990

Sat den fluid 2 at 60°F ($\rho^{sat}_{60,2}$)....... ~~Sat den fluid 2 at 60°F ....~~

6.743069361289

T24/11

Interpolating factor (X)............. ~~Interpolating factor X ....~~

7.809053198722

T24/12

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Tau for fluid at obs. temp. (τ_x) ..... Tau for fluid at obs. temp. ....
0.309509588672

Sat den fluid 1 at obs. temp. ($\rho_{x,1}^{sat}$) . Sat den fluid 1 at obs. temp. ..
7.030188106398

Sat den fluid 2 at obs. temp. ($\rho_{x,2}^{sat}$) . Sat den fluid 2 at obs. temp. ..
6.111938115029

T24/13
C_{TL} .... CTL ....
0.907404360428

T24/14
CTL rounded ..C_{TL} (rounded) 0.90740

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Example 24/12 – Reduced TTemperature ($T_{r,x}$) GGreater TThan 1.0

Input Data

Relative density @ 60°F (γ_{60}) .... Relative density @ 60°F RD60 ... 0.350180

Observed temperature, °F (T_F) .... Observed temperature Tf, °F 195.0250

Computed Data – last digit is rounded

T24/1

Input Data – rounded

γ_{60} rounded to 0.0001.................. RD60, rounded to 0.0001 .... 0.3502

T_F rounded to 0.1 .... Tf, °F, rounded to 0.1 .... 195.0

T24/2

T_x, Kelvin .... Tx, Kelvin 363.705555555556

T24/3

Input data within range

T24/4

Reference Fluid 1.................... Reference Fluid 1 .... EE (68

Reference Fluid 2.................... Reference Fluid 2 .... Ethane

T24/5

Delta (δ) .... Delta 0.812927805760

T24/6

Critical temperature (T_c) .... Critical temperature Tc 303.979338757587

T24/7

Reduced observed temp. ($T_{r,x}$)......... Reduced observed temp. Tr,x 1.196481172181

Reduced temperature Input dataTr,x greater than 1.0,is no solutionoutside the correlation range of the standard

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Example 24/13 – Observed Temperature (T_F f) < Llower Rrange Llimit

```
    Input Data
Relative density @ 60°F (γ60)......... Relative density @ 60°F RD60 ...   0.500000
Observed temperature, °F (TF) ........ Observed temperature Tf, °F ....  -50.8500
    Computed Data – last digit is rounded
  T24/1
    Input Data – rounded
γ60 rounded to 0.0001.................  RD60, rounded to 0.0001 ........  0.5000
TF rounded to 0.1 .................... Tf, °F, rounded to 0.1 .........  -50.9
  T24/2
Tx, Kelvin ........................... Tx, Kelvin .....................
227.094444444444

  T24/3
Tx Tx less than 227.15,is outside the input range of the standardno solution
```

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Example 24/14 – Relative Density @ 60°F (γ_{60})RD60 < Lower Range Limit

```
    Input Data
Relative density @ 60°F (γ60)......... Relative density @ 60°F RD60 ...    0.349940
Observed temperature, °F (TF)........ Observed temperature Tf, °F ....   40.0000
    Computed Data – last digit is rounded
  T24/1
    Input Data – rounded
γ60 rounded to 0.0001................. RD60, rounded to 0.0001 ........   0.3499
TF rounded to 0.1..................... Tf, °F, rounded to 0.1 .........  40.0
  T24/2
Tx, Kelvin ........................... Tx, Kelvin .....................
277.594444444444

  T24/3
γ60 RD60 is less than 0.3500, outside the input range of the standardno solution
```


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Example 24/15 – Observed Temperature (T_F)Tf > Upper Range Limit

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Input Data

Relative density @ 60°F (γ_{60})......... Relative density @ 60°F RD60 ... 0.450000

Observed temperature, °F (T_F) .... Observed temperature Tf, °F 199.4600

Computed Data – last digit is rounded

T24/1

Input Data – rounded

γ_{60} rounded to 0.0001................. RD60, rounded to 0.0001 .... 0.4500

T_F rounded to 0.1 .... Tf, °F, rounded to 0.1 .... 199.5

T24/2

T_x, Kelvin .... Tx, Kelvin ....

366.205555555556

T24/3

T_x Tx greater than 366.15, is outside the input range of the standardno solution

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Example 24/16 – Relative Density @ 60°F (γ_{60})RD60 > Upper Range Limit

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```
    Input Data
Relative density @ 60°F (γ60)......... Relative density @ 60°F RD60 ...   0.688070
Observed temperature, °F (TF) ........ Observed temperature Tf, °F ....   0.0000
    Computed Data – last digit is rounded
  T24/1
    Input Data – rounded
γ60 rounded to 0.0001.................  RD60, rounded to 0.0001 ........   0.6881
TF rounded to 0.1 ..................... Tf, °F, rounded to 0.1 .........  0.0
  T24/2
TX, Kelvin ............................ Tx, Kelvin .....................
255.372222222222

  T24/3
γ60 RD60 is greater than 0.6880, outside the input range of the standardno solution
```

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Example 24/17 – Observed Temperature (~~Tf~~ T_F) a~~&~~nd Relative Density @ 60°F (γ_{60})~~RD60~~ = Upper Range Limits

```
    Input Data
Relative density @ 60°F (γ60) ......... [Relative density @ 60°F RD60 ...]  0.688000
Observed temperature, °F (TF) ........ [Observed temperature Tf, °F ....]  199.4400
    Computed Data – last digit is rounded
  T24/1
    Input Data – rounded
γ60 rounded to 0.0001.................  [RD60, rounded to 0.0001 ........]  0.6880
TF rounded to 0.1 .................... [Tf, °F, rounded to 0.1 .........]  199.4
  T24/2
Tx, Kelvin ........................... [Tx, Kelvin .....................]
366.150000000000

  T24/3
Input data within range
  T24/4
Reference Fluid 1....................     [Reference Fluid 1 ..............]  n-Hexa
Reference Fluid 2....................     [Reference Fluid 2 ..............]  n-Hept
  T24/5
Delta (δ)............................. [Delta ..........................]
0.998373305527

  T24/6
Critical temperature (TC) ............ [Critical temperature Tc ........]
540.096644421272

  T24/7
Reduced observed temp. (Tr,x)......... [Reduced observed temp. Tr,x ....]
0.677934224887

  T24/8
Reduced temp. at 60°F (Tr,60) ........ [Reduced temp. at 60°F Tr,60 ....]
0.534544249696

  T24/9
Scaling factor (h2) .................. [Scaling factor h2 ..............]
1.188010824747

  T24/10
Tau for fluid at 60°F (τ)............ [Tau for fluid at 60°F ..........]
0.465455750304

Sat den fluid 1 at 60°F (ρsat60,1)....... [Sat den fluid 1 at 60°F ........]
7.876480858049

Sat den fluid 2 at 60°F (ρsat60,2)....... [Sat den fluid 2 at 60°F ........]
6.859355371549

  T24/11
Interpolating factor (X)............. [Interpolating factor X .........]
8.148529834765

  T24/12
```

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Tau for fluid at obs. temp. (τ_x) ..... Tau for fluid at obs. temp. ....
0.322065775113

Sat den fluid 1 at obs. temp. ($\rho_{x,1}^{sat}$) . Sat den fluid 1 at obs. temp. ..
7.103375621618

Sat den fluid 2 at obs. temp. ($\rho_{x,2}^{sat}$) . Sat den fluid 2 at obs. temp. ..
6.176601533604

T24/13
C_{TL} .... CTL ....
0.900466171184

T24/14
CTL rounded ..C_{TL} (rounded) 0.90047

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Example 24/18 – Observed Temperature (T_F) a~~Tf &~~nd Relative Density @ 60°F (γ_{60})~~RD60~~ = Lower Range Limits

Input Data

Relative density @ 60°F (γ_{60}) .... ~~Relative density @ 60°F RD60 ...~~ 0.350000

Observed temperature, °F (T_F) .... ~~Observed temperature Tf, °F ....~~ -50.8000

Computed Data – last digit is rounded

T24/1

Input Data – rounded

γ_{60} rounded to 0.0001.................. ~~RD60, rounded to 0.0001 ....~~ 0.3500

T_F rounded to 0.1 .... ~~Tf, °F, rounded to 0.1 ....~~ -50.8

T24/2

T_x, Kelvin .... ~~Tx, Kelvin ....~~ 227.150000000000

T24/3

Input data within range

T24/4

Reference Fluid 1.................... ~~Reference Fluid 1 ....~~ EE (68...

Reference Fluid 2.................... ~~Reference Fluid 2 ....~~ Ethane

T24/5

Delta (δ) .... ~~Delta ....~~ 0.806470360325

T24/6

Critical temperature (T_c) .... ~~Critical temperature Tc ....~~ 303.932716001550

T24/7

Reduced observed temp. ($T_{r,x}$)........ ~~Reduced observed temp. Tr,x ....~~ 0.747369361839

T24/8

Reduced temp. at 60°F ($T_{r,60}$) .... ~~Reduced temp. at 60°F Tr,60 ....~~ 0.949899567752

T24/9

Scaling factor (h_2) .... ~~Scaling factor h2 ....~~ 0.902595741301

T24/10

Tau for fluid at 60°F (τ)............ ~~Tau for fluid at 60°F ....~~ 0.050100432248

Sat den fluid 1 at 60°F ($\rho^{sat}_{60,1}$)....... ~~Sat den fluid 1 at 60°F ....~~ 11.889940226938

Sat den fluid 2 at 60°F ($\rho^{sat}_{60,2}$)....... ~~Sat den fluid 2 at 60°F ....~~ 11.671295077352

T24/11

Interpolating factor (X)............. ~~Interpolating factor X ....~~ 10.772124448866

T24/12

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Tau for fluid at obs. temp. (τ_x) ..... Tau for fluid at obs. temp. ....
0.252630638161

Sat den fluid 1 at obs. temp. ($\rho_{x,1}^{sat}$) . Sat den fluid 1 at obs. temp. ..
16.573069193167

Sat den fluid 2 at obs. temp. ($\rho_{x,2}^{sat}$) . Sat den fluid 2 at obs. temp. ..
16.091771523334

T24/13
C_{TL} .... CTL ....
1.381375977418

T24/14
CTL rounded ..C_{TL} (rounded) 1.38138

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5.1.2 Implementation Procedure for Table 23E (60°F Basis)

This section presents the implementation procedure T23 for calculating the relative densities of NGLs and LPGs at ~~a base conditions~~a base condition of 60°F from known temperatures and densities.

In the past, a hydrometer correction option was allowed ~~so as to be able~~ to correct for the expansion of the glass comprising a hydrometer stem. The hydrometer correction previously took the following form:

Observed densities determined by a glass hydrometer require correction for the effect of temperature on the instrument. Readings from most density meters do not. If the density was determined with a glass hydrometer, then a correction for the expansion or contraction of the glass must be made. Call the rounded observed relative density the uncorrected relative density γ_x^*. Calculate the corrected relative density, γ_x, from:

$$\gamma_x = [1 - 0.00001278(T_F - 60) - 0.0000000062(T_F - 60)^2]\,\gamma_x^*$$

The value of γ_x was not rounded prior to use[10].

Density readings must be corrected for the effect of temperature on the instrument prior to entering the density into the following implementation procedure.

5.1.2.1 Inputs and Outputs

Inputs: Relative density at observed temperature, γ_x
Observed temperature, T_F (°F)

Output: Relative density at 60°F, γ_{60}

5.1.2.2 Outline of Calculations

The calculations are performed using an extended two-fluid corresponding states equation. Two reference fluids are found that are slightly denser and slightly less dense than the observed fluid by comparing their densities at the observed temperature. Iteration must be performed to determine the value of the fluid's relative density at 60°F such that when the Temperature Correction Factor is applied, the observed relative density is obtained. The "guessed" value for the fluid's relative density at 60°F is constrained to lie between the relative densities at 60°F of these two reference fluids (as upper and lower bounds). As the iterations progress, these upper and lower bounds are "brought together" based upon intermediate calculations.

See Figure 2 for a general flow chart of the calculation procedure.

5.1.2.3 T23 Implementation Procedure

T23/Step Number Operation/Procedure at that step

T23/1: Round the relative density γ_x to the nearest 0.0001 and round the observed temperature T_F to the nearest 0.1°F.

Temperature rounding examples follow: –0.05 rounds to –0.1; –0.049 rounds to 0.0, –0.051 rounds to –0.1. Density rounding examples follow: 0.35555 rounds to 0.3556, 0.355549 rounds to 0.3555, 0.40289 rounds to 0.4029.

T23/2: Convert the rounded observed temperature to units of Kelvin, T_x:

$$T_x = \frac{T_F + 459.67}{1.8}$$

T23/3: Check the values of temperature and relative density to ensure that they are in the proper range. The observed temperature T_x and relative density γ_x must fall within the following ~~boundaries~~ranges:

Temperature between 227.15 and 366.15 K, inclusive (equivalent to –46 to 93°C, or –50.8 to 199.4°F)
Relative density between 0.2100 and 0.7400 inclusive.

If these values do not fall in these ranges, then the standard does not apply. Flag this result (possibly by returning a –1 for γ_{60}) and exit this procedure.

T23/4: Reference fluids must be chosen to perform the density calculations. As written here, this is done in two separate steps: T23/4 to compute the density for each reference fluid at the observed temperature and T23/5 to determine which two reference fluids are to be used. However, Steps 4 and 5 could be combined into a single step (e.g., using a binary search technique).

The reference fluids' densities are to be calculated at the observed temperature, T_x. Use the reference fluids' parameter values from ~~Table 1~~Table 2. First, use each reference fluid's critical temperature, $T_{c,ref}$, to compute its reduced observed temperature, $T_{r,x}$:

$$T_{r,x} = \frac{T_x}{T_{c,ref}}$$

If $T_{r,x} \leq 1$, calculate the saturation density for this reference fluid at this reduced temperature $T_{r,x}$. Use the procedure as described in Section 5.1.1.3 Step T24/10. Refer to this calculated density for the reference fluid as $\rho^{sat}_{x,ref}$. Repeat this for 60°F using the reduced temperature $T_{r,60}$:

$$T_{r,60} = \frac{519.67}{1.8T_{c,ref}}$$

Refer to this calculated density as $\rho^{sat}_{60,ref}$. Finally, calculate its relative density at the observation temperature, $\gamma_{x,ref}$, as:

$$\gamma_{x,ref} = \gamma_{60,ref}\left(\frac{\rho^{sat}_{x,ref}}{\rho^{sat}_{60,ref}}\right)$$

where $\gamma_{60,ref}$ is the reference fluid's relative density at 60°F

If $T_{r,x} > 1$, this reference fluid will not be a liquid at this observed temperature and no value of $\gamma_{x,ref}$ can be calculated. It is suggested that this type of "no value" case be flagged by returning ~~a −1~~any negative value for $\gamma_{x,ref}$~~.~~, such as the additive inverse of $\gamma_{60,ref}$ (by multiplying $\gamma_{60,ref}$ by -1).

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T23/5: Determine the two adjacent reference fluids to be used for the calculations. Choose the lowest density reference fluid that has a density value greater than γ_x and refer to this fluid using the subscript "2". ~~Also~~Also, use the next lowest density reference fluid and refer to this fluid using the subscript "1" (even though this reference fluid may not exist as a liquid at the observation temperature). If γ_x is below that for "EE 68/32" (the least dense reference fluid), then set "EE 68/32" as fluid "1" and "ethane" as fluid "2". If γ_x is above that for "n-heptane" (the most dense reference fluid), then set "n-hexane" as fluid "1" and "n-heptane" as fluid "2".

T23/6: Initialize the boundaries on the iteration for the observed fluid's 60°F relative density. For most cases, the observed fluid's 60°F relative density should be between the two reference fluids "1" and "2", $\gamma_{60,1}$ and $\gamma_{60,2}$.

Initialize the upper boundary for the observed fluid's 60°F relative density, $\gamma_{60,high}$, as:

$$\gamma_{60,high} = \gamma_{60,2}$$

and the corresponding relative density at the observed temperature, $\gamma_{x,high}$, as:

$$\gamma_{x,high} = \gamma_{x,2}$$

However, if the relative density γ_x is greater than the reference fluid "2" relative density at the observed temperature $\gamma_{x,2}$, then no answer exists. If this is the case, then $\gamma_{x,60}$ should be flagged (perhaps by being set to –1) and exit this procedure.

Initialize the lower boundary for the observed fluid's 60°F relative density, $\gamma_{60,low}$, as:

$$\gamma_{60,low} = \gamma_{60,1}$$

and the corresponding relative density at the observed temperature, $\gamma_{x,low}$, as:

$$\gamma_{x,low} = \gamma_{x,1}$$

However, if reference fluid "1" is not a liquid at the observed temperature (i.e., $T_{r,x} > 1$ for the reference fluid), then set the lower boundary convergence 60°F relative density by the following equation:

$$\gamma_{60,low} = \left[\frac{T_x - T_{c,1}}{T_{c,2} - T_{c,1}}\right](\gamma_{60,2} - \gamma_{60,1}) + \gamma_{60,1}$$

Note that this equation was derived from equations in Section 5.1 at a reduced temperature of 1.0.

If $\gamma_{60,low}$ is less than 0.3500, then set it equal to 0.3500.

If $\gamma_{60,low}$ has been reset using the preceding technique then recalculate the corresponding $\gamma_{x,low}$ value. Use the procedure in Section 5.1.1.3 Steps T24/4 through T24/13 to calculate its Temperature Correction Factor, CTL. Skip Step 24/14 to avoid rounding the output CTL. The relative density at the observed temperature will be:

$$\gamma_{x,low} = C_{TL} \times \gamma_{60,low}$$

At this point, upper and lower convergence boundaries have been set. After one more check, the iterative process to determine a 60°F relative density γ_{60} can begin. If the observed relative density γ_x is less than the lower limit $\gamma_{x,low}$, then no answer exists. If this is the case, then γ_{60} should be flagged (perhaps by being set to –1) and exit this procedure.

T23/7: Calculate an intermediate 60°F relative density value, $\gamma_{60,mid}$ If a value for $\gamma_{60,low}$ exists, then calculate $\gamma_{60,mid}$ from:

$$\delta = \frac{\gamma_x - \gamma_{x,low}}{\gamma_{x,high} - \gamma_{x,low}}$$

If δ is less than 0.001 then set it equal to 0.001; if δ is greater than 0.999 then set it equal to 0.999. Calculate the intermediate 60°F relative density value:

$$\gamma_{60,mid} = \gamma_{60,low} + \delta\,(\gamma_{60,high} - \gamma_{60,low})$$

However, if a value for $\gamma_{x,low}$ does not exist, then calculate $\gamma_{60,mid}$ from:

$$\gamma_{60,mid} = \frac{\gamma_{60,high} + \gamma_{60,low}}{2}$$

Calculate the Temperature Correction Factor, C_{TL}, using this value of $\gamma_{60,mid}$ and T_x, unrounded, and the procedure from Section 5.1.1.3 Steps T24/5 to T24/13. (Do not round this C_{TL} value.) The relative density, $\gamma_{x,mid}$, at observed temperature, T_x, will be:

$$\gamma_{x,mid} = C_{TL} \times \gamma_{60,mid}$$

T23/8: Check for convergence of the 60°F relative density. The calculations will be considered converged if either occurs:

- If γ_x is between $\gamma_{x,low}$ and $\gamma_{x,mid}$ and the difference between $\gamma_{60,low}$ and $\gamma_{60,mid}$ is less than 0.00000001 (10^{-8}).
- If γ_x is between $\gamma_{x,high}$ and $\gamma_{x,mid}$ and the difference between $\gamma_{60,high}$ and $\gamma_{60,mid}$ is less than 0.00000001 (10^{-8}).

If convergence has been achieved, set:

$$\gamma_{60} = \gamma_{60,mid}$$

and skip to Step T23/12.

T23/9: There are three pairs of relative density values: ($\gamma_{x,low}$, $\gamma_{60,low}$), ($\gamma_{x,mid}$, $\gamma_{60,mid}$) and ($\gamma_{x,high}$, $\gamma_{60,high}$). A quadratic equation can be fit through these three points. This quadratic equation should be a good approximation to the actual relationship between γ_x and γ_{60}. Using the value of the observed relative density γ_x in the quadratic equation should give a very good estimate to γ_{60}.

Calculate the parameters for the quadratic equation by:

$$\alpha = (\gamma_{60,high} - \gamma_{60,low})$$

$$\beta = \gamma_{x,high}^2 - \gamma_{x,low}^2$$

$$\phi = \frac{\gamma_{x,high} - \gamma_{x,low}}{\gamma_{x,mid} - \gamma_{x,low}}$$

$$A = \frac{\alpha - \phi\left(\gamma_{60,mid} - \gamma_{60,low}\right)}{\beta - \phi\left(\gamma_{x,mid}^2 - \gamma_{x,low}^2\right)}$$

$$B = \frac{\alpha - A\beta}{\gamma_{x,high} - \gamma_{x,low}}$$

$$C = \gamma_{60,low} - B\gamma_{x,low} - A\gamma_{x,low}^2$$

Using these values of *A*, *B*, and *C*, calculate the associated value $\gamma_{60,trial}$ using:

$$\gamma_{60,trial} = A\gamma_x^2 + B\gamma_x + C$$

This value of $\gamma_{60,trial}$ may have to be adjusted if it goes outside of the range of $\gamma_{60,low}$ or $\gamma_{60,high}$. If $\gamma_{60,trial} < \gamma_{60,low}$, then reset the value as:

$$\gamma_{60,trial} = \gamma_{60,low} + \frac{\left(\gamma_{60,mid} - \gamma_{60,low}\right)\left(\gamma_x - \gamma_{x,low}\right)}{\left(\gamma_{x,mid} - \gamma_{x,low}\right)}$$

If $\gamma_{60,trial} > \gamma_{60,high}$ then reset the value as:

$$\gamma_{60,trial} = \gamma_{60,mid} + \frac{\left(\gamma_{60,high} - \gamma_{60,mid}\right)\left(\gamma_x - \gamma_{x,mid}\right)}{\left(\gamma_{x,high} - \gamma_{x,mid}\right)}$$

Finally, calculate the Temperature Correction Factor, C_{TL}, using the value of $\gamma_{60,trial}$ and the procedure from Section 5.1.1.3 Steps T24/4 to T24/13. Skip Step 24/14 to avoid rounding the output C_{TL}. The relative density at observed temperature, $\gamma_{x,trial}$, will be:

$$\gamma_{x,trial} = C_{TL} \times \gamma_{60,trial}$$

T23/10: Check for convergence of the 60°F relative density. The calculations will be considered converged if the absolute difference between $\gamma_{x,trial}$ and γ_x is less than 0.00000001 (10^{-8}). If converged, set:

$$\gamma_{60} = \gamma_{60,trial}$$

and skip to Step T23/12.

T23/11: The calculation has not yet converged, so the iteration boundaries must be updated.

If $\gamma_{x,trial} > \gamma_x$ then reset the upper boundaries to:

$$\gamma_{x,high} = \gamma_{x,trial}$$

$$\gamma_{60,high} = \gamma_{60,trial}$$

Also, if $\gamma_{x,mid} < \gamma_x$ then reset the lower boundaries to:

$$\gamma_{x,low} = \gamma_{x,mid}$$

$$\gamma_{60,low} = \gamma_{60,mid}$$

Or if $\gamma_{x,trial} < \gamma_x$ then reset the lower boundaries to:

$$\gamma_{x,low} = \gamma_{x,trial}$$

$$\gamma_{60,low} = \gamma_{60,trial}$$

Also, if $\gamma_{x,mid} > \gamma_x$ then reset the upper boundaries to:

$$\gamma_{x,high} = \gamma_{x,mid}$$

$$\gamma_{60,high} = \gamma_{60,mid}$$

Return to Step T23/7 and continue iterations. Do at most 10 iterations. If 10 iterations are reached, then no solution can be found. Flag this result (possibly by returning a –1 for γ_{60}) and exit this procedure.

Note: At this time, all known cases have been found to require less than 10 iterations.

T23/12: Round the 60°F relative density value γ_{60} to the nearest 0.0001. If the value is less than 0.3500 or greater than 0.6880, then the result is outside the scope of this standard. Flag result (possibly by returning a –1 for γ_{60}). Exit this procedure.

Comment [KF1]: Update Figure Number for addition of Figure 1

Figure 2. Flow Chart of Implementation Procedure for Table 23

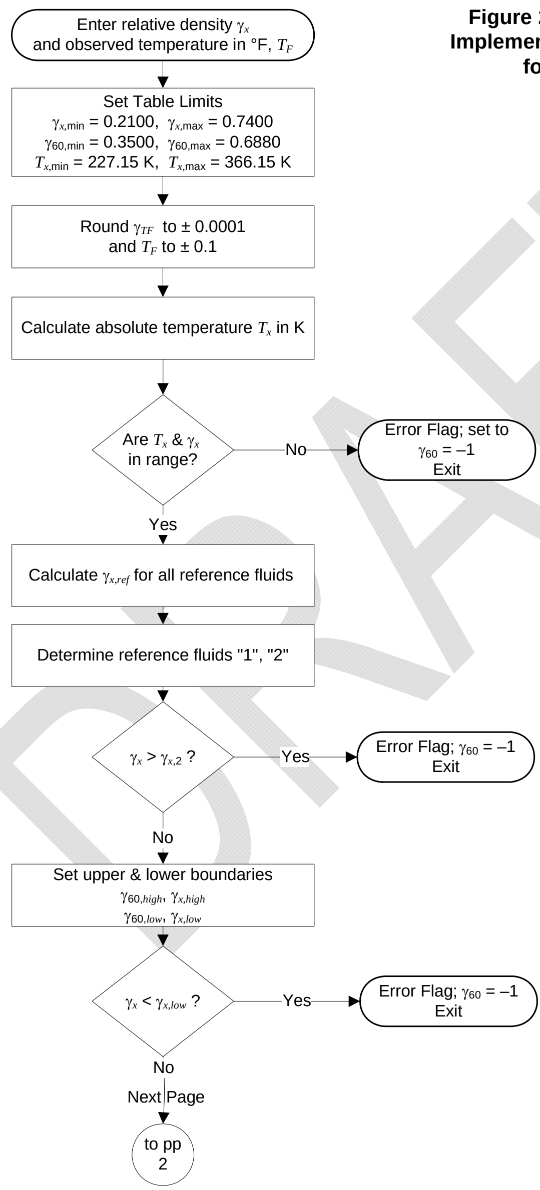
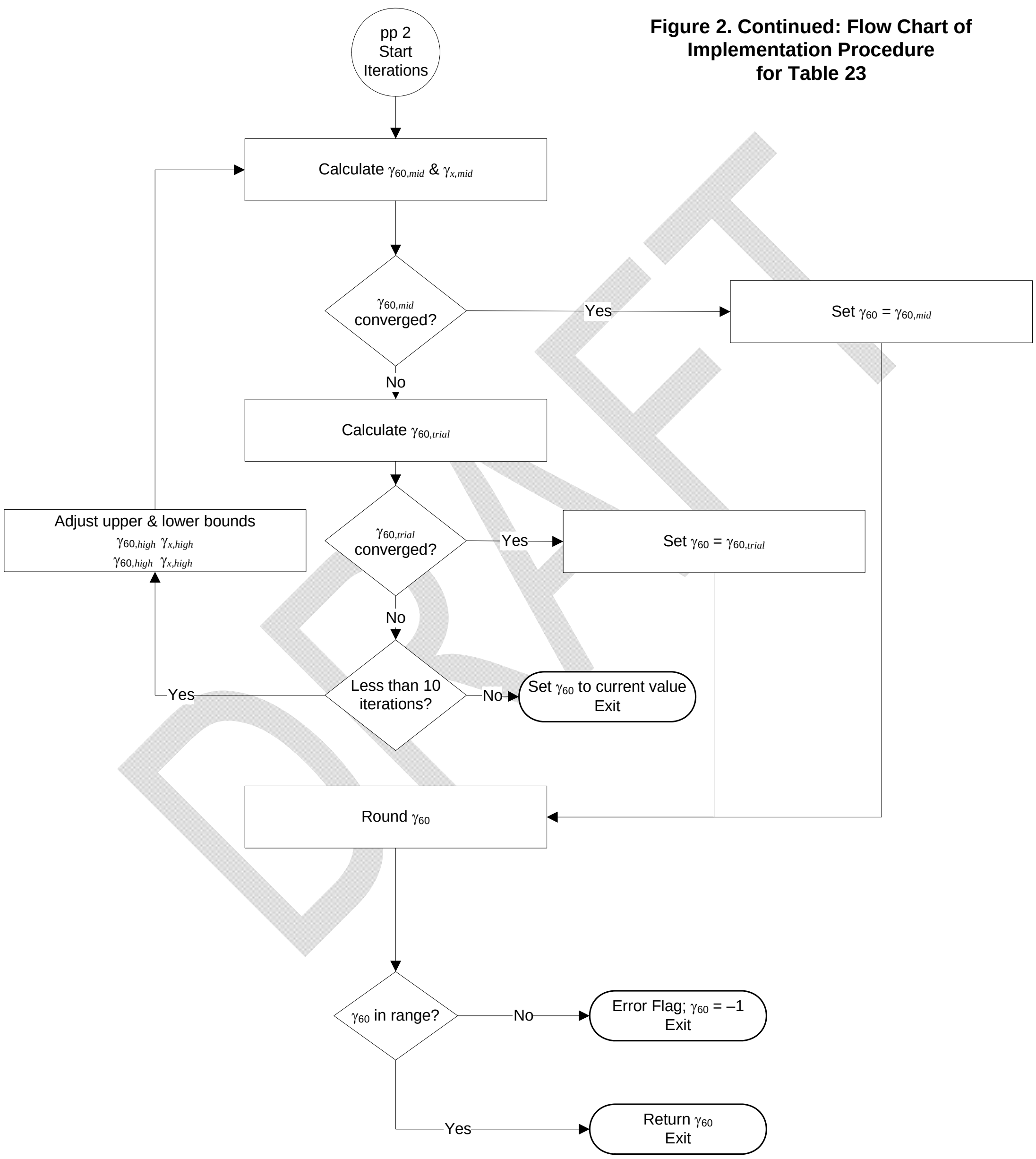


Figure 2. Continued: Flow Chart of Implementation Procedure for Table 23



Comment [KF2]: Update Figure Number for addition of Figure 1

5.1.2.4 Examples for Section 5.1.2 (Table 23E)

(See ~~Table 1~~Table 2 for properties of the Reference Fluids)

Example 23/1 – ~~Utilize~~Use i-Pentane and n-Pentane

Input Data

Relative density @ obs. temp. (γ_x) .. ~~Relative density @ obs. temp. ..~~ 0.67432

Observed temperature, °F (T_F) .... ~~Observed temperature Tf, °F ....~~ -23.33

Computed Data – last digit is rounded

T23/1

Input Data – rounded

γ_x~~RDtf~~, observed rel. density 0.6743

T_F~~Tf~~, °F .... -23.3

T23/2

T_x~~Tx~~, Kelvin 242.427777777778

T23/3

~~RDtf and Tf are within range, continue~~ γ_x and T_F are within range, continue

T23/4

γ_x ~~RDtf~~ for Fluid 1 .... 0.668992076725

~~RDtf~~ γ_x for Fluid 2 .... 0.674300900334

T23/5

Reference Fluid 1.................. ~~Reference Fluid 1 ....~~ i-Pentane

Reference Fluid 2.................. n-Pentane

~~Reference Fluid 2 .... n-Pentane~~

$T_{r,x}$ ~~Tr,x~~ for Fluid 1 .... 0.526513286808

$T_{r,x}$ ~~Tr,x~~ for Fluid 2 .... 0.516188177958

$T_{r,60}$~~Tr,60~~ for Fluid 1 .... 0.627021013716

$T_{r,60}$~~Tr,60~~ for Fluid 2 .... 0.614724913352

T23/6

Upper boundary γ_{60}~~RD60~~$_{,high}$ 0.631054000000

Upper boundary γ_x~~RDtf~~$_{,high}$ 0.674300900334

Lower boundary γ_{60}~~RD60~~$_{,low}$ 0.624285000000

Lower boundary γ_x~~RDtf~~$_{,low}$ 0.668992076725

Iteration steps Pass 1

T23/7

Delta (δ)~~Delta~~ 0.999000000000

γ_{60}~~RD60~~$_{,mid}$ 0.631047231000

C_{TL}~~CTL~~ 1.068534241176

~~RDTf~~$\gamma_{x,mid}$ 0.674295574123

T23/8............................ Continue

T23/9

Alpha (α)~~Alpha~~ 0.006769000000

Beta (β) 0.007131305470

Phi (ϕ) 1.001004282842

A .... -0.784857658731

B 2.329340853270

C .... -0.582762216726

γ_{60}~~RD60~~$_{,Trial}$ 0.631052855782

C_{TL}~~CTL~~$_{,Trial}$ 1.068531730459

~~RDTf~~$\gamma_{x,Trial}$ 0.674300000000

T23/10............................ Converged

T23/11 not needed, convergence already achieved

T23/12

γ_{60}~~RD60~~ ($\gamma_{60,Trial}$ ~~RD60,Trial~~ rounded) 0.6311

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Example 23/2 – ~~Steps 9 & 11,~~ Adjust $\gamma_{60,}$~~RD60Trial~~, Reset High and ~~+~~Low/High Boundaries

Input Data
Relative density @ obs. temp. (γ_x) .. ~~Relative density @ obs. temp. ..~~ 0.24573
Observed temperature, °F (T_F) .... ~~Observed temperature Tf, °F .....~~ 189.98
Computed Data – last digit is rounded
T23/1
Input Data – rounded
γ_x, observed rel. density .... ~~RDtf, observed rel. density ....~~ 0.2457
T_F, °F .... ~~Tf, °F ....~~ 190.0
T23/2
T_x, Kelvin .... ~~Tx, Kelvin ....~~ 360.927777777778

T23/3
~~RDtf and Tf are within range, continue~~ γ_x and T_F are within range, continue
T23/4
γ_x for Fluid 1 .... ~~RDtf for Fluid 1 ....~~ 0.470381000000

γ_x for Fluid 2 .... ~~RDtf for Fluid 2 ....~~ 0.341646473673

T23/5
Reference Fluid 1.................. ~~Reference Fluid 1 ....~~ EP (35/65)
Reference Fluid 2.................. ~~Reference Fluid 2 ....~~ Propane
$T_{r,x}$ for Fluid 1..................... ~~Tr,x for Fluid 1 ....~~ 1.024024790835

$T_{r,x}$ for Fluid 2..................... ~~Tr,x for Fluid 2 ....~~ 0.976060840981

$T_{r,60}$ for Fluid 1 .... ~~Tr,60 for Fluid 1 ....~~ 0.819115801951

$T_{r,60}$ for Fluid 2 .... ~~Tr,60 for Fluid 2 ....~~ 0.780749514726

T23/6
Upper boundary $\gamma_{60,high}$ .... ~~Upper boundary RD60,high ....~~ 0.507025000000

Upper boundary $\gamma_{x,high}$ .... ~~Upper boundary RDtf,high ....~~ 0.341646473673

Lower boundary $\gamma_{60,low}$ .... ~~Lower boundary RD60,low ....~~ 0.488296314601

Lower boundary $\gamma_{x,low}$ .... ~~Lower boundary RDtf,low ....~~ 0.209990106855

Iteration steps — Pass 1 — Pass 2 — Pass 3 — Pass 4
T23/7
Delta (δ)........................... ~~Delta ....~~ 0.~~271235596182~~ 271235596182 0.601796434[illegible] 6017964345840.~~126556348248~~ 126556348248 0.004138210954

~~RD60,mid~~ $\gamma_{60,mid}$ .... 0.~~493376200751~~ 493376200751 0.~~489664201999~~ 48966[illegible] ..... 0.~~488882034911~~ 488882034911 0.488850690456

C_{TL} ~~CTL~~ .... 0.~~587375829009~~ 587375829009 0.529645485[illegible] 5296454859070.~~504021249568~~ 504021249568 0.502607558267

~~RDTf~~ $\gamma_{x,mid}$, ~~mid~~ .... 0.289797254929 0.~~259348434199~~ 25934[illegible] ..... 0.~~246406934127~~ 246406934127 0.245700051887

T23/8 — Continue — Continue — Continue — Continue

T23/9
Alpha (α)~~Alpha~~ .... 0.018728685399 0.~~002273006817~~ 00227[illegible] .... 0.0008~~.~~95498051~~064e-04~~ 0.00003~~.~~14747042~~172e-05~~
Beta (β)~~Beta~~ .... 0.~~072626467996~~ 072626467996 .... 0.028442228403 0.007860987453 0.000 3~~.~~493307143~~583e-04~~
Phi (ϕ)~~Phi~~........................ 1.649681388134 1.202204934943 5.820815799273 237.456099384553

A.................................. 1.515978266954 1.061284960315 1.166129963841 1.088675802961

B .... -0.694014759007 -0.470388528249 -0.~~0.~~529337816619 -0. ~~0.~~491403133721

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C 0.567184205356 0.540274994825
0.548511356689... 0.543866723826

γ60,Trial .... RD60,Trial 0.488182097917 0.488768703948
0.488850560207... 0.488850688195

γ60,Trial RD60,Trial adjusted
γ60,Trial .... RD60,Trial .... 0.490569321418 not changed not
changed not changed

CTL,Trial .... CTL,Trial 0.549012993292 0.498645735699
0.502601576844... 0.502607454450

RDTFγx,Trial .... ,Trial 0.269328931569 0.243722429967
0.245697062401... 0.245700000000

T23/10 Continue e Continue C Continue
Converged
T23/11
Reset boundaries
RDTFγx,high,high 0.269328931569 0.259348434199 0. 0.246406934127

γ60,highRD60,high .... 0.490569321418 0. 0.489664201999 0.
0.488882034911

RDTFγx,low .... ,low .... not changed 0. 0.243722429967
.... 0. 0.245697062401

γ60,low.............................. RD60,low .... not changed 0. 0.488768703948
.... 0. 0.488850560207

T23/12
γ60 (γ60,Trial rounded) .... RD60 (RD60,Trial rounded)
.... 0.4889

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Example 23/3 – ~~T23/11,~~ Reset Upper Boundary Only

Input Data

Relative density @ obs. temp. (γ_x) .. ~~Relative density @ obs. temp. ..~~	0.50004
Observed temperature, °F (T_F) .... ~~Observed temperature Tf, °F .....~~	190.04

Computed Data – last digit is rounded

T23/1

Input Data – rounded

γ_x, observed rel. density .... ~~RDtf, observed rel. density ....~~	0.5000
T_F, °F .... ~~Tf, °F ....~~	190.0

T23/2

T_x, Kelvin .... ~~Tx, Kelvin ....~~	360.927777777778

T23/3

~~RDtf and Tf are within range, continue~~ γ_x and T_F are within range, continue

T23/4

γ_x for Fluid 1 .... ~~RDtf for Fluid 1 ....~~	0.488812742534
γ_x for Fluid 2 .... ~~RDtf for Fluid 2 ....~~	0.543932948655

T23/5

Reference Fluid 1.................. ~~Reference Fluid 1 ....~~	n-Butane
Reference Fluid 2.................. ~~Reference Fluid 2 ....~~	i-Pentane
$T_{r,x}$ for Fluid 1.................... ~~Tr,x for Fluid 1 ....~~	0.848922235812
$T_{r,x}$ for Fluid 2.................... ~~Tr,x for Fluid 2 ....~~	0.783875809612
$T_{r,60}$ for Fluid 1 .... ~~Tr,60 for Fluid 1 ....~~	0.679051546607
$T_{r,60}$ for Fluid 2 .... ~~Tr,60 for Fluid 2 ....~~	0.627021013716

T23/6

Upper boundary $\gamma_{60,high}$ .... ~~Upper boundary RD60,high ....~~	0.624285000000
Upper boundary $\gamma_{x,high}$ .... ~~Upper boundary RDtf,high ....~~	0.543932948655
Lower boundary $\gamma_{60,low}$ .... ~~Lower boundary RD60,low ....~~	0.584127000000
Lower boundary $\gamma_{x,low}$ .... ~~Lower boundary RDtf,low ....~~	0.488812742534

Iteration steps ~~Iteration steps~~	Pass 1 ~~Pass 1~~	Pass 2 ~~Pass 2~~
T23/7		
Delta (δ) .... ~~Delta ....~~	0.202961096368	0.~~0.~~999000000000
$\gamma_{60,mid}$ .... ~~RD60,mid ....~~	0.592277511708	0.~~0.~~591700929263
C_{TL} ~~CTL~~	0.845587965896	0.~~0.~~845005240854
~~RDtf~~ $\gamma_{x,mid}$ ~~, mid~~	0.500822736371	0.~~0.~~499990386246
T23/8............................	Continue	Continue
T23/9		
Alpha (α) .... ~~Alpha ....~~	0.040158000000	0.~~0.~~007581510774
Beta (β) ~~Beta~~	0.056925155369	0.~~0.~~011068449627
Phi (φ) ~~Phi~~	4.~~589528260128~~	~~589528260128~~ 1.000980586162
A. .... ~~A ....~~	1.~~157707890490~~	~~157707890490~~ 1.260826338621
B. .... ~~B ....~~	-0.467064681900	-0.~~-0.~~569112796362
C. .... ~~C ....~~	0.535813879101	0.~~0.~~561057392636
$\gamma_{60,Trial}$ .... ~~RD60,Trial ....~~	0.591708510774	0.~~0.~~591707579111
$C_{TL,Trial}$ .... ~~CTL,Trial ....~~	0.845012937594	0.~~0.~~845014991820

RDTf $\gamma_{x,Trial}$ .... , Trial 0.500001346888 0. 0.500000000000

T23/10 Continue Converged
T23/11
Reset boundaries
RDTf $\gamma_{x,high}$ .... , high 0.500001346888

$\gamma_{60,high}$ .... RD60,high 0.591708510774

T23/12
γ_{60} ($\gamma_{60,Trial}$ rounded) .... RD60 (RD60,Trial rounded) 0.5917

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Example 23/4 – ~~Calculated~~ Relative Density @ 60°F (γ_{60})~~RD60~~ equals 0.3500, ~~T23/11 lo/hi, T23/8 detects~~ = Lower Range Limit

Input Data

Relative density @ obs. temp. (γ_x) .. ~~Relative density @ obs. temp. ..~~ 0.22238

Observed temperature, °F (T_F) .... ~~Observed temperature Tf, °F ....~~ 87.25

Computed Data – last digit is rounded

T23/1

Input Data – rounded

γ_x, observed rel. density .... ~~RDtf, observed rel. density ....~~ 0.2224

T_F, °F .... ~~Tf, °F ....~~ 87.3

T23/2

T_x, Kelvin .... ~~Tx, Kelvin ....~~ 303.872222222222

T23/3

~~RDtf and Tf are within range, continue~~ γ_x and T_F are within range, continue

T23/4

γ_x for Fluid 1 .... ~~RDtf for Fluid 1 ....~~ 0.325022000000

γ_x for Fluid 2 .... ~~RDtf for Fluid 2 ....~~ 0.267719237662

T23/5

Reference Fluid 1.................. ~~Reference Fluid 1 ....~~ EE (68/32)

Reference Fluid 2.................. ~~Reference Fluid 2 ....~~ Ethane

$T_{r,x}$ for Fluid 1.................... ~~Tr,x for Fluid 1 ....~~ 1.019329181249

$T_{r,x}$ for Fluid 2.................... ~~Tr,x for Fluid 2 ....~~ 0.995225566509

$T_{r,60}$ for Fluid 1 .... ~~Tr,60 for Fluid 1 ....~~ 0.968453106422

$T_{r,60}$ for Fluid 2 .... ~~Tr,60 for Fluid 2 ....~~ 0.945552535144

T23/6

Upper boundary $\gamma_{60,high}$ .... ~~Upper boundary RD60,high ....~~ 0.355994000000

Upper boundary $\gamma_{x,high}$................ ~~Upper boundary RDtf,high ....~~ 0.267719237662

Lower boundary $\gamma_{60,low}$................ ~~Lower boundary RD60,low ....~~ 0.350000000000

Lower boundary $\gamma_{x,low}$ .... ~~Lower boundary RDtf,low ....~~ 0.222390762498

Iteration steps	Pass 1	Pass 2
T23/7		
Delta (δ)......................... ~~Delta~~	0.001000000000	~~0.~~0.001000000000
$\gamma_{60,mid}$ ~~RD60,mid~~	0.350005994000	~~0.~~0.350000328926
C_{TL} ~~CTL~~	0.635875915052	~~0.~~0.635428359299
~~RDTf~~ $\gamma_{x,mid}$ ~~,mid~~	0.222560381708	~~0.~~0.222400134764
T23/8	Continue	Converged

T23/9

Alpha (α)~~Alpha~~ 0.005994000000

Beta (β)~~Beta~~ 0.022215938970

Phi (ϕ)~~Phi~~ 267.236683329960

A.................................. ~~A ....~~ 2.145687234871

B.................................. ~~B ....~~ -0.919388011785

C.................................. ~~C ....~~ 0.448342750031

$\gamma_{60,Trial}$ .... ~~RD60,Trial ....~~ 0.350000323256

$C_{TL,Trial}$ .... ~~CTL,Trial ....~~ 0.635427908123

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RDTf $\gamma_{x,Trial}$ .... , Trial 0.222399973249

T23/10 Continue

T23/11
Reset boundaries

RDTf $\gamma_{x,high}$ .... , high 0.222560381708

$\gamma_{60,high}$ .... RD60,high 0.350005994000

RDTf $\gamma_{x,low}$ .... , low 0.222399973249

$\gamma_{60,low}$ .... RD60,low 0.350000323256

T23/12
γ_{60} ($\gamma_{60,Trial}$ rounded) .... RD60 (RD60,Trial rounded) 0.3500

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Example 23/5 – Relative Density at Observed Temperature (~~T23/6,~~ γ_x) ~~RDtf~~ < Lower Boundary

Input Data
Relative density @ obs. temp. (γ_x) .. ~~Relative density @ obs. temp. ..~~ 0.34006
Observed temperature, °F (T_F) .... ~~Observed temperature Tf, °F ....~~ 64.63
Computed Data – last digit is rounded
T23/1
Input Data – rounded
γ_x, observed rel. density .... ~~RDtf, observed rel. density ....~~ 0.3401
T_F, °F .... ~~Tf, °F ....~~ 64.6
T23/2
T_x, Kelvin .... ~~Tx, Kelvin ....~~ 291.261111111111

T23/3
~~RDtf and Tf are within range, continue~~ γ_x and T_F are within range, continue
T23/4
γ_x for Fluid 1 .... ~~RDtf for Fluid 1 ....~~ 0.310026832478

γ_x for Fluid 2 .... ~~RDtf for Fluid 2 ....~~ 0.346752475914

T23/5
Reference Fluid 1.................. ~~Reference Fluid 1 ....~~ EE (68/32)
Reference Fluid 2.................. ~~Reference Fluid 2 ....~~ Ethane
$T_{r,x}$ for Fluid 1..................... ~~Tr,x for Fluid 1 ....~~ 0.977025631851

$T_{r,x}$ for Fluid 2..................... ~~Tr,x for Fluid 2 ....~~ 0.953922349953

$T_{r,60}$ for Fluid 1 .... ~~Tr,60 for Fluid 1 ....~~ 0.968453106422

$T_{r,60}$ for Fluid 2 .... ~~Tr,60 for Fluid 2 ....~~ 0.945552535144

T23/6
Upper boundary $\gamma_{60,high}$ .... ~~Upper boundary RD60,high ....~~ 0.355994000000

Upper boundary $\gamma_{x,high}$ .... ~~Upper boundary RDtf,high ....~~ 0.346752475914

Lower boundary $\gamma_{60,low}$ .... ~~Lower boundary RD60,low ....~~ 0.350000000000

Lower boundary $\gamma_{x,low}$ .... ~~Lower boundary RDtf,low ....~~ 0.340112938057

γ_x observed ~~RDtf observed~~ is ~~less than lower boundary RDtf, no solution~~outside the boundary of the standard
γ_x observed is outside the correlation range of the standard

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Example 23/6 – ~~T23/6,~~ Relative Density at Observed Temperature (γ_x) ~~RDtf~~ > Upper Boundary

Input Data

Relative density @ obs. temp. (γ_x) .. ~~Relative density @ obs. temp. ..~~ 0.72858

Observed temperature, °F (T_F) .... ~~Observed temperature Tf, °F ....~~ -27.53

Computed Data – last digit is rounded

T23/1

Input Data – rounded

γ_x, observed rel. density .... ~~RDtf, observed rel. density ....~~ 0.7286

T_F, °F .... ~~Tf, °F ....~~ -27.5

T23/2

T_x, Kelvin .... ~~Tx, Kelvin ....~~ 240.094444444444

T23/3

~~RDtf and Tf are within range, continue~~ γ_x and T_F are within range, continue

T23/4

γ_x for Fluid 1 .... ~~RDtf for Fluid 1 ....~~ 0.706219967989

γ_x for Fluid 2 .... ~~RDtf for Fluid 2 ....~~ 0.728360741594

T23/5

Reference Fluid 1.................. ~~Reference Fluid 1 ....~~ n-Hexane

Reference Fluid 2.................. ~~Reference Fluid 2 ....~~ n-Heptane

$T_{r,x}$ for Fluid 1.................... ~~Tr,x for Fluid 1 ....~~ 0.473232373006

$T_{r,x}$ for Fluid 2.................... ~~Tr,x for Fluid 2 ....~~ 0.444495870489

$T_{r,60}$ for Fluid 1 .... ~~Tr,60 for Fluid 1 ....~~ 0.569046132957

$T_{r,60}$ for Fluid 2 .... ~~Tr,60 for Fluid 2 ....~~ 0.534491447849

T23/6

γ_x observed is outside the boundary of the standard

γ_x observed is outside the correlation range of the standard

~~RDtf observed is greater than Fluid 2 RDtf, no solution~~

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Example 23/7 – Test Binary Search Routine aAt Low End

```
    Input Data
Relative density @ obs. temp. (γx) .. Relative density @ obs. temp. .. 0.45572
Observed temperature, °F (TF) ....... Observed temperature Tf, °F ..... -24.67
    Computed Data – last digit is rounded
  T23/1
    Input Data – rounded
γx, observed rel. density ........... RDtf, observed rel. density .... 0.4557
TF, °F .............................. Tf, °F ........................ -24.7
  T23/2
Tx, Kelvin .......................... Tx, Kelvin ...................... 241.650000000000

  T23/3
RDtf and Tf are within range, continueγx and TF are within range, continue
  T23/4
γx for Fluid 1 ...................... RDtf for Fluid 1 ............... 0.455790716298

γx for Fluid 2 ...................... RDtf for Fluid 2 ............... 0.462651655172

  T23/5
Reference Fluid 1..................       Reference Fluid 1 .............. EE (68/32)
Reference Fluid 2..................       Reference Fluid 2 .............. Ethane
Tr,x for Fluid 1..................... Tr,x for Fluid 1 ............... 0.810606822985

Tr,x for Fluid 2..................... Tr,x for Fluid 2 ............... 0.791438771166

Tr,60 for Fluid 1 ................... Tr,60 for Fluid 1 .............. 0.968453106422

Tr,60 for Fluid 2 ................... Tr,60 for Fluid 2 .............. 0.945552535144

  T23/6
Upper boundary γ60,high ............. Upper boundary RD60,high ....... 0.355994000000

Upper boundary γx,high .............. Upper boundary RDtf,high ....... 0.462651655172

Lower boundary γ60,low .............. Lower boundary RD60,low ........ 0.350000000000

Lower boundary γx,low ............... Lower boundary RDtf,low ........ 0.459877928850

γx observed is outside the boundary of the standardRDtf observed is less than lower boundary RDtf, no solution
γx observed is outside the correlation range of the standard
```

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Example 23/8 – Relative Density at Observed Temperature (~~T23/6~~ γ_x) ~~RDtf~~ near $\gamma_{x,low}$~~RDlowTf~~, ~~T23/11~~ Reset Lower/Upper Boundaries

Input Data
Relative density @ obs. temp. (γ_x) .. ~~Relative density @ obs. temp. ..~~ 0.25776
Observed temperature, °F (T_F) .... ~~Observed temperature Tf, °F .....~~ 179.28
Computed Data – last digit is rounded
T23/1
Input Data – rounded
γ_x, observed rel. density .... ~~RDtf, observed rel. density .....~~ 0.2578
T_F, °F .... ~~Tf, °F ....~~ 179.3
T23/2
T_x, Kelvin .... ~~Tx, Kelvin ....~~ 354.983333333333

T23/3
~~RDtf and Tf are within range, continue~~ γ_x and T_F are within range, continue
T23/4
γ_x for Fluid 1 .... ~~RDtf for Fluid 1 ....~~ 0.470381000000

γ_x for Fluid 2 .... ~~RDtf for Fluid 2 ....~~ 0.367118287562

T23/5
Reference Fluid 1.................. ~~Reference Fluid 1 ....~~ EP (35/65)
Reference Fluid 2.................. ~~Reference Fluid 2 ....~~ Propane
$T_{r,x}$ for Fluid 1.................... ~~Tr,x for Fluid 1 ....~~ 1.007159204827

$T_{r,x}$ for Fluid 2.................... ~~Tr,x for Fluid 2 ....~~ 0.959985216435

$T_{r,60}$ for Fluid 1 .... ~~Tr,60 for Fluid 1 ....~~ 0.819115801951

$T_{r,60}$ for Fluid 2 .... ~~Tr,60 for Fluid 2 ....~~ 0.780749514726

T23/6
Upper boundary $\gamma_{60,high}$ .... ~~Upper boundary RD60,high ....~~ 0.507025000000

Upper boundary $\gamma_{x,high}$ .... ~~Upper boundary RDtf,high ....~~ 0.367118287562

Lower boundary $\gamma_{60,low}$ .... ~~Lower boundary RD60,low ....~~ 0.475719627406

Lower boundary $\gamma_{x,low}$ .... ~~Lower boundary RDtf,low ....~~ 0.203205649078

Iteration steps	Pass 1	Pass 2	Pass 3
~~Iteration steps Pass 1 Pass 2 Pass 3~~			
T23/7			
Delta (δ)........................... ~~Delta~~	0.333069807351	0.~~0.~~203517533920	0.~~0.~~029802787362
$\gamma_{60,mid}$ .... ~~RD60,mid~~	0.486146501825	0.~~0.~~478475881642	0.~~0.~~477446269344
C_{TL} ~~CTL~~	0.636706579940	0.~~0.~~560060148072	0.~~0.~~540064021350
~~RDTf~~ $\gamma_{x,mid}$ ~~, mid~~	0.309532676527	0.~~0.~~267975273121	0.~~0.~~257851552201
T23/8	Continue	Continue	Continue
T23/9			
Alpha (α) ~~Alpha~~	0.031305372594	0.~~0.~~009630620270	0.~~0.~~001061240214
Beta (β) ~~Beta~~	0.093483301245	0.~~0.~~035990492536	0.~~0.~~005510968782
Phi (ϕ) ~~Phi~~	1.~~541589588429~~ 541589588429	2.~~776410749513~~ 776410749513	28.803325550048
A........................... ~~A~~	1.~~613666311213~~ 613666311213	1.~~551880192561~~ 551880192561	1.415113489360

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B. .... B .... -0.729324366880 -0. 0.711644239073
0. 0.642401682060

C. .... C 0.557290084813 0. 0.557737265084
.... 0. 0.549003291079

$\gamma_{60,Trial}$ .... RD60,Trial 0.476515881554 0. 0.477414641428
.... 0. 0.477441768642

$C_{TL,Trial}$ .... CTL,Trial 0.513269870440 0. 0.539337110326
.... 0. 0.539961117999

RDTf $\gamma_{x,Trial}$ .... ,Trial 0.244581244788 0. 0.257487433135
.... 0. 0.257799991175

T23/10 Continue Continue Converged
T23/10 Continue Continue Converged
T23/11
Reset boundaries
RDTf $\gamma_{x,high}$ .... ,high 0.309532676527 0. 0.267975273121

$\gamma_{60,high}$ .... RD60,high 0.486146501825 0. 0.478475881642

RDTf $\gamma_{x,low}$ .... ,low 0.244581244788 0. 0.257487433135

$\gamma_{60,low}$ .... RD60,low 0.476515881554 0. 0.477414641428

T23/12
γ_{60} ($\gamma_{60,Trial}$ rounded) .... RD60 (RD60,Trial rounded) 0.47

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Example 23/9 – ~~T23/11, r~~Reset Upper/Lower Boundaries Using Ethane ~~&~~And EP (65/35)

```
    Input Data
Relative density @ obs. temp. (γx) .. ~~Relative density @ obs. temp. ..~~ 0.39548
Observed temperature, °F (TF) ....... ~~Observed temperature Tf, °F ....~~ 59.78
    Computed Data – last digit is rounded
  T23/1
    Input Data – rounded
γx, observed rel. density ........... ~~RDtf, observed rel. density ....~~ 0.3955
TF, °F .............................. ~~Tf, °F .........................~~ 59.8
  T23/2
Tx, Kelvin .......................... ~~Tx, Kelvin ......................~~ 288.594444444444

  T23/3
~~RDtf  and Tf are within range, continue~~γx and TF are within range, continue
  T23/4
γx for Fluid 1 ...................... ~~RDtf for Fluid 1 ...............~~ 0.356376967243

γx for Fluid 2 ...................... ~~RDtf for Fluid 2 ...............~~ 0.429505267826

  T23/5
Reference Fluid 1..................   ~~Reference Fluid 1 ..............~~ Ethane
Reference Fluid 2..................   ~~Reference Fluid 2 ..............~~ EP (65/35)
Tr,x for Fluid 1.................... ~~Tr,x for Fluid 1 ...............~~ 0.945188630152

Tr,x for Fluid 2.................... ~~Tr,x for Fluid 2 ...............~~ 0.864909774461

Tr,60 for Fluid 1 .................. ~~Tr,60 for Fluid 1 ..............~~ 0.945552535144

Tr,60 for Fluid 2 .................. ~~Tr,60 for Fluid 2 ..............~~ 0.865242771467

  T23/6
Upper boundary γ60,high ............ ~~Upper boundary RD60,high .......~~ 0.429277000000

Upper boundary γx,high ............. ~~Upper boundary RDtf,high .......~~ 0.429505267826

Lower boundary γ60,low ............. ~~Lower boundary RD60,low ........~~ 0.355994000000

Lower boundary γx,low .............. ~~Lower boundary RDtf,low ........~~ 0.356376967243


     Iteration steps                              Pass 1            Pass 2 ~~Iteration steps                                   Pass 1~~
~~Pass 2~~
  T23/7
Delta (δ)........................... ~~Delta ...........................~~ 0.534991685093     0. ~~0.~~999000000000

γ60,mid............................. ~~RD60,mid ........................~~ 0.395199795659     0. ~~0.~~395230790997

CTL~~CTL ............................~~                     1.000681275169  1.000681092670

~~RDTf~~γx,mid~~,mid ......................~~                   0.395469035466  0. ~~0.~~395499979792

  T23/8                                     Continue          Continue ~~T23/8                                  Continue~~
~~Continue~~

  T23/9
Alpha (α)~~Alpha .........................~~                                   0.~~073283000000~~ 073283000000
.................... 3.10263646086e-05
Beta (β)~~Beta ..........................~~                                    0.~~057470232309~~ 057470232309
.................... 2.45005041712e-05
Phi (ϕ)~~Phi ...........................~~                                     1.~~870668498940~~ 870668498940
...................... 1.001001001559

A~~..............................~~..  -0.023321269027  -0. ~~0.~~018033364749

B.................................  ~~B ..............................~~ 1.~~020443223123~~ 020443223123
...................... 1.015912364749

C~~..............................~~..  -0.004706553990  -0. ~~0.~~003741745597

γ60,Trial .......................... ~~RD60,Trial .....................~~ 0.395230822023     0. ~~0.~~395230811239

CTL,Trial .......................... ~~CTL,Trial ......................~~ 1.~~000681092487~~ 000681092487 1.00068109
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RDTf $\gamma_{x,Trial}$	γ_{Trial}	0.395500010767	0.	0.395500000000
T23/10	Continue	Converged T23/10		Continue
Converged				
T23/11				
Reset boundaries				
RDTf $\gamma_{x,high}$	γ_{high}	0.395500010767		
$\gamma_{60,high}$	RD60,high	0.395230822023		
RDTf $\gamma_{x,low}$	γ_{low}	0.395469035466		
$\gamma_{60,low}$	RD60,low	0.395199795659		
T23/12				
γ_{60} ($\gamma_{60,Trial}$ rounded)	RD60 (RD60,Trial rounded)		0.3952	

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Example 23/10 – T23/9 & 11, Adjust γ_{60}, $RD60_{Trial}$, Reset High and Low/High+low/hi Boundaries

Input Data

Relative density @ obs. temp. (γ_x) .. Relative density @ obs. temp. ..	0.21056
Observed temperature, °F (T_F) .... Observed temperature Tf, °F	87.46

Computed Data – last digit is rounded

T23/1

Input Data – rounded

γ_x, observed rel. density .... RDtf, observed rel. density	0.2106
T_F, °F .... Tf, °F	87.5

T23/2

T_x, Kelvin .... Tx, Kelvin	303.983333333333

T23/3

RDtf and Tf are within range, continue γ_x and T_F are within range, continue

T23/4

γ_x for Fluid 1 .... RDtf for Fluid 1	0.325022000000
γ_x for Fluid 2 .... RDtf for Fluid 2	0.266017434379

T23/5

Reference Fluid 1.................. Reference Fluid 1	EE (68/32)
Reference Fluid 2.................. Reference Fluid 2	Ethane
$T_{r,x}$ for Fluid 1.................... Tr,x for Fluid 1	1.019701899746
$T_{r,x}$ for Fluid 2.................... Tr,x for Fluid 2	0.995589471501
$T_{r,60}$ for Fluid 1 .... Tr,60 for Fluid 1	0.968453106422
$T_{r,60}$ for Fluid 2 .... Tr,60 for Fluid 2	0.945552535144

T23/6

Upper boundary $\gamma_{60,high}$ .... Upper boundary RD60,high	0.355994000000
Upper boundary $\gamma_{x,high}$ .... Upper boundary RDtf,high	0.266017434379
Lower boundary $\gamma_{60,low}$ .... Lower boundary RD60,low	0.350217135734
Lower boundary $\gamma_{x,low}$ .... Lower boundary RDtf,low	0.201957415331

Iteration steps	Pass 1	Pass 2	Pass 3	Pass 4
T23/7				
Delta (δ) .... Delta	0.134913863553	0.442156617893	0.285572535939	0.045507746482
$\gamma_{60,mid}$ RD60,mid	0.350996514811	0.350318978649	0.350250911268	0.350238857349
C_{TL} CTL	0.663001877090	0.618306878199	0.605460325548	0.601336301107
RDTf $\gamma_{x,mid}$, mid	0.232711348172	0.216601542528	0.212063030760	0.210611338982
T23/8	Continue	Continue	Continue	Continue
T23/9				
Alpha (α) Alpha	0.005776864266	0.0002.19024009057e-04	0.00008.82768152069e-05	0.00001.26286194163e-05
Beta (β) Beta	0.029978477786	0.008277157180	0.003568550978	0.0006.47744349018e-04
Phi (ϕ) Phi	2.082986243708	1.334762574159	2.175177227878	18.901668137223
A .... A	1.946686690732	0.936748950385	0.877145829125	0.793585193044
B .... B	-0.820821476963	-0.385471575544	-0.362105293706	-0.327124761330

C	C	0.436589003610	0.389858988966
	0.387594169917	0.383933874925	
$\gamma_{60,Trial}$	RD60,Trial	0.350064149476	0.350225701834
	0.350238282649	0.350238776362	
$\gamma_{60,Trial}$ adjusted	RD60,Trial adjusted		
$\gamma_{60,Trial}$	RD60,Trial	0.350436159743	not changed
changed	not changed		
$C_{TL,Trial}$	CTL,Trial	0.632080457699	0.594476787322
	0.601105752483	0.601304054034	
RDTF $\rho_{x,Trial}$	ρTrial	0.221503848245	0.208201050064
	0.210530246440	0.210599996106	
T23/10	Continue	Continue	Continue / Converged
T23/10	Continue	Continue	Continue / Converged
T23/11 Reset boundaries			
RDTF $\rho_{x,high}$	ρhigh	0.221503848245	0.216601542528
	0.212063030760		
$\gamma_{60,high}$	RD60,high	0.350436159743	0.350318978649
	0.350250911268		
RDTF $\rho_{x,low}$	ρlow	not changed	0.208201050064
	0.210530246440		
$\gamma_{60,low}$	RD60,low	not changed	0.350225701834
	0.350238282649		
T23/12			
γ_{60} ($\gamma_{60,Trial}$ rounded)	RD60 (RD60,Trial rounded)	0.3502	

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Example 23/11 – T23/11, Reset Upper Boundary Only

```
    Input Data
Relative density @ obs. temp. (γx) .. Relative density @ obs. temp. .. 0.45003
Observed temperature, °F (TF) ....... Observed temperature Tf, °F .... 199.43
    Computed Data – last digit is rounded
  T23/1
    Input Data – rounded
γx, observed rel. density ........... RDtf, observed rel. density .... 0.4500
TF, °F .............................. Tf, °F ........................ 199.4
  T23/2
Tx, Kelvin .......................... Tx, Kelvin .................... 366.150000000000

  T23/3
RDtf and Tf are within range, continue γx and TF are within range, continue
  T23/4
γx for Fluid 1 ...................... RDtf for Fluid 1 .............. 0.445396160533

γx for Fluid 2 ...................... RDtf for Fluid 2 .............. 0.480129616454

  T23/5
Reference Fluid 1..................    Reference Fluid 1 .............. i-Butane
Reference Fluid 2..................    Reference Fluid 2 .............. n-Butane
Tr,x for Fluid 1..................... Tr,x for Fluid 1 .............. 0.897756528135

Tr,x for Fluid 2..................... Tr,x for Fluid 2 .............. 0.861205193339

Tr,60 for Fluid 1 ................... Tr,60 for Fluid 1 ............. 0.707871902797

Tr,60 for Fluid 2 ................... Tr,60 for Fluid 2 ............. 0.679051546607

  T23/6
Upper boundary γ60,high ............. Upper boundary RD60,high ....... 0.584127000000

Upper boundary γx,high .............. Upper boundary RDtf,high ....... 0.480129616454

Lower boundary γ60,low .............. Lower boundary RD60,low ........ 0.562827000000

Lower boundary γx,low ............... Lower boundary RDtf,low ........ 0.445396160533


    Iteration steps                 Pass 1       Pass 2  Iteration steps                Pass 1
Pass 2
  T23/7
Delta (δ)............................ Delta ......................... 0.132547693417   0.   0.999000000000

γ60,mid ............................. RD60,mid ...................... 0.565650265870   0.   0.565462936534

CTL CTL ..............................                  0.796107835259   0.   0.795800434708

RDTf γx,mid, mid ......................                 0.450318608675   0.   0.449995650705

  T23/8                               Continue     Continue
  T23/8                           Continue      Continue
  T23/9
Alpha (α) Alpha ..........................                           0.021300000000   0.   0.002638575109

Beta (β) Beta ............................                          0.032146708779   0.   0.004122443006

Phi (ϕ) Phi .............................                           7.056134451304   056134451304
...................... 1.000989768898

A.................................   A .............................. 1.331470032321   331470032321
...................... 1.412580442222

B.................................   B .............................. -0.619068238574   -0.   0.691710762248

C.................................   C .............................. 0.574423600922   0.   0.590691810831

γ60,Trial ........................... RD60,Trial .................... 0.565465575109   0.   0.565465457370

CTL,Trial ........................... CTL,Trial ..................... 0.795804772113   0.   0.795804578573
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RDTf $\gamma_{x,Trial}$ .... ,Trial 0.450000203137 0. 0.450000000000

T23/10 Continue Converged
T23/10 Continue Converged
T23/11
Reset boundaries
RDTf $\gamma_{x,high}$ .... ,high 0.450000203137

$\gamma_{60,high}$ .... RD60,high 0.565465575109

T23/12
γ_{60} ($\gamma_{60,Trial}$ rounded) .... RD60 (RD60,Trial rounded) 0.5655

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Example 23/12 – ~~T23/10 d~~Detects Solution ~~i~~In One Pass, Using I-Hexane

Input Data

Relative density @ obs. temp. (γ_x) .. ~~Relative density @ obs. temp. ..~~ 0.60133

Observed temperature, °F (T_F) .... ~~Observed temperature Tf, °F .....~~ 177.17

Computed Data – last digit is rounded

T23/1

Input Data – rounded

γ_x, observed rel. density .... ~~RDtf, observed rel. density ....~~ 0.6013

T_F, °F .... ~~Tf, °F ....~~ 177.2

T23/2

T_x, Kelvin .... ~~Tx, Kelvin ....~~ 353.816666666667

T23/3

~~RDtf and Tf are within range, continue~~ γ_x and T_F are within range, continue

T23/4

γ_x for Fluid 1 .... ~~RDtf for Fluid 1 ....~~ 0.594442903364

γ_x for Fluid 2 .... ~~RDtf for Fluid 2 ....~~ 0.602928497317

T23/5

Reference Fluid 1.................. ~~Reference Fluid 1 ....~~ i-Hexane

Reference Fluid 2.................. ~~Reference Fluid 2 ....~~ n-Hexane

$T_{r,x}$ for Fluid 1.................... ~~Tr,x for Fluid 1 ....~~ 0.710403908577

$T_{r,x}$ for Fluid 2.................... ~~Tr,x for Fluid 2 ....~~ 0.697381820571

$T_{r,60}$ for Fluid 1 .... ~~Tr,60 for Fluid 1 ....~~ 0.579671831253

$T_{r,60}$ for Fluid 2 .... ~~Tr,60 for Fluid 2 ....~~ 0.569046132957

T23/6

Upper boundary $\gamma_{60,high}$ .... ~~Upper boundary RD60,high ....~~ 0.664064000000

Upper boundary $\gamma_{x,high}$ .... ~~Upper boundary RDtf,high ....~~ 0.602928497317

Lower boundary $\gamma_{60,low}$ .... ~~Lower boundary RD60,low ....~~ 0.657167000000

Lower boundary $\gamma_{x,low}$ .... ~~Lower boundary RDtf,low ....~~ 0.594442903364

Iteration steps Pass 1

~~Iteration steps Pass 1~~

T23/7

Delta (δ)......................... ~~Delta ....~~ 0.808086820333

$\gamma_{60,mid}$ .... ~~RD60,mid ....~~ 0.662740374800

C_{TL}~~CTL~~ 0.907329937112

~~RDTf~~$\gamma_{x,mid}$~~,mid~~ 0.601324182589

T23/8 Continue

~~T23/8 Continue~~

T23/9

Alpha (α)~~Alpha~~ 0.006897000000

Beta (β)~~Beta~~ 0.010160407517

Phi (ϕ)~~Phi~~ 1.233141931306

A................................. ~~A~~ 1.780418160509

B................................. ~~B~~ .... -1.319032483022

C................................. ~~C~~ 0.812123726312

$\gamma_{60,Trial}$ .... ~~RD60,Trial~~ 0.662720493291

$C_{TL,Trial}$ .... ~~CTL,Trial~~ 0.907320672201

~~RDTf~~$\gamma_{x,Trial}$ .... ~~,Trial~~ 0.601300003454

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```
T23/10                                      Converged
T23/11 not needed, convergence already achieved
T23/12
γ60 (γ60,Trial rounded) ................ RD60 (RD60,Trial rounded) ...... 0.6627
```

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Example 23/13 – ~~Calculated~~ Relative Density @ 60°F (γ_{60})~~RD60 equals 0.6880~~ = Upper Range Limit

Input Data		
Relative density @ obs. temp. (γ_x) ..	~~Relative density @ obs. temp. ..~~	0.73592
Observed temperature, °F (T_F)	~~Observed temperature Tf, °F .....~~	-44.13
Computed Data – last digit is rounded		
T23/1		
Input Data – rounded		
γ_x, observed rel. density	~~RDtf, observed rel. density ....~~	0.7359
T_F, °F	~~Tf, °F ....~~	-44.1
T23/2		
T_x, Kelvin	~~Tx, Kelvin ....~~	230.872222222222
T23/3		
~~RDtf and Tf are within range, continue~~ γ_x and T_F are within range, continue		
T23/4		
γ_x for Fluid 1	~~RDtf for Fluid 1 ....~~	0.714077137643
γ_x for Fluid 2	~~RDtf for Fluid 2 ....~~	0.735959630678
T23/5		
Reference Fluid 1..................	~~Reference Fluid 1 ....~~	n-Hexane
Reference Fluid 2..................	~~Reference Fluid 2 ....~~	n-Heptane
$T_{r,x}$ for Fluid 1....................	~~Tr,x for Fluid 1 ....~~	0.455055133975
$T_{r,x}$ for Fluid 2....................	~~Tr,x for Fluid 2 ....~~	0.427422423812
$T_{r,60}$ for Fluid 1	~~Tr,60 for Fluid 1 ....~~	0.569046132957
$T_{r,60}$ for Fluid 2	~~Tr,60 for Fluid 2 ....~~	0.534491447849
T23/6		
Upper boundary $\gamma_{60,high}$	~~Upper boundary RD60,high ....~~	0.688039000000
Upper boundary $\gamma_{x,high}$	~~Upper boundary RDtf,high ....~~	0.735959630678
Lower boundary $\gamma_{60,low}$	~~Lower boundary RD60,low ....~~	0.664064000000
Lower boundary $\gamma_{x,low}$	~~Lower boundary RDtf,low ....~~	0.714077137643
Iteration steps Pass 1	~~Iteration steps Pass 1~~	
T23/7		
Delta (δ)	~~Delta ....~~	0.997274959562
$\gamma_{60,mid}$	~~RD60,mid ....~~	0.687973667156
C_{TL}	~~CTL ....~~	1.069661466437
~~RDTf~~$\gamma_{x,mid}$	~~, mid ....~~	0.735898921680
T23/8 Continue	~~T23/8 Continue~~	
T23/9		
Alpha (α)	~~Alpha ....~~	0.023975000000
Beta (β)...........................	~~Beta ....~~	0.031730419484
Phi (ϕ)............................	~~Phi ....~~	1.002782036454
A..................................	~~A ....~~	-0.891797542956
B..................................	~~B ....~~	2.388763933252
C..................................	~~C ....~~	-0.586964652669
$\gamma_{60,Trial}$	~~RD60,Trial ....~~	0.687974827662
$C_{TL,Trial}$	~~CTL,Trial ....~~	1.069661229476
~~RDTf~~$\gamma_{x,Trial}$	~~, Trial ....~~	0.735900000006
T23/10		Converged

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  T23/11 not needed, convergence already achieved
  T23/12
γ60 (γ60,Trial rounded) ................ RD60 (RD60,Trial rounded) ...... 0.6880
```

Example 23/14 – Rd Lower Boundary Reset Test= lower RD limit

```
    Input Data
Relative density @ obs. temp. (γx) .. Relative density @ obs. temp. ..     0.21
Observed temperature, °F (TF) ....... Observed temperature Tf, °F ....189.4
    Computed Data – last digit is rounded
  T23/1
    Input Data – rounded
γx, observed rel. density ........... RDtf, observed rel. density ....0.2100
TF, °F .............................. Tf, °F .........................189.4
  T23/2
Tx, Kelvin .......................... Tx, Kelvin .....................360.594444444444

  T23/3
RDtf  and Tf are within range, continueγx and TF are within range, continue
  T23/4
γx for Fluid 1 ...................... RDtf for Fluid 1 ...............0.470381000000

γx for Fluid 2 ...................... RDtf for Fluid 2 ...............0.343306875586

  T23/5
Reference Fluid 1..................      Reference Fluid 1 ..............EP (35/65)
Reference Fluid 2..................      Reference Fluid 2 ..............Propane
Tr,x for Fluid 1..................... Tr,x for Fluid 1 ...............1.023079057040

Tr,x for Fluid 2..................... Tr,x for Fluid 2 ...............0.975159404090

Tr,60 for Fluid 1 ................... Tr,60 for Fluid 1 ..............0.819115801951

Tr,60 for Fluid 2 ................... Tr,60 for Fluid 2 ..............0.780749514726

  T23/6
Upper boundary γ60,high ............. Upper boundary RD60,high .......0.507025000000

Upper boundary γx,high .............. Upper boundary RDtf,high .......0.343306875586

Lower boundary γ60,low .............. Lower boundary RD60,low ........0.487591079805

Lower boundary γx,low ............... Lower boundary RDtf,low ........0.209600629464

      Iteration steps                          Pass 1          Pass 2            Pass 3     Iteration steps
Pass 1                    Pass 2                    Pass 3
  T23/7
Delta (δ)........................... Delta ..........................0.002986925048      0.      0.090629503273
............... 0.      0.362651574654

γ60,mid ............................. RD60,mid .......................0.487649127468      0.      0.487591210267
............... 0.      0.487591089742

CTL ................................. CTL ............................0.462843318636      0.      0.433760342155
............... 0.      0.431453309175

RDTfγx,mid .......................... ,mid ......................0.225705140487      0.      0.211502118518
............... 0.      0.210372789193

  T23/8                                        Continue        Continue          T23/8
Continue                 Continue                 Converged

  T23/9
Alpha (α) ........................... Alpha ..........................0.019433920195      1.43950513215e-06
Beta (β)............................. Beta ...........................0.073927186953      0.      0.001866682512

Phi (ϕ).............................. Phi ............................8.302409550559      302409550559 2.31746183

A.................................... A ..............................1.205283669609      0.      0.103011400791

B.................................... B ..............................-0.521062500820     -0.     -0.043309773699

C.................................... C ..............................0.543855074908      0.      0.492148295111

γ60,Trial ........................... RD60,Trial .....................0.487584959566      0.      0.487591045409
```

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$\gamma_{60,Trial}$ adjusted RD60,Trial adjusted
$\gamma_{60,Trial}$ .... RD60,Trial .... 0.487592519310 0. 487591107206 not
$C_{TL,Trial}$ .... CTL,Trial 0.438905949758 0. 0.432128227318
RDTf $\gamma_{X,Trial}$ .... ,Trial 0.214007257783 0. 0.210701880813

T23/10 Continue Continue
T23/10 Continue Continue
T23/11
Reset boundaries
RDTf $\gamma_{X,high}$ .... ,high 0.214007257783 0. 0.210701880813
$\gamma_{60,high}$ .... RD60,high 0.487592519310 0. 0.487591107206

T23/12
γ_{60} ($\gamma_{60,Trial}$ rounded) .... RD60 (RD60,Trial rounded) 0.48

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Example 23/15 – Relative Density at Observed Temperature (T23/3, γ_x) RDtf < Lower Range Limit

```
    Input Data
Relative density @ obs. temp. (γx) .. Relative density @ obs. temp. ..  0.20993
Observed temperature, °F (TF) ....... Observed temperature Tf, °F .... 187.94
    Computed Data – last digit is rounded
  T23/1
    Input Data – rounded
γx, observed rel. density ........... RDtf, observed rel. density ....  0.2099
TF, °F .............................. Tf, °F ........................ 187.9
  T23/2
Tx, Kelvin .......................... Tx, Kelvin ...................... 359.761111111111

  T23/3
RDTfγx in _is outside the input range of the standardless than 0.2100, no solution
```

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Example 23/16 – T23/3, Relative Density at Observed Temperature (γ_x) RDtf > Upper Range Limit

```
    Input Data
Relative density @ obs. temp. (γx) .. Relative density @ obs. temp. .. 0.74005
Observed temperature, °F (TF) ....... Observed temperature Tf, °F .... -28.48
    Computed Data – last digit is rounded
  T23/1
    Input Data – rounded
γx, observed rel. density ........... RDtf, observed rel. density .... 0.7401
TF, °F .............................. Tf, °F ........................ -28.5
  T23/2
Tx, Kelvin .......................... Tx, Kelvin ..................... 239.538888888889

  T23/3
RDTfγx in i is outside the input range of the standardgreater than 0.7400, no solution
```

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Example 23/17 – Relative Density at Observed Temperature (γ_x) RDtf = > Upper range Boundary Limit, fails T23/6

Input Data
Relative density @ obs. temp. (γ_x) .. Relative density @ obs. temp. .. 0.74
Observed temperature, °F (T_F) .... Observed temperature Tf, °F .... -50
Computed Data – last digit is rounded
T23/1
Input Data – rounded
γ_x, observed rel. density .... RDtf, observed rel. density 0.7400
T_F, °F .... Tf, °F .... -50.0
T23/2
T_x, Kelvin .... Tx, Kelvin 227.594444444444

T23/3
RDtf and Tf are within range, continue γ_x and T_F are within range, continue
T23/4
γ_x for Fluid 1 .... RDtf for Fluid 1 .... 0.716864897522

γ_x for Fluid 2 .... RDtf for Fluid 2 .... 0.738661816297

T23/5
Reference Fluid 1.................. Reference Fluid 1 .... n-Hexane
Reference Fluid 2.................. Reference Fluid 2 .... n-Heptane
$T_{r,x}$ for Fluid 1.................... Tr,x for Fluid 1 .... 0.448594549018

$T_{r,x}$ for Fluid 2.................... Tr,x for Fluid 2 .... 0.421354150596

$T_{r,60}$ for Fluid 1 .... Tr,60 for Fluid 1 .... 0.569046132957

$T_{r,60}$ for Fluid 2 .... Tr,60 for Fluid 2 .... 0.534491447849

T23/6
γ_x observed is outside the boundary of the standard
γ_x observed is outside the correlation range of the standard
RDtf observed is greater than Fluid 2 RDtf, no solution

Example 23/18 – Observed Temperature (T23/3, T_F) Tf = Lower Range Limit

Input Data
Relative density @ obs. temp. (γ_X) .. Relative density @ obs. temp. .. 0.5
Observed temperature, °F (T_F) .... Observed temperature Tf, °F .... -50.8
Computed Data – last digit is rounded
T23/1
Input Data – rounded
γ_X, observed rel. density .... RDtf, observed rel. density 0.5000
T_F, °F .... Tf, °F .... -50.8
T23/2
T_X, Kelvin .... Tx, Kelvin 227.150000000000

T23/3
RDtf and Tf are within range, continue γ_X and T_F are within range, continue
T23/4
γ_X for Fluid 1 .... RDtf for Fluid 1 .... 0.485962637468

γ_X for Fluid 2 .... RDtf for Fluid 2 .... 0.528232774666

T23/5
Reference Fluid 1.................. Reference Fluid 1 .... Ethane
Reference Fluid 2.................. Reference Fluid 2 .... EP (65/35)
$T_{r,x}$ for Fluid 1.................... Tr,x for Fluid 1 .... 0.743949169751

$T_{r,x}$ for Fluid 2.................... Tr,x for Fluid 2 .... 0.680762429946

$T_{r,60}$ for Fluid 1 .... Tr,60 for Fluid 1 .... 0.945552535144

$T_{r,60}$ for Fluid 2 .... Tr,60 for Fluid 2 .... 0.865242771467

T23/6
Upper boundary $\gamma_{60,high}$ .... Upper boundary RD60,high 0.429277000000

Upper boundary $\gamma_{x,high}$ .... Upper boundary RDtf,high 0.528232774666

Lower boundary $\gamma_{60,low}$ .... Lower boundary RD60,low 0.355994000000

Lower boundary $\gamma_{x,low}$ .... Lower boundary RDtf,low 0.485962637468

Iteration steps Pass 1 Pass 2 Pass 3 Iteration steps
Pass 1 Pass 2 Pass 3
T23/7
Delta (δ)......................... Delta .... 0.332086987697 0. 0.764261437411 .... 0. 0.996676046418

$\gamma_{60,mid}$ .... RD60,mid .... 0.380330330719 0. 0.389044267951 .... 0. 0.389195295035

C_{TL} .... CTL .... 1.301530344004 1.284969011460 .... 1.284702066298

RDTf $\gamma_{x,mid}$ .... ,mid .... 0.495011466176 0. 0.499909828404 .... 0. 0.499999999725

T23/8 Continue Continue Continue T23/8
Continue Continue Continue

T23/9
Alpha (α) .... Alpha .... 0.073283000000 0. 0.011401775368 .... 0.000 1.515307654763e-04
Beta (β)........................... Beta .... 0.042870179217 0. 0.006504743146 .... 0.0000 9.04641913088e-05
Phi (ϕ)............................ Phi .... 4.671337977889 671337977889 1.332539455... 1.003338101716

A .... *A*.. -28.769572088869 769572088869 -19.740869990631 740869990631 16.984940231986

B................................. *B* .... 30.911650589439 911650589439 ..... 21.419561059033 419561059033 18.658299106732

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C.................................... C ................................ -7.871700166414 871700166414 -
5.385367233142 385367233142-4.693719199874

γ60,Trial ............................. RD60,Trial ....................... 0.391732106088 0. 0.389195798716
............... 0. 0.389195295495

CTL,Trial ............................. CTL,Trial ....................... 1.280310496169 280310496169 1.28470117
284701177082.......... 1.284702065485

RDTfγx,Trial .......................... ,Trial ...................... 0.501538727110 0. 0.500000300726
............... 0. 0.500000000000

  T23/10                                  Continue        Continue        Converged
  T23/10                              Continue        Continue        Converged
  T23/11
Reset boundaries
RDTfγx,high ........................... ,high ...................... 0.501538727110 0. 0.500000300726

γ60,high .............................. RD60,high ...................... 0.391732106088 0. 0.389195798716

RDTfγx,low ............................ ,low ....................... 0.495011466176 0. 0.499909828404

γ60,low ............................... RD60,low ....................... 0.380330330719 0. 0.389044267951

  T23/12
γ60 (γ60,Trial rounded) ................ RD60 (RD60,Trial rounded) ............................................ 0.38
```

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Example 23/19 – Observed Temperature (T23/3, T_F) Tf < Lower Range Limit

```
    Input Data
Relative density @ obs. temp. (γX) .. Relative density @ obs. temp. ..        0.5
Observed temperature, °F (TF) ....... Observed temperature Tf, °F ....   -50.9
    Computed Data – last digit is rounded
  T23/1
    Input Data – rounded
γX, observed rel. density ........... RDtf, observed rel. density ....    0.5000
TF, °F .............................. Tf, °F .........................  -50.9
  T23/2
TX, Kelvin .......................... Tx, Kelvin ......................227.094444444444

  T23/3
TXTx is outside the input range of the standardless than 227.15, no solution
```

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5.2 CTL (Table 54) and Density (Table 53) for NGL and LPG using a 15°C Base Temperature

5.2.1 Implementation Procedure for Table 54E (15°C Basis)

This section presents the implementation procedure T54 for the computation of Temperature Correction Factor, C_{TL}. The C_{TL} is used to calculate volumes of fluid at the base temperature from volumes at some known temperature. The fluids are characterized by the specification of density at the base temperature, 15°C.

5.2.1.1 Inputs and Outputs

Inputs: Density at 15°C, ρ_{15} (kg/m^3)
Observed temperature, T_F (°C)

Output: Temperature Correction Factor, C_{TL} (from T_F to T_B)

5.2.1.2 Outline of Calculations

The calculations are performed using an extended two-fluid corresponding states equation. By comparing densities at 60°F, two reference fluids are selected so that one is slightly more dense and one that is slightly less dense than the observed fluid. The densities of these reference fluids are then scaled to the observed reduced temperature (reduced by the critical temperature of the fluid of interest). The Temperature Correction Factor is then computed from the reference fluid densities. See Figure 3 for a general flow chart of the calculation procedure.

5.2.1.3 T54 Implementation Procedure

T54/Step Number Operation/Procedure at that step

T54/1: Round the density $\rho\rho_{15}$ to the nearest 0.1 and round the observed temperature T_F to the nearest 0.05°C.

T54/2: Convert the rounded observed temperature to units of Kelvin, T_x:

$$T_x = T_F + 273.15$$

T54/3: The resultant temperature T_x and density $\rho\rho_{15}$ must fall within the following boundariesranges:

Temperature between 227.15 and 366.15 K, inclusive (equivalent to –46 to 93°C, or –50.8 to 199.4°F)

Density between 351.7 and 687.8 kg/m^3 inclusive

If these values do not fall in these ranges, then the standard does not apply. Flag this result (return a –1 for C_{TL}) and exit this procedure.

Note: The density ~~boundaries~~ ranges tested in this step slightly exceed the ~~boundaries~~ ranges used within the T24 implementation procedure (0.3500 to 0.6880 relative density at 60°F) that act as the true limits for this method.

T54/4: Convert the 15°C density to relative density, relative to the density of water at 60°F

$$\gamma_{TB} = \frac{\rho_{15}}{\rho_{w60}}$$

At the time of the writing of this standard, the value for the ~~relative~~absolute density of water at 60°F (ρ_{w60}) was 999.016 kg/m^3. This ~~was~~is the value used for ρ_{w60} in the examples. Refer to API *MPMS* Chapter 11.4.1 for the most current value of ρ_{w60}~~ρ_{w60}~~.

T54/5: Use the procedure described in Section 5.1.2 for Table 23 to compute a relative density at 60°F from the known relative density at 15°C. Enter the procedure at Step T23/4 so as to avoid additional rounding of the input values. Inputs to implementation procedure T23 are the values of T_{BK} and γ_{TB}, where T_{BK} is the base temperature 15°C in Kelvin (288.15 K) and γ_{TB} is the density at the base temperature 15°C . Implementation procedure T23 is exited after Step T23/11 so as not to round the output values. The converged output from Step T23/11 is γ_{60}.

T54/6: The resultant density γ_{60}, if it were rounded to the nearest 0.0001, must fall within 0.3500 and 0.6880 inclusive. Test γ_{60} to ensure it is within the following boundaries:

Relative density greater than or equal to 0.34995 and less than 0.68805

If the relative density does not fall in this range, then the standard does not apply. Flag this result (return a –1 for C_{TL}) and exit this procedure.

T54/7: Use the procedure described in Section 5.1.1 for Table 24 to compute the Temperature Correction Factor (C_{TL1}) from 60°F to the observed temperature, T_x. This step provides the factor used to reduce an observed volume at T_x to a volume at 60°F when the relative density at 60°F, γ_{60}, is known. Enter implementation procedure T24 with T_x and γ_{60} at Step T24/4 to avoid double rounding of the inputs. On exit skip Step T24/14 to avoid rounding the output, C_{TL1}.

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By definition:

$$C_{TL1} = \frac{V_{60}}{V_{Tx}} = \frac{\gamma_{Tx}}{\gamma_{60}}$$

T54/8: Use the procedure described in Section 5.1.1 for Table 24 to compute the Temperature Correction Factor (C_{TL2}) from 60°F to the new base temperature 15°C. This step provides the factor used to reduce an observed volume at 15°C to a volume at 60°F if the relative density at 60°F, γ_{60}, is known. Enter implementation procedure T24 at Step T24/4 to avoid double rounding of the inputs. The inputs are T_{BK} and γ_{60}, where T_{BK} is the base temperature 15°C in Kelvin (288.15 K). On exit skip Step T24/14 to avoid rounding of the output C_{TL2}.

By definition:

$$C_{TL2} = \frac{V_{60}}{V_{15}} = \frac{\gamma_{TB}}{\gamma_{60}}$$

T54/9: Compute the desired C_{TL} to reduce volume from the observed temperature, T_F, to the base condition of 15°C. The defining formulas show that the calculation is made by computing the ratio C_{TL1}/C_{TL2}.

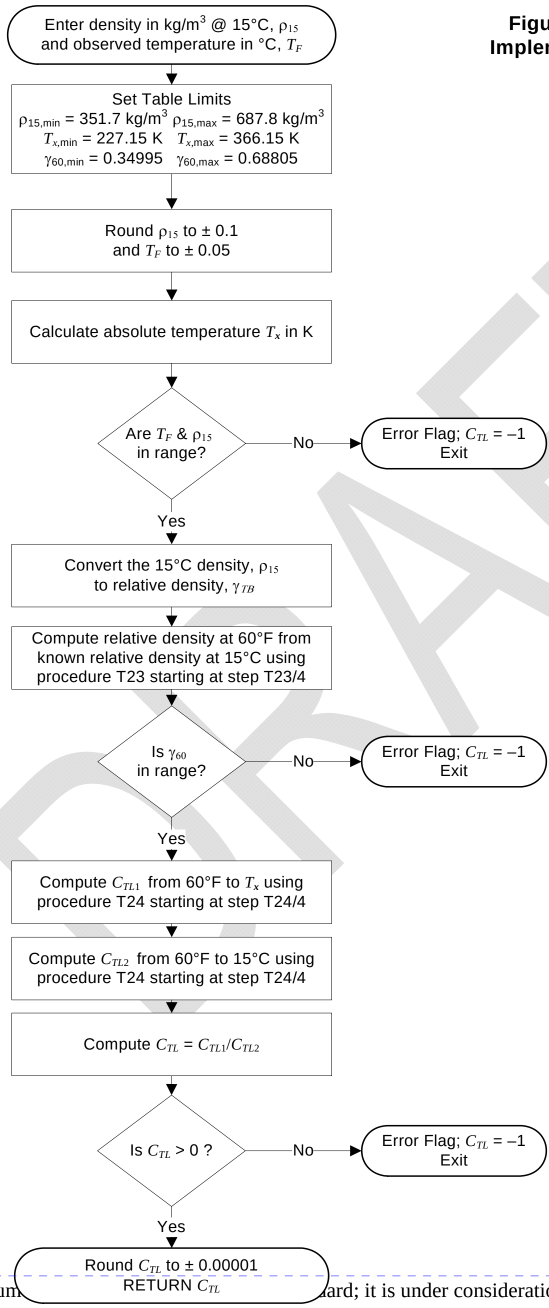
$$\frac{C_{TL1}}{C_{TL2}} = \frac{\left(\frac{V_{60}}{V_{Tx}}\right)}{\left(\frac{V_{60}}{V_{15}}\right)} = \frac{V_{15}}{V_{Tx}}$$

$$C_{TL} = \frac{V_{15}}{V_{Tx}} = \frac{\gamma_{Tx}}{\gamma_{15}}$$

T54/10: Perform error check to ascertain that only positive C_{TL} is used. If C_{TL} is less than or equal to 0, set an error flag (such as $C_{TL} = -1$) and quit.

T54/11: Round the Temperature Correction Factor C_{TL} to the nearest 0.00001.

Figure 3. Flow Chart of Implementation Procedure for Table 54



Comment [KF3]: Update Figure Number for addition of Figure 1

5.2.1.4 Examples for Section 5.2.2 (Table 54E)

(See ~~Table 1~~Table 2 for properties of the Reference Fluids)

Example 54/1 – ~~Utilize~~Use EE (68/32) and Ethane

Input Data to Implementation Procedure T54

Density (kg/m³) @ 15°C (ρ_{15}~~Den15~~) . 352.59

Observed temperature T_F~~Tf~~, °C ~~....~~ –45.020

Computed Data – last digit is rounded

T54/1

Input Data – rounded

ρ_{15}~~Den15~~, rounded to 0.1 ~~...........~~ 352.6

T_F~~Tf~~, °C, rounded to 0.05 ~~.........~~ –45.00

T54/2

T_x~~Tx~~, Kelvin ~~.......................~~. 228.15

T54/3

T_x~~Tx~~ and ρ_{15}~~Den15~~ are within range, continue

T54/4

ρ_{15}~~Den15~~ relative to 60°F water ~~...~~. 0.352947300143

T54/5, Call Table 23 procedure to obtain relative density at 60°F

γ_{60}~~RD60~~ from Table 23 ~~.............~~. 0.350947981104

T54/6

γ_{60}~~RD60~~ is within range, continue

T54/7, Call Table 24 Procedure with T_x~~Tx~~ and γ_{60}~~RD60~~

Reference Fluid 1 ~~Reference Fluid 1 ....~~ EE (68/32)

Reference Fluid 2 ~~Reference Fluid 2 ....~~ Ethane

C_{TL1}, T_x~~Tx~~ to 60°F ~~...............~~. 1.374246650548

T54/8, Call Table 24 Procedure with 15°C and γ_{60}~~RD60~~

Reference Fluid 1 ~~Reference Fluid 1 ....~~ EE (68/32)

Reference Fluid 2 ~~Reference Fluid 2 ....~~ Ethane

C_{TL2}, 15°C to 60°F ~~.............~~. 1.005696910034

T54/9 C_{TL}~~CTL~~ = C_{TL1}~~CTL1~~/C_{TL2}~~CTL2~~

C_{TL}, T_x~~Tx~~ to 15°C ~~.................~~ 1.366462039245

T54/10

C_{TL} ~~CTL~~ is positive, continue

T54/11 C_{TL} ~~CTL~~ rounded

C_{TL} ~~CTL~~ (rounded) ~~...................~~ 1.36646

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Example 54/2 – ~~Utilize~~Use Ethane and EP (65/35)

Input Data to Implementation Procedure T54

Density (kg/m³) @ 15°C (ρ_{15}~~Den15~~) . 399.55

Observed temperature T_F~~Tf~~, °C ..... –3.920

Computed Data – last digit is rounded

T54/1

Input Data – rounded

ρ_{15}~~Den15~~, rounded to 0.1 .... 399.6

T_F~~Tf~~, °C, rounded to 0.05 .... –3.90

T54/2

T_x~~Tx~~, Kelvin 269.25

T54/3

T_x~~Tx~~ and ρ_{15}~~Den15~~ are within range, continue

T54/4

ρ_{15}~~Den15~~ relative to 60°F water ... 0.399993593696

T54/5, Call Table 23 procedure to obtain relative density at 60°F

γ_{60}~~RD60~~ from Table 23 .... 0.398679750427

T54/6

γ_{60}~~RD60~~ is within range, continue

T54/7, Call Table 24 Procedure with T_x~~Tx~~ and γ_{60}~~RD60~~

Reference Fluid 1 ~~Reference Fluid 1 ....~~ Ethane

Reference Fluid 2 ~~Reference Fluid 2 ....~~ EP (65/35)

C_{TL1}~~CTL1~~, T_x~~Tx~~ to 60°F 1.101743247711

T54/8, Call Table 24 Procedure with 15°C and γ_{60}~~RD60~~

Reference Fluid 1 ~~Reference Fluid 1 ....~~ Ethane

Reference Fluid 2 ~~Reference Fluid 2 ....~~ EP (65/35)

C_{TL2}~~CTL2~~, 15°C to 60°F 1.003295485330

T54/9 C_{TL} ~~CTL~~ = C_{TL1}~~CTL1~~/C_{TL2}~~CTL2~~

C_{TL}, ~~CTL,~~ T_x~~Tx~~ to 15°C 1.098124394877

T54/10

C_{TL} ~~CTL~~ is positive, continue

T54/11 C_{TL} ~~CTL~~ rounded

C_{TL} ~~CTL~~ (rounded) 1.09812

Example 54/3 – ~~Utilize~~Use EP (65/35) and EP (35/65)

Input Data to Implementation Procedure T54
Density (kg/m³) @ 15°C (ρ_{15}~~Den15~~) . 451.09
Observed temperature T_F~~Tf~~, °C ~~.....~~ 30.774
Computed Data – last digit is rounded
T54/1
Input Data – rounded
ρ_{15}~~Den15~~, rounded to 0.1 ~~...........~~ 451.1
T_F~~Tf~~, °C, rounded to 0.05 ~~........~~ 30.75
T54/2
T_X~~Tx~~, Kelvin ~~.....................~~. 303.90
T54/3
T_X~~Tx~~ and ρ_{15}~~Den15~~ are within range, continue
T54/4
ρ_{15}~~Den15~~ relative to 60°F water ~~..~~. 0.451544319610

T54/5, Call Table 23 procedure to obtain relative density at 60°F
γ_{60}~~RD60~~ from Table 23 ~~............~~. 0.450522856945

T54/6
γ_{60}~~RD60~~ is within range, continue
T54/7, Call Table 24 Procedure with T_X~~Tx~~ and γ_{60}~~RD60~~
Reference Fluid 1 ~~Reference Fluid 1 ....~~ EP (65/35)
Reference Fluid 2 ~~Reference Fluid 2 ....~~ EP (35/65)
C_{TL1}~~CTL1~~, T_X~~Tx~~ to 60°F ~~..............~~. 0.932384171290

T54/8, Call Table 24 Procedure with 15°C and γ_{60}~~RD60~~
Reference Fluid 1 ~~Reference Fluid 1 ....~~ EP (65/35)
Reference Fluid 2 ~~Reference Fluid 2 ....~~ EP (35/65)
C_{TL2}~~CTL2~~, 15°C to 60°F ~~............~~. 1.002267286478

T54/9 C_{TL} ~~CTL~~ = C_{TL1}~~CTL1~~/C_{TL2}~~CTL2~~
C_{TL}, ~~CTL,~~ T_X~~Tx~~ to 15°C ~~................~~ 0.930274971427

T54/10
C_{TL} ~~CTL~~ is positive, continue
T54/11 C_{TL} ~~CTL~~ rounded
C_{TL} ~~CTL~~ (rounded) ~~..................~~ 0.93027

Example 54/4 – ~~Utilize~~Use EP (35/65) and Propane

Input Data to Implementation Procedure T54
Density (kg/m³) @ 15°C (ρ_{15}~~Den15~~) . 489.92
Observed temperature T_F~~Tf~~, °C ~~.....~~ 84.975
Computed Data – last digit is rounded
T54/1
Input Data – rounded
ρ_{15}~~Den15~~, rounded to 0.1 ~~...........~~ 489.9
T_F~~Tf~~, °C, rounded to 0.05 ~~........~~ 85.00
T54/2
T_X~~Tx~~, Kelvin ~~.....................~~. 358.15
T54/3
T_X~~Tx~~ and ρ_{15}~~Den15~~ are within range, continue
T54/4
ρ_{15}~~Den15~~ relative to 60°F water ~~..~~. 0.490382536416

T54/5, Call Table 23 procedure to obtain relative density at 60°F
γ_{60}~~RD60~~ from Table 23 ~~............~~. 0.489511777456

T54/6
γ_{60}~~RD60~~ is within range, continue
T54/7, Call Table 24 Procedure with T_X~~Tx~~ and γ_{60}~~RD60~~
Reference Fluid 1 ~~Reference Fluid 1 ....~~ EP (35/65)
Reference Fluid 2 ~~Reference Fluid 2 ....~~ Propane
C_{TL1}~~CTL1~~, T_X~~Tx~~ to 60°F ~~...............~~. 0.608584025858

T54/8, Call Table 24 Procedure with 15°C and γ_{60}~~RD60~~
Reference Fluid 1 ~~Reference Fluid 1 ....~~ EP (35/65)
Reference Fluid 2 ~~Reference Fluid 2 ....~~ Propane
C_{TL2}~~CTL2~~, 15°C to 60°F ~~............~~. 1.001778832207

T54/9 C_{TL} ~~CTL~~ = C_{TL1}~~CTL1~~/C_{TL2}~~CTL2~~
C_{TL}, ~~CTL,~~ T_X~~Tx~~ to 15°C ~~................~~ 0.607503379281

T54/10
C_{TL} ~~CTL~~ is positive, continue
T54/11 C_{TL} ~~CTL~~ rounded
C_{TL} ~~CTL~~ (rounded) ~~..................~~ 0.60750

Example 54/5 – ~~Utilize~~Use Propane and i-Butane

Input Data to Implementation Procedure T54
Density (kg/m³) @ 15°C (ρ_{15}~~Den15~~) . 539.49
Observed temperature T_F~~Tf~~, °C ~~.....~~ 68.360
Computed Data – last digit is rounded
T54/1
Input Data – rounded
ρ_{15}~~Den15~~, rounded to 0.1 ~~...........~~ 539.5
T_F~~Tf~~, °C, rounded to 0.05 ~~........~~ 68.35
T54/2
T_X~~Tx~~, Kelvin ~~....................~~. 341.50
T54/3
T_X~~Tx~~ and ρ_{15}~~Den15~~ are within range, continue
T54/4
ρ_{15}~~Den15~~ relative to 60°F water ~~..~~. 0.540031390889

T54/5, Call Table 23 procedure to obtain relative density at 60°F
γ_{60}~~RD60~~ from Table 23 ~~............~~. 0.539309445177

T54/6
γ_{60}~~RD60~~ is within range, continue
T54/7, Call Table 24 Procedure with T_X~~Tx~~ and γ_{60}~~RD60~~
Reference Fluid 1 ~~Reference Fluid 1 ....~~ Propane
Reference Fluid 2 ~~Reference Fluid 2 ....~~ i-Butane
C_{TL1}~~CTL1~~, T_X~~Tx~~ to 60°F ~~..............~~. 0.850308225942

T54/8, Call Table 24 Procedure with 15°C and γ_{60}~~RD60~~
Reference Fluid 1 ~~Reference Fluid 1 ....~~ Propane
Reference Fluid 2 ~~Reference Fluid 2 ....~~ i-Butane
C_{TL2}~~CTL2~~, 15°C to 60°F ~~............~~. 1.001338650108

T54/9 C_{TL} ~~CTL~~ = C_{TL1}~~CTL1~~/C_{TL2}~~CTL2~~
C_{TL}, ~~CTL,~~ T_X~~Tx~~ to 15°C ~~................~~ 0.849171482446

T54/10
C_{TL} ~~CTL~~ is positive, continue
T54/11 C_{TL} ~~CTL~~ rounded
C_{TL} ~~CTL~~ (rounded) ~~..................~~ 0.84917

Example 54/6 – ~~Utilize~~Use i-Butane and n-Butane

Input Data to Implementation Procedure T54

Density (kg/m³) @ 15°C (ρ_{15}~~Den15~~) . 569.42

Observed temperature T_F~~Tf~~, °C ~~.....~~ –16.090

Computed Data – last digit is rounded

T54/1

Input Data – rounded

ρ_{15}~~Den15~~, rounded to 0.1 ~~...........~~ 569.4

T_F~~Tf~~, °C, rounded to 0.05 ~~........~~ –16.10

T54/2

T_x~~Tx~~, Kelvin ~~.....................~~. 257.05

T54/3

T_x~~Tx~~ and ρ_{15}~~Den15~~ are within range, continue

T54/4

ρ_{15}~~Den15~~ relative to 60°F water ~~..~~. 0.569960841468

T54/5, Call Table 23 procedure to obtain relative density at 60°F

γ_{60}~~RD60~~ from Table 23 ~~.............~~. 0.569305082960

T54/6

γ_{60}~~RD60~~ is within range, continue

T54/7, Call Table 24 Procedure with T_x~~Tx~~ and γ_{60}~~RD60~~

Reference Fluid 1 ~~Reference Fluid 1 ....~~ i-Butane

Reference Fluid 2 ~~Reference Fluid 2 ....~~ n-Butane

C_{TL1}~~CTL1~~, T_x~~Tx~~ to 60°F ~~...............~~. 1.062511014737

T54/8, Call Table 24 Procedure with 15°C and γ_{60}~~RD60~~

Reference Fluid 1 ~~Reference Fluid 1 ....~~ i-Butane

Reference Fluid 2 ~~Reference Fluid 2 ....~~ n-Butane

C_{TL2}~~CTL2~~, 15°C to 60°F ~~............~~. 1.001151857830

T54/9 C_{TL} ~~CTL~~ = C_{TL1}~~CTL1~~/C_{TL2}~~CTL2~~

C_{TL}, ~~CTL,~~ T_x~~Tx~~ to 15°C ~~.................~~ 1.061288561198

T54/10

C_{TL} ~~CTL~~ is positive, continue

T54/11 C_{TL} ~~CTL~~ rounded

C_{TL} ~~CTL~~ (rounded) ~~...................~~ 1.06129

Example 54/7 – ~~Utilize~~Use n-Butane and i-Pentane

```
    Input Data to Implementation Procedure T54
Density (kg/m³) @ 15°C (ρ15Den15) . 599.37
Observed temperature TFTf, °C .....  43.360
    Computed Data – last digit is rounded
  T54/1
    Input Data – rounded
ρ15Den15, rounded to 0.1 ........... 599.4
TFTf, °C, rounded to 0.05 ........  43.35
  T54/2
TxTx, Kelvin ...................... 316.50
  T54/3
TxTx and ρ15Den15 are within range, continue
  T54/4
ρ15Den15 relative to 60°F water ...   0.599990390544

  T54/5, Call Table 23 procedure to obtain relative density at 60°F
γ60RD60 from Table 23 .............   0.599396660576

  T54/6
γ60RD60 is within range, continue
  T54/7, Call Table 24 Procedure with TxTx and γ60RD60
Reference Fluid 1            Reference Fluid 1 ..............n-Butane
Reference Fluid 2            Reference Fluid 2 ..............i-Pentane
CTL1CTL1, TxTx to 60°F ...............   0.948276855780

  T54/8, Call Table 24 Procedure with 15°C and γ60RD60
Reference Fluid 1            Reference Fluid 1 ..............n-Butane
Reference Fluid 2            Reference Fluid 2 ..............i-Pentane
CTL2CTL2, 15°C to 60°F ............   1.000990546173

  T54/9 CTL CTL = CTL1CTL1/CTL2CTL2
CTL,CTL, TxTx to 15°C ................    0.947338473281

  T54/10
CTL CTL is positive, continue
  T54/11 CTL CTL rounded
CTL CTL (rounded) ..................   0.94734
```

Example 54/8 – ~~Utilize~~Use i-Pentane and n-Pentane

Input Data to Implementation Procedure T54
Density (kg/m³) @ 15°C (ρ_{15}~~Den15~~) . 624.42
Observed temperature T_F~~Tf~~, °C 76.650
Computed Data – last digit is rounded
T54/1
Input Data – rounded
ρ_{15}~~Den15~~, rounded to 0.1 .... 624.4
T_F~~Tf~~, °C, rounded to 0.05 .... 76.65
T54/2
T_X~~Tx~~, Kelvin 349.80
T54/3
T_X~~Tx~~ and ρ_{15}~~Den15~~ are within range, continue
T54/4
ρ_{15}~~Den15~~ relative to 60°F water ... 0.625015014775

T54/5, Call Table 23 procedure to obtain relative density at 60°F
γ_{60}~~RD60~~ from Table 23 .... 0.624458073820

T54/6
γ_{60}~~RD60~~ is within range, continue
T54/7, Call Table 24 Procedure with T_X~~Tx~~ and γ_{60}~~RD60~~
Reference Fluid 1 ~~Reference Fluid 1 ....~~ i-Pentane
Reference Fluid 2 ~~Reference Fluid 2 ....~~ n-Pentane
C_{TL1}~~CTL1~~, T_X~~Tx~~ to 60°F 0.893460003018

T54/8, Call Table 24 Procedure with 15°C and γ_{60}~~RD60~~
Reference Fluid 1 ~~Reference Fluid 1 ....~~ i-Pentane
Reference Fluid 2 ~~Reference Fluid 2 ....~~ n-Pentane
C_{TL2}~~CTL2~~, 15°C to 60°F 1.000891878859

T54/9 C_{TL} ~~CTL~~ = C_{TL1}~~CTL1~~/C_{TL2}~~CTL2~~
C_{TL}, ~~CTL,~~ T_X~~Tx~~ to 15°C 0.892663854998

T54/10
C_{TL} ~~CTL~~ is positive, continue
T54/11 C_{TL} ~~CTL~~ rounded
C_{TL} ~~CTL~~ (rounded) 0.89266

Example 54/9 – ~~Utilize~~Use n-Pentane and i-Hexane

```
    Input Data to Implementation Procedure T54
Density (kg/m³) @ 15°C (ρ15Den15) . 639.41
Observed temperature TFTf, °C ..... –24.460
    Computed Data – last digit is rounded
  T54/1
    Input Data – rounded
ρ15Den15, rounded to 0.1 ........... 639.4
TFTf, °C, rounded to 0.05 ......... –24.45
  T54/2
TxTx, Kelvin ....................... 248.70
  T54/3
TxTx and ρ15Den15 are within range, continue
  T54/4
ρ15Den15 relative to 60°F water ...   0.640029789313

  T54/5, Call Table 23 procedure to obtain relative density at 60°F
γ60RD60 from Table 23 .............   0.639504496457

  T54/6
γ60RD60 is within range, continue
  T54/7, Call Table 24 Procedure with TxTx and γ60RD60
Reference Fluid 1            Reference Fluid 1 ..............n-Pentane
Reference Fluid 2            Reference Fluid 2 ..............i-Hexane
CTL1CTL1, TxTx to 60°F ...............   1.057426821739

  T54/8, Call Table 24 Procedure with 15°C and γ60RD60
Reference Fluid 1            Reference Fluid 1 ..............n-Pentane
Reference Fluid 2            Reference Fluid 2 ..............i-Hexane
CTL2CTL2, 15°C to 60°F .............   1.000821406041

  T54/9 CTL CTL = CTL1CTL1/CTL2CTL2
CTL,CTL, TxTx to 15°C ................    1.056558957827

  T54/10
CTL CTL is positive, continue
  T54/11 CTL CTL rounded
CTL CTL (rounded) ..................   1.05656
```

Example 54/10 – ~~Utilize~~Use i-Hexane and n-Hexane

Input Data to Implementation Procedure T54
Density (kg/m³) @ 15°C (ρ_{15}~~Den15~~) . 659.38
Observed temperature T_F~~Tf~~, °C ~~.....~~ 80.580
Computed Data – last digit is rounded
T54/1
Input Data – rounded
ρ_{15}~~Den15~~, rounded to 0.1 ~~..........~~ 659.4
T_F~~Tf~~, °C, rounded to 0.05 ~~........~~ 80.60
T54/2
T_X~~Tx~~, Kelvin ~~....................~~. 353.75
T54/3
T_X~~Tx~~ and ρ_{15}~~Den15~~ are within range, continue
T54/4
ρ_{15}~~Den15~~ relative to 60°F water ~~..~~. 0.660049488697

T54/5, Call Table 23 procedure to obtain relative density at 60°F
γ_{60}~~RD60~~ from Table 23 ~~............~~. 0.659551831579

T54/6
γ_{60}~~RD60~~ is within range, continue
T54/7, Call Table 24 Procedure with T_X~~Tx~~ and γ_{60}~~RD60~~
Reference Fluid 1 ~~Reference Fluid 1 ....~~ i-Hexane
Reference Fluid 2 ~~Reference Fluid 2 ....~~ n-Hexane
C_{TL1}~~CTL1~~, T_X~~Tx~~ to 60°F ~~..............~~. 0.905892081483

T54/8, Call Table 24 Procedure with 15°C and γ_{60}~~RD60~~
Reference Fluid 1 ~~Reference Fluid 1 ....~~ i-Hexane
Reference Fluid 2 ~~Reference Fluid 2 ....~~ n-Hexane
C_{TL2}~~CTL2~~, 15°C to 60°F ~~............~~. 1.000754538301

T54/9 C_{TL} ~~CTL~~ = C_{TL1}~~CTL1~~/C_{TL2}~~CTL2~~
C_{TL}, ~~CTL,~~ T_X~~Tx~~ to 15°C ~~................~~ 0.905209066572

T54/10
C_{TL} ~~CTL~~ is positive, continue
T54/11 C_{TL} ~~CTL~~ rounded
C_{TL} ~~CTL~~ (rounded) ~~..................~~ 0.90521

Example 54/11 – ~~Utilize~~Use n-Hexane and n-Heptane

```
    Input Data to Implementation Procedure T54
Density (kg/m³) @ 15°C (ρ15Den15) . 669.38
Observed temperature TFTf, °C .....  82.790
    Computed Data – last digit is rounded
  T54/1
    Input Data – rounded
ρ15Den15, rounded to 0.1 ........... 669.4
TFTf, °C, rounded to 0.05 ........  82.80
  T54/2
TXTx, Kelvin ..................... 355.95
  T54/3
TXTx and ρ15Den15 are within range, continue
  T54/4
ρ15Den15 relative to 60°F water ...   0.670059338389

  T54/5, Call Table 23 procedure to obtain relative density at 60°F
γ60RD60 from Table 23 .............   0.669573371528

  T54/6
γ60RD60 is within range, continue
  T54/7, Call Table 24 Procedure with TXTx and γ60RD60
Reference Fluid 1            Reference Fluid 1 .............. n-Hexane
Reference Fluid 2            Reference Fluid 2 .............. n-Heptane
CTL1CTL1, TXTx to 60°F ...............   0.907185481500

  T54/8, Call Table 24 Procedure with 15°C and γ60RD60
Reference Fluid 1            Reference Fluid 1 .............. n-Hexane
Reference Fluid 2            Reference Fluid 2 .............. n-Heptane
CTL2CTL2, 15°C to 60°F .............   1.000725785828

  T54/9 CTL CTL = CTL1CTL1/CTL2CTL2
CTL,CTL, TXTx to 15°C .................   0.906527536662

  T54/10
CTL CTL is positive, continue
  T54/11 CTL CTL rounded
CTL CTL (rounded) ..................   0.90653
```

Example 54/12 – Reduced Temperature (T_x~~X~~) Greater Than 1.0

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```
    Input Data to Implementation Procedure T54
Density (kg/m³) @ 15°C (ρ15~~Den15~~) . 399.83
Observed temperature TF~~Tf~~, °C ~~....~~  90.570
    Computed Data – last digit is rounded
  T54/1
    Input Data – rounded
ρ15~~Den15~~, rounded to 0.1 ~~..........~~ 399.8
TF~~Tf~~, °C, rounded to 0.05 ~~........~~  90.55
  T54/2
Tx~~Tx~~, Kelvin ~~....................~~. 363.70
  T54/3
Tx~~Tx~~ and ρ15~~Den15~~ are within range, continue
  T54/4
ρ15~~Den15~~ relative to 60°F water ~~..~~.   0.400193790690

  T54/5, Call Table 23 procedure to obtain relative density at 60°F
γ60~~RD60~~ from Table 23 ~~............~~.   0.398881468881

  T54/6
γ60~~RD60~~ is within range, continue
  T54/7, Call Table 24 Procedure with Tx~~Tx~~ and γ60~~RD60~~
Reference Fluid 1             ~~Reference Fluid 1 .............~~ Ethane
Reference Fluid 2             ~~Reference Fluid 2 .............~~ EP (65/35)
~~Reduced temperature~~ Tr,x ~~Input data greater than 1.0, no solution~~is outside the correla
range of the standard
CTL1~~CTL1~~, Tx~~Tx~~ to 60°F ~~..............~~.  -1.0

Value from Table 24 ~~not valid, no solution~~is outside the correlation range of the standard
```

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Example 54/13 – Observed Temperature (T_FTf) < Lower Range Limit

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```
    Input Data to Implementation Procedure T54
Density (kg/m³) @ 15°C (ρ15Den15) . 449.56
Observed temperature TFTf, °C ..... –46.030
    Computed Data – last digit is rounded
  T54/1
    Input Data – rounded
ρ15Den15, rounded to 0.1 ........... 449.6
TFTf, °C, rounded to 0.05 ......... –46.05
  T54/2
TXTx, Kelvin ....................... 227.10
  T54/3
Tx Input data is outside the range of the standardless than 227.15, no solution
```

Example 54/14 – Density at 15°C (ρ_{15}) < Lower Range Limit

```
    Input Data to Implementation Procedure T54
Density (kg/m³) @ 15°C (ρ15Den15) . 349.59
Observed temperature TFTf, °C .....   4.440
    Computed Data – last digit is rounded
  T54/1
    Input Data – rounded
ρ15Den15, rounded to 0.1 ........... 349.6
TFTf, °C, rounded to 0.05 .........   4.45
  T54/2
TxTx, Kelvin ....................... 277.60
  T54/3
Density Input data is outside the range of the standardless than  351.7, no solution
```

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Example 54/15 – Observed Temperature (T_FTf) > Upper Range Limit

```
    Input Data to Implementation Procedure T54
Density (kg/m³) @ 15°C (ρ15Den15) . 449.56
Observed temperature TFTf, °C .....  93.030
    Computed Data – last digit is rounded
  T54/1
    Input Data – rounded
ρ15Den15, rounded to 0.1 ........... 449.6
TFTf, °C, rounded to 0.05 .........  93.05
  T54/2
TXTx, Kelvin ...................... 366.20
  T54/3
Tx Input data is outside the range of the standardgreater than 366.15, no solution
```

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Example 54/16 – Density at 15°C (ρ_{15}) > Upper Range Limit

```
    Input Data to Implementation Procedure T54
Density (kg/m³) @ 15°C (ρ15Den15) . 687.85
Observed temperature TFTf, °C ..... –17.780
    Computed Data – last digit is rounded
  T54/1
    Input Data – rounded
ρ15Den15, rounded to 0.1 ........... 687.9
TFTf, °C, rounded to 0.05 ......... –17.80
  T54/2
TxTx, Kelvin ....................... 255.35
  T54/3
Den15Input data is outside the range of the standardgreater than  687.8, no solution
```

Example 54/17 – Observed Temperature (T_F Tf) &and Density at 15°C (ρ_{15})Den15 = Upper range Boundary Limits

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```
    Input Data to Implementation Procedure T54
Density (kg/m³) @ 15°C (ρ15Den15) . 687.84
Observed temperature TFTf, °C .....  93.020
    Computed Data – last digit is rounded
  T54/1
    Input Data – rounded
ρ15Den15, rounded to 0.1 ........... 687.8
TFTf, °C, rounded to 0.05 ........  93.00
  T54/2
TXTx, Kelvin ...................... 366.15
  T54/3
TXTx and ρ15Den15 are within range, continue
  T54/4
ρ15Den15 relative to 60°F water ...   0.688477461822

  T54/5, Call Table 23 procedure to obtain relative density at 60°F
γ60RD60 from Table 23 .............   0.688010661267

  T54/6
γ60RD60 is within range, continue
  T54/7, Call Table 24 Procedure with TXTx and γ60RD60
Reference Fluid 1            Reference Fluid 1 ..............n-Hexane
Reference Fluid 2            Reference Fluid 2 ..............n-Heptane
CTL1CTL1, TXTx to 60°F ...............   0.900470590102

  T54/8, Call Table 24 Procedure with 15°C and γ60RD60
Reference Fluid 1            Reference Fluid 1 ..............n-Hexane
Reference Fluid 2            Reference Fluid 2 ..............n-Heptane
CTL2CTL2, 15°C to 60°F ............   1.000678478666

  T54/9 CTL CTL = CTL1CTL1/CTL2CTL2
CTL,CTL, TXTx to 15°C .................    0.899860054252

  T54/10
CTL CTL is positive, continue
  T54/11 CTL CTL rounded
CTL CTL (rounded) ..................   0.89986
```

Example 54/18 – Observed Temperature (T_F~~Tf~~) ~~&~~and Density at 15°C (ρ_{15})~~Den15~~ = Lower ~~range~~ Boundary Limit~~s~~

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Input Data to Implementation Procedure T54
Density (kg/m³) @ 15°C (ρ_{15}~~Den15~~) . 351.67
Observed temperature T_F~~Tf~~, °C ~~.....~~ –46.020
Computed Data – last digit is rounded
T54/1
Input Data – rounded
ρ_{15}~~Den15~~, rounded to 0.1 ~~..........~~ 351.7
T_F~~Tf~~, °C, rounded to 0.05 ~~........~~ –46.00
T54/2
T_X~~Tx~~, Kelvin ~~....................~~. 227.15
T54/3
T_X~~Tx~~ and ρ_{15}~~Den15~~ are within range, continue
T54/4
ρ_{15}~~Den15~~ relative to 60°F water ~~..~~. 0.352046413671

T54/5, Call Table 23 procedure to obtain relative density at 60°F
γ_{60}~~RD60~~ from Table 23 ~~............~~. 0.350027377993

T54/6
γ_{60}~~RD60~~ is within range, continue
T54/7, Call Table 24 Procedure with T_X~~Tx~~ and γ_{60}~~RD60~~
Reference Fluid 1 ~~Reference Fluid 1 ....~~ EE (68/32)
Reference Fluid 2 ~~Reference Fluid 2 ....~~ Ethane
C_{TL1}~~CTL1~~, T_X~~Tx~~ to 60°F ~~..............~~. 1.381296917892

T54/8, Call Table 24 Procedure with 15°C and γ_{60}~~RD60~~
Reference Fluid 1 ~~Reference Fluid 1 ....~~ EE (68/32)
Reference Fluid 2 ~~Reference Fluid 2 ....~~ Ethane
C_{TL2}~~CTL2~~, 15°C to 60°F ~~............~~. 1.005768222160

T54/9 C_{TL} ~~CTL~~ = C_{TL1}~~CTL1~~/C_{TL2}~~CTL2~~
C_{TL}, ~~CTL,~~ T_X~~Tx~~ to 15°C ~~................~~ 1.373374985865

T54/10
C_{TL} ~~CTL~~ is positive, continue
T54/11 C_{TL} ~~CTL~~ rounded
C_{TL} ~~CTL~~ (rounded) ~~..................~~ 1.37337

5.2.2 Implementation Procedure for Table 53E (15°C Basis)

This section presents the implementation procedure T53 for calculating the densities of NGLs and LPGs at ~~a base conditions~~a base condition of 15°C from known measurement temperatures and densities.

Density readings must be corrected for the effect of temperature on the instrument prior to entering the density into the following implementation procedure.

5.2.2.1 Inputs and Outputs

Inputs: Density at observed temperature, ρ_x (kg/m^3)
Observed temperature, T_F (°C)

Output: Density at 15°C, ρ_{15} (kg/m^3)

5.2.2.2 Outline of Calculations

The calculations are done using an extended two-fluid corresponding states equation. Two reference fluids are found that are slightly denser and slightly less dense than the observed fluid by comparing their densities at the observed temperature. Iteration must be performed to determine the value of the fluid's relative density at 60°F such that when the Temperature Correction Factor is applied, the observed relative density is obtained. The "guessed" value for the fluid's relative density at 60°F is constrained to lie between the relative densities at 60°F of these two reference fluids (as upper and lower bounds). As the iterations progress, these upper and lower bounds are "brought together" based upon intermediate calculations. The relative density at 15°C is then computed from the 60°F relative density by using scaling factors between the properties of the two reference fluids.

See Figure 4 for a general flow chart of the calculation procedure.

5.2.2.3 T53 Implementation Procedure

T53/Step Number — Operation/Procedure at that step

T53/1: Round the density ρ_x to the nearest 0.1 and round the observed temperature T_F to the nearest 0.05°C.

T53/2: Convert the rounded observed temperature to units of Kelvin, T_x:

$$T_x = T_F + 273.15$$

T53/3: Convert the density, ρ_x, to relative density, γ_x, relative to the density of water at 60°F:

$$\gamma_x = \frac{\rho_x}{\rho_{w60}}$$

At the time of the writing of this standard, the value for the absolute~~relative~~ density of water at 60°F (ρ_{w60}~~ρ_{w60}~~) was 999.016 kg/m^3. This ~~was~~is the value used for ρ_{w60}~~ρ_{w60}~~ in the examples. Refer to API *MPMS* Chapter 11.4.1 for the most current value of ρ_{w60}~~ρ_{w60}~~.

T53/4: Check the values of temperature and relative density to ensure that they are in the proper range. The observed temperature T_x and relative density γ_x must fall within the following ~~boundaries~~ranges:

Temperature between 227.15 and 366.15 K, inclusive (equivalent to –46 to 93°C, or –50.8 to 199.4°F)
Relative density, if it were rounded to the nearest 0.0001, must fall within 0.2100 and 0.7400 inclusive. Test γ_x to ensure it is within the following ~~boundaries~~ranges:

Relative density greater than or equal to 0.20995 and less than 0.74005

If these values do not fall in these ranges, then the standard does not apply. Flag this result (possibly by returning –1 for the density) and exit this procedure.

T53/5: Compute the relative density at 60°F, γ_{60}, from the temperature and the relative density at the measurement condition, γ_x. Use the procedure described in Section 5.2.1 for Table 23 to perform this step. Enter the procedure with γ_x and T_x at Step T23/4 ~~so as to~~to avoid additional rounding of the input values. Exit after Step T23/11 to avoid rounding the result.

T53/6: Compute the relative density at 15°C, γ_{15}, from the relative density at 60°F. This is performed by using the procedure described in Section 5.1.1 for Table 24. Enter implementation procedure T24 with γ_{60} and T_x = 288.15 (e.g. 273.15 + 15.00). Enter at Step T24/4 to avoid double rounding of the inputs. The C_{TL} for the conversion between γ_{60} and γ_{15} will be returned without rounding from Step T24/13. Compute γ_{15}:

$$\gamma_{15} = C_{TL} \times \gamma_{60}$$

T53/7: Insure that only valid values came from Steps T53/5 and T53/6. If the γ_{60} obtained from Section 5.2.1 for Table 23 is greater than –1, then proceed. If not, set the fluid density at 15°C to some flag value such as –1 and quit. If the C_{TL} from Step T53/6 is negative, then set the fluid density at 15°C to the error flag condition and exit this procedure.

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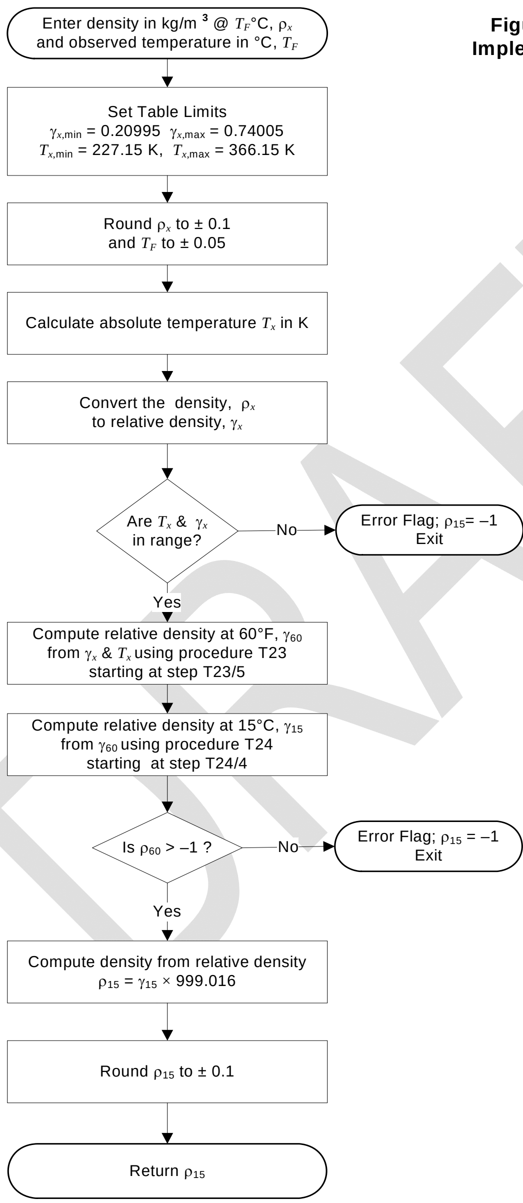
T53/8: Calculate the fluid density at 15°C from the relative density at 15°C.

$$\rho_{15} = \gamma_{15} \times 999.016$$

T53/9: Round the fluid density, ρ_{15}, to the nearest 0.1. Exit this procedure.

Comment [KF4]: Update Figure Number for addition of Figure 1

Figure 4. Flow Chart of Implementation Procedure for Table 53



5.2.2.4 Examples for Section 5.2.2 (Table 53E)

(See ~~Table 1~~Table 2 for properties of the Reference Fluids)

Example 53/1 – ~~Utilize~~Use EP (65/35) ~~&~~and EP (35/65)

Input Data to Implementation Procedure T53
Density @ obs. temp. (kg/m³) ~~...~~. 532.57
Observed Temperature T_F~~Tf~~ (°C) ~~...~~. –44.120
Computed Data – last digit is rounded
T53/1
Input Data – rounded
Density, rounded to 0.1 ~~.........~~ 532.6
Temperature rounded to 0.05 ~~.....~~ –44.10
T53/2
T_x~~Tx~~, Kelvin ~~....................~~. 229.05
T53/3
Density relative to 60° water ~~..~~ 0.533124594601

T53/4
T_x~~Tx~~ and relative density are within range, continue
T53/5, Call Table 23 procedure to obtain relative density at 60°F
γ_{60}~~RD60~~ from Table 23 ~~.............~~. 0.440515294609

T53/6, Call Table 24 Procedure to obtain C_{TL} ~~CTL~~ from 60°F to 15°C
C_{TL} ~~CTL~~ from Table 24 ~~..............~~ 1.002432483838

Relative density at 15°C ~~.......~~. 0.441586840944

T53/7, Values returned from Tables 23 ~~&~~and 24 valid, continue
T53/8
Density at 15 °C (kg/m³) ~~.......~~. 441.152319492337

T53/9
Density at 15°C (rounded) ~~......~~ 441.2

Example 53/2 – ~~Utilize~~Use n-Pentane ~~&~~and i-Hexane

```
    Input Data to Implementation Procedure T53
Density @ obs. temp. (kg/m³) ... 673.66
Observed Temperature TFTf (°C) ... –23.330
    Computed Data – last digit is rounded
  T53/1
    Input Data – rounded
Density, rounded to 0.1 ......... 673.7
Temperature rounded to 0.05 ..... –23.35
  T53/2
TXTx, Kelvin ...................... 249.80
  T53/3
Density relative to 60° water ..   0.674363573757

  T53/4
TXTx and relative density are within range, continue
  T53/5, Call Table 23 procedure to obtain relative density at 60°F
γ60RD60 from Table 23 .............   0.638538685930

  T53/6, Call Table 24 Procedure to obtain CTL CTL from 60°F to 15°C
CTL CTL from Table 24 ..............   1.000825081981

Relative density at 15°C .......   0.639065532694

  T53/7, Values returned from Tables 23 &and 24 valid, continue
  T53/8
Density at 15 °C (kg/m³) ....... 638.436692209971

  T53/9
Density at 15°C (rounded) ...... 638.4
```

Example 53/3 – ~~Utilize~~Use EP (35/65) ~~&~~and Propane

```
    Input Data to Implementation Procedure T53
Density @ obs. temp. (kg/m³) ... 245.49
Observed Temperature T_F Tf (°C) ... 87.770
    Computed Data – last digit is rounded
  T53/1
    Input Data – rounded
Density, rounded to 0.1 .......... 245.5
Temperature rounded to 0.05 .....  87.75
  T53/2
T_x Tx, Kelvin ....................... 360.90
  T53/3
Density relative to 60° water ..   0.245741809941

  T53/4
T_x Tx and relative density are within range, continue
  T53/5, Call Table 23 procedure to obtain relative density at 60°F
γ60 RD60 from Table 23 ..............    0.488795025411

  T53/6, Call Table 24 Procedure to obtain C_TL CTL from 60°F to 15°C
C_TL CTL from Table 24 ...............    1.001786178364

Relative density at 15°C ........    0.489668100510

  T53/7, Values returned from Tables 23 &and 24 valid, continue
  T53/8
Density at 15 °C (kg/m³) ........ 489.186267098922

  T53/9
Density at 15°C (rounded) ....... 489.2
```

Example 53/4 – ~~Utilize~~Use n-Butane ~~&~~and i-Pentane

Input Data to Implementation Procedure T53
Density @ obs. temp. (kg/m³) ~~..~~. 499.55
Observed Temperature T_F~~Tf~~ (°C) ~~..~~. 87.820
Computed Data – last digit is rounded
T53/1
Input Data – rounded
Density, rounded to 0.1 ~~.........~~ 499.6
Temperature rounded to 0.05 ~~....~~ 87.80
T53/2
T_X~~Tx~~, Kelvin ~~.....................~~. 360.95
T53/3
Density relative to 60° water ~~..~~ 0.500092090617

T53/4
T_X~~Tx~~ and relative density are within range, continue
T53/5, Call Table 23 procedure to obtain relative density at 60°F
γ_{60}~~RD60~~ from Table 23 ~~............~~. 0.591794896225

T53/6, Call Table 24 Procedure to obtain C_{TL} ~~CTL~~ from 60°F to 15°C
C_{TL} ~~CTL~~ from Table 24 ~~..............~~ 1.001026475488

Relative density at 15°C ~~......~~. 0.592402359180

T53/7, Values returned from Tables 23 ~~&~~and 24 valid, continue
T53/8
Density at 15 °C (kg/m³) ~~......~~. 591.819435258795

T53/9

Density at 15°C (rounded) ~~......~~ 591.8

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Example 53/5 – ~~Utilize~~Use Ethane ~~&~~and EP (65/35)

```
    Input Data to Implementation Procedure T53
Density @ obs. temp. (kg/m³) ... 395.09
Observed Temperature T_F Tf (°C) ... 15.430
    Computed Data – last digit is rounded
  T53/1
    Input Data – rounded
Density, rounded to 0.1 ........ 395.1
Temperature rounded to 0.05 ....  15.45
  T53/2
T_x Tx, Kelvin ..................... 288.60
  T53/3
Density relative to 60° water ..   0.395489161335

  T53/4
T_x Tx and relative density are within range, continue
  T53/5, Call Table 23 procedure to obtain relative density at 60°F
γ60 RD60 from Table 23 ............    0.395233433716

  T53/6, Call Table 24 Procedure to obtain C_TL CTL from 60°F to 15°C
C_TL CTL from Table 24 .............    1.003392579214

Relative density at 15°C ......    0.396574294447

  T53/7, Values returned from Tables 23 &and 24 valid, continue
  T53/8
Density at 15 °C (kg/m³) ...... 396.184065341566

  T53/9
Density at 15°C (rounded) ...... 396.2
```

Example 53/6 – ~~Utilize~~Use i-Butane ~~&~~and n-Butane

```
    Input Data to Implementation Procedure T53
Density @ obs. temp. (kg/m³) ... 449.59
Observed Temperature T_F Tf (°C) ... 93.020
    Computed Data – last digit is rounded
  T53/1
    Input Data – rounded
Density, rounded to 0.1 ......... 449.6
Temperature rounded to 0.05 ....  93.00
  T53/2
T_X Tx, Kelvin ...................... 366.15
  T53/3
Density relative to 60° water ..   0.450042842157

  T53/4
T_X Tx and relative density are within range, continue
  T53/5, Call Table 23 procedure to obtain relative density at 60°F
γ60 RD60 from Table 23 .............    0.565490291365

  T53/6, Call Table 24 Procedure to obtain C_TL CTL from 60°F to 15°C
C_TL CTL from Table 24 ..............    1.001176265550

Relative density at 15°C .......    0.566155458114

  T53/7, Values returned from Tables 23 &and 24 valid, continue
  T53/8
Density at 15 °C (kg/m³) ....... 565.598361142720

  T53/9
Density at 15°C (rounded) ...... 565.6
```

Example 53/7 – ~~Utilize~~Use i-Hexane ~~&~~and n-Hexane

Input Data to Implementation Procedure T53
Density @ obs. temp. (kg/m³) ... 600.74
Observed Temperature T_F ~~Tf~~ (°C) ... 80.650
Computed Data – last digit is rounded
T53/1
Input Data – rounded
Density, rounded to 0.1 .... 600.7
Temperature rounded to 0.05 ..... 80.65
T53/2
T_x ~~Tx~~, Kelvin 353.80
T53/3
Density relative to 60° water .. 0.601291671004

T53/4
T_x ~~Tx~~ and relative density are within range, continue
T53/5, Call Table 23 procedure to obtain relative density at 60°F
γ_{60} ~~RD60~~ from Table 23 .... 0.662699711760

T53/6, Call Table 24 Procedure to obtain C_{TL} ~~CTL~~ from 60°F to 15°C
C_{TL} ~~CTL~~ from Table 24 .... 1.000745797303

Relative density at 15°C 0.663193951418

T53/7, Values returned from Tables 23 ~~&~~and 24 valid, continue
T53/8
Density at 15 °C (kg/m³) 662.541368569934

T53/9
Density at 15°C (rounded) 662.5

Example 53/8 – ~~Calculated~~ Relative Density @ 60°F (γ_{60})~~RD60~~ Near ~~0.6880~~Upper Boundary Limit Using N-Hexane ~~&~~and N-Heptane

```
    Input Data to Implementation Procedure T53
Density @ obs. temp. (kg/m³) .... 736.80
Observed Temperature TF (°C) .... -44.230
    Computed Data - last digit is rounded
  T53/1
    Input Data - rounded
Density, rounded to 0.1 ......... 736.8
Temperature rounded to 0.05 ..... -44.25
  T53/2
Tx, Kelvin ....................... 228.90
  T53/3
Density relative to 60° water ..   0.737525725314

  T53/4
Tx and relative density are within range, continue
  T53/5, Call Table 23 procedure to obtain relative density at 60°F
γ60 from Table 23 .............   0.687974688885

  T53/6, Call Table 24 Procedure to obtain CTL from 60°F to 15°C
CTL from Table 24 ..............   1.000678561307

Relative density at 15°C ........   0.688441521889

  T53/7, Values returned from Tables 23 and 24 valid, continue
  T53/8
Density at 15 °C (kg/m³) ........ 687.764095431267

  T53/9
Density at 15°C (rounded) ...... 687.8
```

Example 53/9 – ~~Calculated~~ Relative Density @ 60°F (γ_{60})~~RD60~~ Near ~~0.3500~~Lower Boundary Limit Using EE (68/32) a~~&~~nd Ethane

Input Data to Implementation Procedure T53
Density @ obs. temp. (kg/m³) ~~...~~. 224.56
Observed Temperature T_F~~Tf~~ (°C) ~~...~~. 30.680
Computed Data – last digit is rounded
T53/1
Input Data – rounded
Density, rounded to 0.1 ~~.........~~ 224.6
Temperature rounded to 0.05 ~~.....~~ 30.70
T53/2
T_X~~Tx~~, Kelvin ~~......................~~. 303.85
T53/3
Density relative to 60° water ~~..~~ 0.224821224084

T53/4
T_X~~Tx~~ and relative density are within range, continue
T53/5, Call Table 23 procedure to obtain relative density at 60°F
γ_{60}~~RD60~~ from Table 23 ~~.............~~. 0.350001829424

T53/6, Call Table 24 Procedure to obtain C_{TL} ~~CTL~~ from 60°F to 15°C
C_{TL} ~~CTL~~ from Table 24 ~~...............~~ 1.005770230278

Relative density at 15°C ~~.......~~. 0.352021420577

T53/7, Values returned from Tables 23 ~~&~~and 24 valid, continue
T53/8
Density at 15 °C (kg/m³) ~~.......~~. 351.675031499270

T53/9
Density at 15°C (rounded) ~~.......~~ 351.7

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Example 53/10 – Relative Density at Observed Temperature (γ_x T23/6, RDtf) < Lower Boundary Using EE (68/32) &and Ethane

```
    Input Data to Implementation Procedure T53
Density @ obs. temp. (kg/m³) ... 339.63
Observed Temperature TFTf (°C) ... 18.130
    Computed Data – last digit is rounded
  T53/1
    Input Data – rounded
Density, rounded to 0.1 ......... 339.6
Temperature rounded to 0.05 ..... 18.15
  T53/2
TxTx, Kelvin ...................... 291.30
  T53/3
Density relative to 60° water ..   0.339934495544

  T53/4
TxTx and relative density are within range, continue
  T53/5, Call Table 23 procedure to obtain relative density at 60°F
γ60RD60 from Table 23 .............  –1.0

Input dataData is outside the range correlation range of Table 23, no solutionthe standard
```

Example 53/11 – Relative Density at Observed Temperature (T23/6, γ_x) RDtf > Upper Boundary Using n-Hexane &and n-Heptane

```
    Input Data to Implementation Procedure T53
Density @ obs. temp. (kg/m³) ... 727.86
Observed Temperature T_F Tf (°C) ... –33.070
    Computed Data – last digit is rounded
  T53/1
    Input Data – rounded
Density, rounded to 0.1 ......... 727.9
Temperature rounded to 0.05 ..... –33.05
  T53/2
T_x Tx, Kelvin ...................... 240.10
  T53/3
Density relative to 60° water ..   0.728616959088

  T53/4
T_x Tx and relative density are within range, continue
  T53/5, Call Table 23 procedure to obtain relative density at 60°F
γ60 RD60 from Table 23 .............  –1.0

Input dataData is outside the range correlation range of Table 23, no solutionthe standard
```

Example 53/12 – ~~Density~~ Input Density < Input Range Limit

```
    Input Data to Implementation Procedure T53
Density @ obs. temp. (kg/m³) ... 209.74
Observed Temperature TF Tf (°C) ... 11.530
    Computed Data – last digit is rounded
  T53/1
    Input Data – rounded
Density, rounded to 0.1 ......... 209.7
Temperature rounded to 0.05 ....  11.55
  T53/2
TX Tx, Kelvin ...................... 284.70
  T53/3
Density relative to 60° water ..   0.209906548043

  T53/4
Relative density is less than 0.21002099 5, no solution outside the input range of the standard
```

Example 53/13 – Input Density > Input Range Limit

```
    Input Data to Implementation Procedure T53
Density @ obs. temp. (kg/m³) .... 739.3235
Observed Temperature TFTf (°C) ....  11.530
    Computed Data – last digit is rounded
  T53/1
    Input Data – rounded
Density, rounded to 0.1 ......... 739.34
Temperature rounded to 0.05 .....  11.55
  T53/2
TxTx, Kelvin ...................... 284.70
  T53/3
Density relative to 60° water ..    0.7401282862340.740028187737

  T53/4
Relative density is outside the input range of the standardgreater than or equal to
0.740055, no solution
```

Example 53/14 – Input Temperature < Input Range Limit

```
    Input Data to Implementation Procedure T53
Density @ obs. temp. (kg/m³) ... 645.62
Observed Temperature TFTf (°C) ... −46.030
    Computed Data – last digit is rounded
  T53/1
    Input Data – rounded
Density, rounded to 0.1 ......... 645.6
Temperature rounded to 0.05 .... −46.05
  T53/2
TXTx, Kelvin ....................... 227.10
  T53/3
Density relative to 60° water ..   0.646235896122

  T53/4
TXTx less than 227.15, no solutionis outside the input range of the standard
```

Example 53/15 – Input Temperature > Input Range Limit

```
    Input Data to Implementation Procedure T53
Density @ obs. temp. (kg/m³) ... 645.62
Observed Temperature TF Tf (°C) ... 93.070
    Computed Data – last digit is rounded
  T53/1
    Input Data – rounded
Density, rounded to 0.1 ......... 645.6
Temperature rounded to 0.05 .....  93.05
  T53/2
Tx Tx, Kelvin ..................... 366.20
  T53/3
Density relative to 60° water ..   0.646235896122

  T53/4
Tx Tx is outside the input range of the standardgreater than 366.15, no solution
```

5.3 CTL (Table 60) and Density (Table 59) for NGL and LPG using a 20°C Base Temperature

5.3.1 Implementation Procedure for Table 60E (20°C Basis)

This section presents the implementation procedure T60 for the computation of Temperature Correction Factors, C_{TL}s. The C_{TL}s are used to calculate volumes of fluid at the base temperature from volumes at some known temperature. The fluids are characterized by the specification of density at the base temperature, 20°C.

5.3.1.1 Inputs and Outputs

Inputs: Density at 20°C, ρ_{20} (kg/m^3)
Observed temperature, T_F (°C)

Output: Temperature Correction Factor, C_{TL} (from T_F to T_B)

5.3.1.2 Outline of Calculations

The calculations are performed using an extended two-fluid corresponding states equation. By comparing densities at 60°F, two reference fluids are selected so that one is slightly more dense and one that is slightly less dense than the observed fluid. The densities of these reference fluids are then scaled to the observed reduced temperature (reduced by the critical temperature of the fluid of interest). The Temperature Correction Factor is then computed from the reference fluid densities. See Figure 5 for a general flow chart of the calculation procedure.

5.3.1.3 T60 Implementation Procedure

T60/Step Number Operation/Procedure at that step

T60/1: Round the density ρ~~ρ~~$_{20}$ to the nearest 0.1 and round the observed temperature T_F to the nearest 0.05°C.

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T60/2: Convert the rounded observed temperature to units of Kelvin, T_x:

$$T_x = T_F + 273.15$$

T60/3: The resultant temperature T_x and ρ~~ρ~~$_{20}$ must fall within the following ~~boundaries~~ranges:

Temperature between 227.15 and 366.15 K, inclusive (equivalent to –46 to 93°C, or –50.8 to 199.4°F)

Density between 331.7 and 683.6 kg/m^3 inclusive

If these values do not fall in these ranges, then the standard does not apply. Flag this result (possibly by returning a –1 for C_{TL}) and exit this procedure.

Note: The density ~~boundaries~~ ranges tested in this step slightly exceed the ~~boundaries~~ ranges used within the T24 implementation procedure (0.3500 to 0.6880 relative density at 60°F) that act as the true limits for this method.

T60/4: Convert the 20°C density to relative density, relative to the density of water at 60°F:

$$\gamma_{TB} = \frac{\rho_{20}}{999.016}$$

T60/5: Use the procedure described in Section 5.1.2 for Table 23 to compute a relative density at 60°F from the known relative density at 20°C. Enter the procedure at Step T23/4 ~~so as to~~to avoid additional rounding of the input values. Inputs to Procedure T23 are the values of T_{BK} and γ_{TB}, where T_{BK} is the base temperature 20°C in Kelvin (293.15 K) and γ_{TB} is the density at the base temperature 20°C. Implementation procedure T23 is exited after Step T23/11 so as not to round the output values. The converged output from Step T23/11 is γ_{60}.

T60/6: The resultant density γ_{60}, if it were rounded to the nearest 0.0001, must fall within 0.3500 and 0.6880 inclusive. Test γ_{60} to ensure it is within the following ~~boundaries~~ranges:

Relative density greater than or equal to 0.34995 and less than 0.68805

If the relative density does not fall in this range, then the standard does not apply. Flag this result (return a –1 for C_{TL}) and exit this procedure.

T60/7: Use the procedure described in Section 5.1.1 for Table 24 to compute the Temperature Correction Factor (C_{TL1}) from 60°F to the observed temperature, T_x. This step provides the factor used to reduce an observed volume at T_x to a volume at 60°F when the relative density at 60°F, γ_{60}, is known. Enter implementation procedure T24 with T_x and γ_{60} at Step T24/4 to avoid double rounding of the inputs. On exit skip Step T24/14 to avoid rounding the output C_{TL1}.

By definition:

$$C_{TL1} = \frac{V_{60}}{V_{Tx}} = \frac{\gamma_{Tx}}{\gamma_{60}}$$

T60/8: Use the procedure described in Section 5.1.1 for Table 24 to compute the Temperature Correction Factor (C_{TL2}) from 60°F to the new base temperature 20°C. This step provides the factor used to reduce an observed volume at 20°C to a volume at 60°F when the relative density at 60°F, γ_{60}, is known. Enter implementation procedure T24 at Step T24/4 to avoid double rounding of the inputs. The inputs are T_{BK} and γ_{60}, where T_{BK} is the base temperature 20°C in Kelvin (293.15 K). On exit skip Step T24/14 to avoid double rounding of the output C_{TL1}.

By definition:

$$C_{TL2} = \frac{V_{60}}{V_{20}} = \frac{\gamma_{TB}}{\gamma_{60}}$$

T60/9: Compute the desired C_{TL} to reduce volume from the observed temperature, T_x, to the base condition of 20°C. The defining formulas show that the calculation is made by computing the ratio C_{TL1}/C_{TL2}.

$$\frac{C_{TL1}}{C_{TL2}} = \frac{\left(\frac{V_{60}}{V_{Tx}}\right)}{\left(\frac{V_{60}}{V_{20}}\right)} = \frac{V_{20}}{V_{Tx}}$$

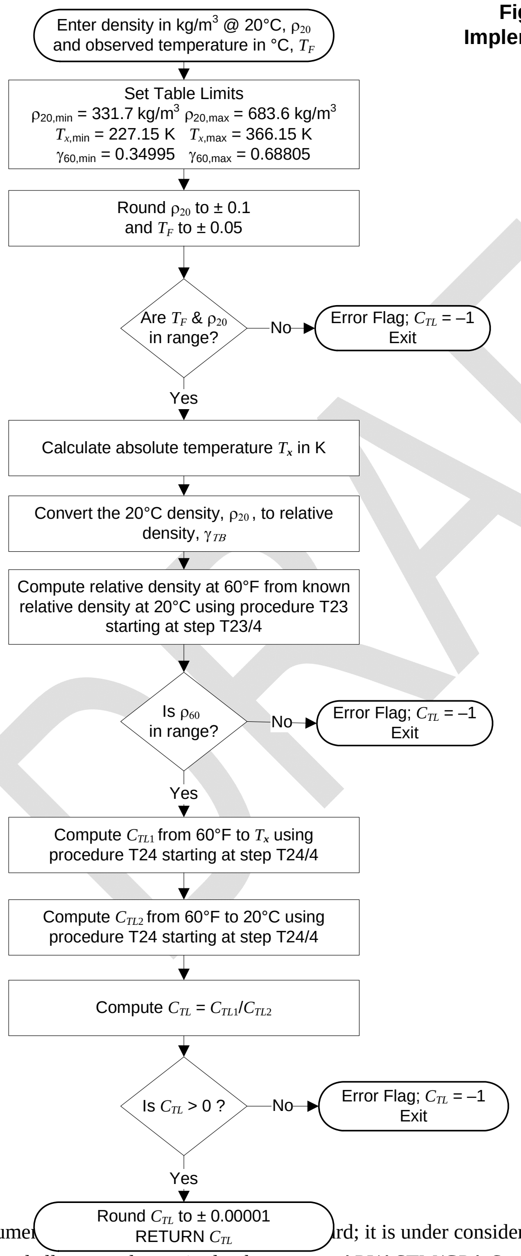
$$C_{TL1} = \frac{V_{20}}{V_{Tx}} = \frac{\rho_{Tx}}{\rho_{20}}$$

T60/10: Perform error check to ascertain that only positive C_{TL} is used. If C_{TL} is less than or equal to 0, set an error flag (such as $C_{TL} = -1$) and exit this procedure.

T60/11: Round the Temperature Correction Factor C_{TL} to the nearest 0.00001. Exit this procedure.

Comment [KF5]: Update Figure Number for addition of Figure 1

Figure 5. Flow Chart of Implementation Procedure for Table 60



5.3.1.4 Examples for Section 5.3.1 (Table 60)

(See ~~Table 1~~Table 2 for properties of the Reference Fluids)

Example 60/1 – ~~Utilize~~Use EE (68/32) and Ethane

Input Data to Implementation Procedure T60

Density (kg/m³) @ 20°C (ρ~~Den~~20) . 332.69

Observed temperature T_F~~Tf~~, °C ~~.....~~ –5.020

Computed Data – last digit is rounded

T60/1

Input Data – rounded

ρ_{20}~~Den20~~, rounded to 0.1 ~~...........~~ 332.7

T_F~~Tf~~, °C, rounded to 0.05 ~~........~~ –5.00

T60/2

T_X~~Tx~~, Kelvin ~~.....................~~. 268.15

T60/3

T_X~~Tx~~ and ρ_{20}~~Den20~~ are within range, continue

T60/4

ρ_{20}~~Den20~~ relative to 60°F water ~~..~~. 0.333027699256

T60/5, Call Table 23 procedure

γ_{60}~~RD60~~ from Table 23 ~~............~~. 0.350810339452

T60/6

γ_{60}~~RD60~~ is within range, continue

T60/7, Call Table 24 Procedure with T_X~~Tx~~ and γ_{60}~~RD60~~

Reference Fluid 1 ~~Reference Fluid 1 ....~~ EE (68/32)

Reference Fluid 2 ~~Reference Fluid 2 ....~~ Ethane

C_{TL1}~~CTL1~~, T_X~~Tx~~ to 60°F ~~..............~~. 1.164305432161

T60/8, Call Table 24 Procedure with 20°C and γ_{60}~~RD60~~

Reference Fluid 1 ~~Reference Fluid 1 ....~~ EE (68/32)

Reference Fluid 2 ~~Reference Fluid 2 ....~~ Ethane

C_{TL2}~~CTL2~~, 20°C to 60°F ~~............~~. 0.949309823927

T60/9 C_{TL} ~~CTL~~ = C_{TL1}~~CTL1~~/C_{TL2}~~CTL2~~

C_{TL}, ~~CTL,~~ T_X~~Tx~~ to 20°C ~~................~~ 1.226475701416

T60/10

C_{TL} ~~CTL~~ is positive, continue

T60/11 C_{TL} ~~CTL~~ rounded

C_{TL} ~~CTL~~ (rounded) ~~..................~~ 1.22648

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Example 60/2 – ~~Utilize~~Use Ethane and EP (65/35)

Input Data to Implementation Procedure T60
Density (kg/m³) @ 20°C (ρ_{20}~~Den20~~) . 399.55
Observed temperature T_F~~Tf~~, °C ~~.....~~ –3.920
Computed Data – last digit is rounded
T60/1
Input Data – rounded
ρ_{20}~~Den20~~, rounded to 0.1 ~~...........~~ 399.6
T_F~~Tf~~, °C, rounded to 0.05 ~~........~~ –3.90
T60/2
T_X~~Tx~~, Kelvin ~~.....................~~. 269.25
T60/3
T_X~~Tx~~ and ρ_{20}~~Den20~~ are within range, continue
T60/4
ρ_{20}~~Den20~~ relative to 60°F water ~~..~~. 0.399993593696

T60/5, Call Table 23 procedure
γ_{60}~~RD60~~ from Table 23 ~~............~~. 0.410257484971

T60/6
γ_{60}~~RD60~~ is within range, continue
T60/7, Call Table 24 Procedure with T_X~~Tx~~ and γ_{60}~~RD60~~
Reference Fluid 1 ~~Reference Fluid 1 ....~~ Ethane
Reference Fluid 2 ~~Reference Fluid 2 ....~~ EP (65/35)
C_{TL1}~~CTL1~~, T_X~~Tx~~ to 60°F ~~..............~~. 1.094238548593

T60/8, Call Table 24 Procedure with 20°C and γ_{60}~~RD60~~
Reference Fluid 1 ~~Reference Fluid 1 ....~~ Ethane
Reference Fluid 2 ~~Reference Fluid 2 ....~~ EP (65/35)
C_{TL2}~~CTL2~~, 20°C to 60°F ~~............~~. 0.974981830112

T60/9 C_{TL} ~~CTL~~ = C_{TL1}~~CTL1~~/C_{TL2}~~CTL2~~
C_{TL}, ~~CTL,~~ T_X~~Tx~~ to 20°C ~~................~~ 1.122316862527

T60/10
C_{TL} ~~CTL~~ is positive, continue
T60/11 C_{TL} ~~CTL~~ rounded
C_{TL} ~~CTL~~ (rounded) ~~..................~~ 1.12232

Example 60/3 – ~~Utilize~~Use EP (65/35) and EP (35/65)

Input Data to Implementation Procedure T60

Density (kg/m³) @ 20°C (ρ_{20}~~Den20~~) . 451.09

Observed temperature T_F~~Tf~~, °C ~~.....~~ 30.774

Computed Data – last digit is rounded

T60/1

Input Data – rounded

ρ_{20}~~Den20~~, rounded to 0.1 ~~...........~~ 451.1

T_F~~Tf~~, °C, rounded to 0.05 ~~........~~ 30.75

T60/2

T_X~~Tx~~, Kelvin ~~.....................~~. 303.90

T60/3

T_X~~Tx~~ and ρ_{20}~~Den20~~ are within range, continue

T60/4

ρ_{20}~~Den20~~ relative to 60°F water ~~..~~. 0.451544319610

T60/5, Call Table 23 procedure

γ_{60}~~RD60~~ from Table 23 ~~............~~. 0.459584427423

T60/6

γ_{60}~~RD60~~ is within range, continue

T60/7, Call Table 24 Procedure with T_X~~Tx~~ and γ_{60}~~RD60~~

Reference Fluid 1 ~~Reference Fluid 1 ....~~ EP (65/35)

Reference Fluid 2 ~~Reference Fluid 2 ....~~ EP (35/65)

C_{TL1}~~CTL1~~, T_X~~Tx~~ to 60°F ~~..............~~. 0.936730755171

T60/8, Call Table 24 Procedure with 20°C and γ_{60}~~RD60~~

Reference Fluid 1 ~~Reference Fluid 1 ....~~ EP (65/35)

Reference Fluid 2 ~~Reference Fluid 2 ....~~ EP (35/65)

C_{TL2}~~CTL2~~, 20°C to 60°F ~~............~~. 0.982505700078

T60/9 C_{TL} ~~CTL~~ = C_{TL1}~~CTL1~~/C_{TL2}~~CTL2~~

C_{TL}, ~~CTL,~~ T_X~~Tx~~ to 20°C ~~................~~ 0.953409995582

T60/10

C_{TL} ~~CTL~~ is positive, continue

T60/11 C_{TL} ~~CTL~~ rounded

C_{TL} ~~CTL~~ (rounded) ~~..................~~ 0.95341

Example 60/4 – ~~Utilize~~Use EP (35/65) and Propane

Input Data to Implementation Procedure T60
Density (kg/m³) @ 20°C (ρ_{20}~~Den20~~) . 489.92
Observed temperature T_F~~Tf~~, °C 84.975
Computed Data – last digit is rounded
T60/1
Input Data – rounded
ρ_{20}~~Den20~~, rounded to 0.1 .... 489.9
T_F~~Tf~~, °C, rounded to 0.05 .... 85.00
T60/2
T_x~~Tx~~, Kelvin 358.15
T60/3
T_x~~Tx~~ and ρ_{20}~~Den20~~ are within range, continue
T60/4
ρ_{20}~~Den20~~ relative to 60°F water ... 0.490382536416

T60/5, Call Table 23 procedure
γ_{60}~~RD60~~ from Table 23 .... 0.497272599314

T60/6
γ_{60}~~RD60~~ is within range, continue
T60/7, Call Table 24 Procedure with T_x~~Tx~~ and γ_{60}~~RD60~~
Reference Fluid 1 ~~Reference Fluid 1 ....~~ EP (35/65)
Reference Fluid 2 ~~Reference Fluid 2 ....~~ Propane
C_{TL1}~~CTL1~~, T_x~~Tx~~ to 60°F 0.659050245916

T60/8, Call Table 24 Procedure with 20°C and γ_{60}~~RD60~~
Reference Fluid 1 ~~Reference Fluid 1 ....~~ EP (35/65)
Reference Fluid 2 ~~Reference Fluid 2 ....~~ Propane
C_{TL2}~~CTL2~~, 20°C to 60°F 0.986144294080

T60/9 C_{TL} ~~CTL~~ = C_{TL1}~~CTL1~~/C_{TL2}~~CTL2~~
C_{TL}, ~~CTL,~~ T_x~~Tx~~ to 20°C 0.668310154886

T60/10
C_{TL} ~~CTL~~ is positive, continue
T60/11 C_{TL} ~~CTL~~ rounded
C_{TL} ~~CTL~~ (rounded) 0.66831

Example 60/5 – ~~Utilize~~Use Propane and i-Butane

Input Data to Implementation Procedure T60

Density (kg/m³) @ 20°C (ρ_{20}~~Den20~~) . 539.49

Observed temperature T_F~~Tf~~, °C ~~.....~~ 68.360

Computed Data – last digit is rounded

T60/1

Input Data – rounded

ρ_{20}~~Den20~~, rounded to 0.1 ~~...........~~ 539.5

T_F~~Tf~~, °C, rounded to 0.05 ~~........~~ 68.35

T60/2

T_X~~Tx~~, Kelvin ~~....................~~. 341.50

T60/3

T_X~~Tx~~ and ρ_{20}~~Den20~~ are within range, continue

T60/4

ρ_{20}~~Den20~~ relative to 60°F water ~~..~~. 0.540031390889

T60/5, Call Table 23 procedure

γ_{60}~~RD60~~ from Table 23 ~~............~~. 0.545748636061

T60/6

γ_{60}~~RD60~~ is within range, continue

T60/7, Call Table 24 Procedure with T_X~~Tx~~ and γ_{60}~~RD60~~

Reference Fluid 1 ~~Reference Fluid 1 ....~~ Propane

Reference Fluid 2 ~~Reference Fluid 2 ....~~ i-Butane

C_{TL1}~~CTL1~~, T_X~~Tx~~ to 60°F ~~..............~~. 0.856605931918

T60/8, Call Table 24 Procedure with 20°C and γ_{60}~~RD60~~

Reference Fluid 1 ~~Reference Fluid 1 ....~~ Propane

Reference Fluid 2 ~~Reference Fluid 2 ....~~ i-Butane

C_{TL2}~~CTL2~~, 20°C to 60°F ~~............~~. 0.989524032138

T60/9 C_{TL} ~~CTL~~ = C_{TL1}~~CTL1~~/C_{TL2}~~CTL2~~

C_{TL}, ~~CTL,~~ T_X~~Tx~~ to 20°C ~~................~~ 0.865674712384

T60/10

C_{TL} ~~CTL~~ is positive, continue

T60/11 C_{TL} ~~CTL~~ rounded

C_{TL} ~~CTL~~ (rounded) ~~..................~~ 0.86567

Example 60/6 – ~~Utilize~~Use i-Butane and n-Butane

```
    Input Data to Implementation Procedure T60
Density (kg/m³) @ 20°C (ρ20Den20) . 569.42
Observed temperature TFTf, °C ..... –16.090
    Computed Data – last digit is rounded
  T60/1
    Input Data – rounded
ρ20Den20, rounded to 0.1 ........... 569.4
TFTf, °C, rounded to 0.05 ........ –16.10
  T60/2
TXTx, Kelvin ...................... 257.05
  T60/3
TXTx and ρ20Den20 are within range, continue
  T60/4
ρ20Den20 relative to 60°F water ...   0.569960841468

  T60/5, Call Table 23 procedure
γ60RD60 from Table 23 .............   0.575142670956

  T60/6
γ60RD60 is within range, continue
  T60/7, Call Table 24 Procedure with TXTx and γ60RD60
Reference Fluid 1            Reference Fluid 1 ..............i-Butane
Reference Fluid 2            Reference Fluid 2 ..............n-Butane
CTL1CTL1, TXTx to 60°F ..............   1.060732897657

  T60/8, Call Table 24 Procedure with 20°C and γ60RD60
Reference Fluid 1            Reference Fluid 1 ..............i-Butane
Reference Fluid 2            Reference Fluid 2 ..............n-Butane
CTL2CTL2, 20°C to 60°F ............   0.990990359414

  T60/9 CTL CTL = CTL1CTL1/CTL2CTL2
CTL,CTL, TXTx to 20°C ................   1.070376606170

  T60/10
CTL CTL is positive, continue
  T60/11 CTL CTL rounded
CTL CTL (rounded) ..................   1.07038
```

Example 60/7 – ~~Utilize~~Use n-Butane and i-Pentane

Input Data to Implementation Procedure T60

Density (kg/m³) @ 20°C (ρ_{20}~~Den20~~) . 599.37

Observed temperature T_F~~Tf~~, °C ~~.....~~ 43.360

Computed Data – last digit is rounded

T60/1

Input Data – rounded

ρ_{20}~~Den20~~, rounded to 0.1 ~~...........~~ 599.4

T_F~~Tf~~, °C, rounded to 0.05 ~~........~~ 43.35

T60/2

T_X~~Tx~~, Kelvin ~~......................~~. 316.50

T60/3

T_X~~Tx~~ and ρ_{20}~~Den20~~ are within range, continue

T60/4

ρ_{20}~~Den20~~ relative to 60°F water ~~..~~. 0.599990390544

T60/5, Call Table 23 procedure

γ_{60}~~RD60~~ from Table 23 ~~.............~~. 0.604700215005

T60/6

γ_{60}~~RD60~~ is within range, continue

T60/7, Call Table 24 Procedure with T_X~~Tx~~ and γ_{60}~~RD60~~

Reference Fluid 1 ~~Reference Fluid 1 ....~~ n-Butane

Reference Fluid 2 ~~Reference Fluid 2 ....~~ i-Pentane

C_{TL1}~~CTL1~~, T_X~~Tx~~ to 60°F ~~...............~~. 0.949609422686

T60/8, Call Table 24 Procedure with 20°C and γ_{60}~~RD60~~

Reference Fluid 1 ~~Reference Fluid 1 ....~~ n-Butane

Reference Fluid 2 ~~Reference Fluid 2 ....~~ i-Pentane

C_{TL2}~~CTL2~~, 20°C to 60°F ~~.............~~. 0.992211317977

T60/9 C_{TL} ~~CTL~~ = C_{TL1}~~CTL1~~/C_{TL2}~~CTL2~~

C_{TL}, ~~CTL,~~ T_X~~Tx~~ to 20°C ~~.................~~ 0.957063687423

T60/10

C_{TL} ~~CTL~~ is positive, continue

T60/11 C_{TL} ~~CTL~~ rounded

C_{TL} ~~CTL~~ (rounded) ~~...................~~ 0.95706

Example 60/8 – UtilizeUse i-Pentane and n-Pentane

Input Data to Implementation Procedure T60

Density (kg/m^3) @ 20°C (ρ_{20}Den20) . 624.42

Observed temperature T_FTf, °C 76.650

Computed Data – last digit is rounded

T60/1

Input Data – rounded

ρ_{20}Den20, rounded to 0.1 .... 624.4

T_FTf, °C, rounded to 0.05 .... 76.65

T60/2

T_xTx, Kelvin 349.80

T60/3

T_xTx and ρ_{20}Den20 are within range, continue

T60/4

ρ_{20}Den20 relative to 60°F water ... 0.625015014775

T60/5, Call Table 23 procedure

γ_{60}RD60 from Table 23 .... 0.629388813227

T60/6

γ_{60}RD60 is within range, continue

T60/7, Call Table 24 Procedure with T_xTx and γ_{60}RD60

Reference Fluid 1 Reference Fluid 1 .... i-Pentane

Reference Fluid 2 Reference Fluid 2 .... n-Pentane

C_{TL1}CTL1, T_xTx to 60°F 0.896907512500

T60/8, Call Table 24 Procedure with 20°C and γ_{60}RD60

Reference Fluid 1 Reference Fluid 1 .... i-Pentane

Reference Fluid 2 Reference Fluid 2 .... n-Pentane

C_{TL2}CTL2, 20°C to 60°F 0.993050721018

T60/9 C_{TL} CTL = C_{TL1}CTL1/C_{TL2}CTL2

C_{TL}, CTL, T_xTx to 20°C 0.903183990019

T60/10

C_{TL} CTL is positive, continue

T60/11 C_{TL} CTL rounded

C_{TL} CTL (rounded) 0.90318

Example 60/9 – ~~Utilize~~Use n-Pentane and i-Hexane

Input Data to Implementation Procedure T60

Density (kg/m³) @ 20°C (ρ_{20}~~Den20~~) . 639.41

Observed temperature T_F~~Tf~~, °C ~~.....~~ –24.460

Computed Data – last digit is rounded

T60/1

Input Data – rounded

ρ_{20}~~Den20~~, rounded to 0.1 ~~...........~~ 639.4

T_F~~Tf~~, °C, rounded to 0.05 ~~........~~ –24.45

T60/2

T_X~~Tx~~, Kelvin ~~.....................~~. 248.70

T60/3

T_X~~Tx~~ and ρ_{20}~~Den20~~ are within range, continue

T60/4

ρ_{20}~~Den20~~ relative to 60°F water ~~..~~. 0.640029789313

T60/5, Call Table 23 procedure

γ_{60}~~RD60~~ from Table 23 ~~.............~~. 0.644192277735

T60/6

γ_{60}~~RD60~~ is within range, continue

T60/7, Call Table 24 Procedure with T_X~~Tx~~ and γ_{60}~~RD60~~

Reference Fluid 1 ~~Reference Fluid 1 ....~~ n-Pentane

Reference Fluid 2 ~~Reference Fluid 2 ....~~ i-Hexane

C_{TL1}~~CTL1~~, T_X~~Tx~~ to 60°F ~~...............~~. 1.056377254246

T60/8, Call Table 24 Procedure with 20°C and γ_{60}~~RD60~~

Reference Fluid 1 ~~Reference Fluid 1 ....~~ n-Pentane

Reference Fluid 2 ~~Reference Fluid 2 ....~~ i-Hexane

C_{TL2}~~CTL2~~, 20°C to 60°F ~~.............~~. 0.993538437998

T60/9 C_{TL} ~~CTL~~ = C_{TL1}~~CTL1~~/C_{TL2}~~CTL2~~

C_{TL}, ~~CTL,~~ T_X~~Tx~~ to 20°C ~~.................~~ 1.063247493850

T60/10

C_{TL} ~~CTL~~ is positive, continue

T60/11 C_{TL} ~~CTL~~ rounded

C_{TL} ~~CTL~~ (rounded) ~~...................~~ 1.06325

Example 60/10 – ~~Utilize~~Use i-Hexane and n-Hexane

Input Data to Implementation Procedure T60
Density (kg/m³) @ 20°C (ρ_{20}~~Den20~~) . 659.38
Observed temperature T_F~~Tf~~, °C 80.580
Computed Data – last digit is rounded
T60/1
Input Data – rounded
ρ_{20}~~Den20~~, rounded to 0.1 659.4
T_F~~Tf~~, °C, rounded to 0.05 80.60
T60/2
T_x~~Tx~~, Kelvin . 353.75
T60/3
T_x~~Tx~~ and ρ_{20}~~Den20~~ are within range, continue
T60/4
ρ_{20}~~Den20~~ relative to 60°F water . 0.660049488697

T60/5, Call Table 23 procedure
γ_{60}~~RD60~~ from Table 23 . 0.664004852143

T60/6
γ_{60}~~RD60~~ is within range, continue
T60/7, Call Table 24 Procedure with T_x~~Tx~~ and γ_{60}~~RD60~~
Reference Fluid 1 ~~Reference Fluid 1~~ i-Hexane
Reference Fluid 2 ~~Reference Fluid 2~~ n-Hexane
C_{TL1}~~CTL1~~, T_x~~Tx~~ to 60°F . 0.908011926489

T60/8, Call Table 24 Procedure with 20°C and γ_{60}~~RD60~~
Reference Fluid 1 ~~Reference Fluid 1~~ i-Hexane
Reference Fluid 2 ~~Reference Fluid 2~~ n-Hexane
C_{TL2}~~CTL2~~, 20°C to 60°F . 0.994043170870

T60/9 C_{TL} ~~CTL~~ = C_{TL1}~~CTL1~~/C_{TL2}~~CTL2~~
C_{TL}, ~~CTL,~~ T_x~~Tx~~ to 20°C 0.913453211186

T60/10
C_{TL} ~~CTL~~ is positive, continue
T60/11 C_{TL} ~~CTL~~ rounded
C_{TL} ~~CTL~~ (rounded) 0.91345

Example 60/11 – UtilizeUse n-Hexane and n-Heptane

```
    Input Data to Implementation Procedure T60
Density (kg/m³) @ 20°C (ρ20Den20) . 669.38
Observed temperature TFTf, °C .....  82.790
    Computed Data – last digit is rounded
  T60/1
    Input Data – rounded
ρ20Den20, rounded to 0.1 ........... 669.4
TFTf, °C, rounded to 0.05 ........  82.80
  T60/2
TXTx, Kelvin ...................... 355.95
  T60/3
TXTx and ρ20Den20 are within range, continue
  T60/4
ρ20Den20 relative to 60°F water ...   0.670059338389

  T60/5, Call Table 23 procedure
γ60RD60 from Table 23 .............   0.673917506957

  T60/6
γ60RD60 is within range, continue
  T60/7, Call Table 24 Procedure with TXTx and γ60RD60
Reference Fluid 1            Reference Fluid 1 ..............n-Hexane
Reference Fluid 2            Reference Fluid 2 ..............n-Heptane
CTL1CTL1, TXTx to 60°F ...............   0.909032061079

  T60/8, Call Table 24 Procedure with 20°C and γ60RD60
Reference Fluid 1            Reference Fluid 1 ..............n-Hexane
Reference Fluid 2            Reference Fluid 2 ..............n-Heptane
CTL2CTL2, 20°C to 60°F ............   0.994275014129

  T60/9 CTL CTL = CTL1CTL1/CTL2CTL2
CTL,CTL, TXTx to 20°C ................   0.914266222283

  T60/10
CTL CTL is positive, continue
  T60/11 CTL CTL rounded
CTL CTL (rounded) ..................   0.91427
```

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Example 60/12 – Reduced Temperature ($T_{r,x}$) Greater Than 1.0

Input Data to Implementation Procedure T60
Density (kg/m³) @ 20°C (ρ_{20}~~Den20~~) . 399.83
Observed temperature T_F~~Tf~~, °C ~~.....~~ 90.570
Computed Data – last digit is rounded
T60/1
Input Data – rounded
ρ_{20}~~Den20~~, rounded to 0.1 ~~...........~~ 399.8
T_F~~Tf~~, °C, rounded to 0.05 ~~.........~~ 90.55
T60/2
T_X~~Tx~~, Kelvin ~~......................~~. 363.70
T60/3
T_X~~Tx~~ and ρ_{20}~~Den20~~ are within range, continue
T60/4
ρ_{20}~~Den20~~ relative to 60°F water ~~..~~. 0.400193790690

T60/5, Call Table 23 procedure
γ_{60}~~RD60~~ from Table 23 ~~.............~~. 0.410447384415

T60/6
γ_{60}~~RD60~~ is within range, continue
T60/7, Call Table 24 Procedure with T_X~~Tx~~ and γ_{60}~~RD60~~
Reference Fluid 1 ~~Reference Fluid 1 ....~~ Ethane
Reference Fluid 2 ~~Reference Fluid 2 ....~~ EP (65/35)
Reduced temperature Tr,x ~~greater than 1.0, no solution~~is outside the range of the standard
C_{TL1}~~CTL1~~, T_X~~Tx~~ to 60°F ~~...............~~. –1.0

Value from Table 24 is outside the correlation range of the standard~~not valid, no solution~~

Example 60/13 – Observed Temperature (T_F) Tf < Lower Range Limit

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Input Data to Implementation Procedure T60

Density (kg/m³) @ 20°C (ρ_{20}Den20) . 449.56

Observed temperature T_FTf, °C ..... –46.030

Computed Data – last digit is rounded

T60/1

Input Data – rounded

ρ_{20}Den20, rounded to 0.1 .... 449.6

T_FTf, °C, rounded to 0.05 .... –46.05

T60/2

T_xTx, Kelvin 227.10

T60/3

T_xTx is outside the input range of the standardless than 227.15, no solution

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Example 60/14 – Density at 20°C (ρ_{20}) < Lower Range Limit

```
    Input Data to Implementation Procedure T60
Density (kg/m³) @ 20°C (ρ20Den20) . 331.59
Observed temperature TFTf, °C .....  64.440
    Computed Data – last digit is rounded
  T60/1
    Input Data – rounded
ρ20Den20, rounded to 0.1 ........... 331.6
TFTf, °C, rounded to 0.05 ........  64.45
  T60/2
TXTx, Kelvin ...................... 337.60
  T60/3
Density Density at 20°C is outside the input range of the standardless than  331.7, no
solution
```

Example 60/15 – Observed Temperature (T_F)Tf > Upper Range Limit

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```
    Input Data to Implementation Procedure T60
Density (kg/m³) @ 20°C (ρ20Den20) . 449.56
Observed temperature TFTf, °C .....  93.030
    Computed Data – last digit is rounded
  T60/1
    Input Data – rounded
ρ20Den20, rounded to 0.1 .......... 449.6
TFTf, °C, rounded to 0.05 ........  93.05
  T60/2
TxTx, Kelvin ...................... 366.20
  T60/3
TxTx is outside the input range of the standardgreater than 366.15, no solution
```

Example 60/16 – Density at 20°C > Upper Range Limit

Input Data to Implementation Procedure T60

Density (kg/m^3) @ 20°C (ρ_{20}~~Den20~~) . 683.65

Observed temperature T_F~~Tf~~, °C ~~.....~~ –17.780

Computed Data – last digit is rounded

T60/1

Input Data – rounded

ρ_{20}~~Den20~~, rounded to 0.1 ~~...........~~ 683.7

T_F~~Tf~~, °C, rounded to 0.05 ~~.........~~ –17.80

T60/2

T_X~~Tx~~, Kelvin ~~......................~~. 255.35

T60/3

Density at 20°C is outside the input range of the standard~~greater than 683.6, no solution~~

Example 60/17 – Observed Temperature (T_FTf) &and Density at 20°C (ρ_{20}) = Upper Range Limits

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Input Data to Implementation Procedure T60
Density (kg/m³) @ 20°C (ρ_{20}Den20) . 683.64
Observed temperature T_FTf, °C 93.020
Computed Data – last digit is rounded
T60/1
Input Data – rounded
ρ_{20}Den20, rounded to 0.1 .... 683.6
T_FTf, °C, rounded to 0.05 .... 93.00
T60/2
T_XTx, Kelvin 366.15
T60/3
T_XTx and ρ_{20}Den20 are within range, continue
T60/4
ρ_{20}Den20 relative to 60°F water ... 0.684273324952

T60/5, Call Table 23 procedure
γ_{60}RD60 from Table 23 .... 0.688015480920

T60/6
γ_{60}RD60 is within range, continue
T60/7, Call Table 24 Procedure with T_XTx and γ_{60}RD60
Reference Fluid 1 Reference Fluid 1 .... n-Hexane
Reference Fluid 2 Reference Fluid 2 .... n-Heptane
C_{TL1}CTL1, T_XTx to 60°F 0.900472587577

T60/8, Call Table 24 Procedure with 20°C and γ_{60}RD60
Reference Fluid 1 Reference Fluid 1 .... n-Hexane
Reference Fluid 2 Reference Fluid 2 .... n-Heptane
C_{TL2}CTL2, 20°C to 60°F 0.994560942200

T60/9 C_{TL} CTL = C_{TL1}CTL1/C_{TL2}CTL2
C_{TL}, CTL, T_XTx to 20°C 0.905397094707

T60/10
C_{TL} CTL is positive, continue
T60/11 C_{TL} CTL rounded
C_{TL} CTL (rounded) 0.90540

Example 60/18 – Observed Temperature (T_F Tf) &and Density at 20°C (ρ_{20}) = Lower Range Limits

```
    Input Data to Implementation Procedure T60
Density (kg/m³) @ 20°C (ρ20Den20) . 331.67
Observed temperature TFTf, °C ..... –46.020
    Computed Data – last digit is rounded
  T60/1
    Input Data – rounded
ρ20Den20, rounded to 0.1 .......... 331.7
TFTf, °C, rounded to 0.05 ........ –46.00
  T60/2
TXTx, Kelvin ..................... 227.15
  T60/3
TXTx and ρ20Den20 are within range, continue
  T60/4
ρ20Den20 relative to 60°F water ...   0.332026714287

  T60/5, Call Table 23 procedure
γ60RD60 from Table 23 ............  –1.0

Input data is outside the range of Table 23, no solutionthe standard
```

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5.3.2 Implementation Procedure for Table 59E (20°C Basis)

This section presents the implementation procedure T59 for calculating the densities of NGLs and LPGs at ~~a base conditions~~a base condition of 20°C from known temperatures and densities.

Density readings must be corrected for the effect of temperature on the instrument prior to entering the density into the following implementation procedure.

5.3.2.1 Inputs and Outputs

Inputs: Density at observed temperature, ρ_x (kg/m^3)
Observed temperature, T_F (°C)

Output: Density at 20°C, ρ_{20} (kg/m^3)

5.3.2.2 Outline of Calculations

The calculations are done using an extended two-fluid corresponding states equation. Two reference fluids are found that are slightly denser and slightly less dense than the observed fluid by comparing their densities at the observed temperature. Iteration must be performed to determine the value of the fluid's relative density at 60°F such that when the Temperature Correction Factor is applied, the observed relative density is obtained. The "guessed" value for the fluid's relative density at 60°F is constrained to lie between the relative densities at 60°F of these two reference fluids (as upper and lower bounds). As the iterations progress, these upper and lower bounds are "brought together" based upon intermediate calculations. The relative density at 20°C is then computed from the 60°F relative density by using scaling factors between the properties of the two reference fluids.

See Figure 6 for a general flow chart of the calculation procedure.

5.3.2.3 T59 Implementation Procedure

T59/Step Number Operation/Procedure at that step

T59/1: Round the density ρ_x to the nearest 0.1 and round the observed temperature T_F to the nearest 0.05°C.

T59/2: Convert the rounded observed temperature to units of Kelvin, T_x:

$$T_x = T_F + 273.15$$

T59/3: Convert the density, ρ_x, to relative density, γ_x, relative to the density of water at 60°F.

$$\gamma_x = \frac{\rho_x}{999.016}$$

T59/4: Check the values of temperature and relative density to ensure that they are in the proper range. The observed temperature T_x and relative density γ_x must fall within the following ~~boundaries~~ranges:

Temperature between 227.15 and 366.15 K, inclusive (equivalent to –46 to 93°C, or –50.8 to 199.4°F)
Relative density, if it were rounded to the nearest 0.0001, must fall within 0.2100 and 0.7400 inclusive. Test γ_x to ensure it is within the following ~~boundaries~~ranges:

Relative density greater than or equal to 0.20995 and less than 0.74005

If these values do not fall in these ranges, then the standard does not apply. Flag this result (possibly by returning –1 for the density) and exit this procedure.

T59/5: Compute the relative density at 60°F, γ_{60}, from the temperature and the relative density at the measurement condition, γ_x. Use the procedure described in Section 5.1.2 for Table 23 to perform this step. Enter the implementation procedure with γ_x and T_x at Step T23/4 ~~so as to~~to avoid additional rounding of the input values. Exit after Step T23/11 to avoid rounding the result.

T59/6: Compute the relative density at 20°C, γ_{20}, from the relative density at 60°F. This is performed by using the procedure described in Section 5.1.1 for Table 24. Enter implementation procedure T24 with γ_{60} and T_x = 293.15 (e.g. 273.15 + 20). Enter at Step T24/4 to avoid double rounding of the inputs. The C_{TL} for the conversion between γ_{60} and γ_{20} will be returned without rounding from Step T24/13. Compute γ_{20}:

$$\gamma_{20} = C_{TL} \times \gamma_{60}$$

T59/7: Insure that only valid values came from Steps T59/5 and T59/6. If the γ_{60} obtained from Section 5.2.1 for Table 23 is greater than –1, then proceed. If not, set the fluid density at 20°C to some flag value such as –1 and quit. If the C_{TL} from Step T59/6 is negative, then set the fluid density at 20°C to the error flag condition and exit this procedure.

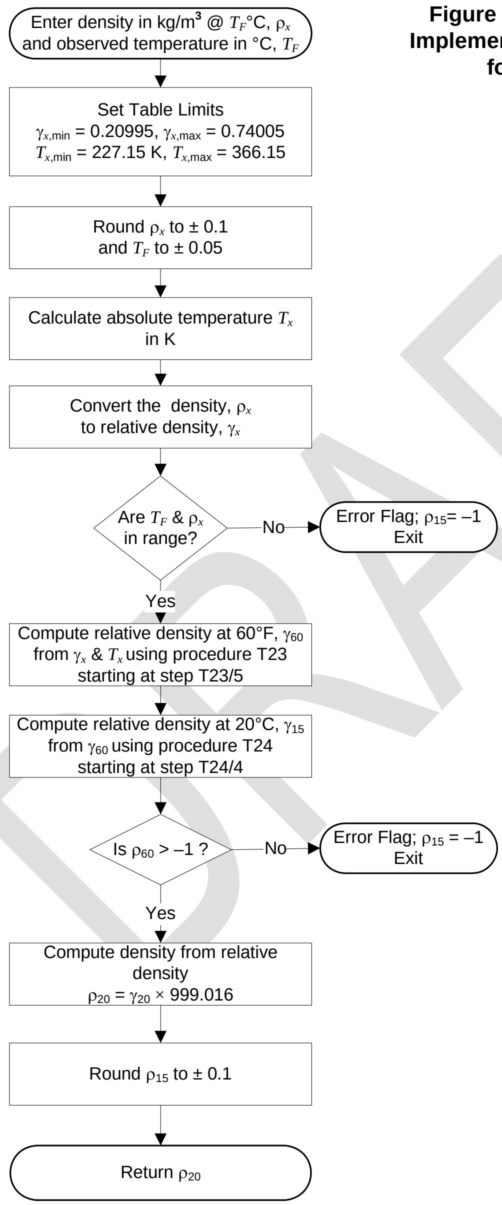
T59/8: Calculate the fluid density at 20°C from the relative density at 20°C.

$$\rho_{20} = \gamma_{20} \times 999.016$$

T59/9: Round the fluid density, ρ_{20}, to the nearest 0.1. Exit this procedure.

Comment [KF6]: Update Figure Number for addition of Figure 1

Figure 6. Flow Chart of Implementation Procedure for Table 59



5.3.2.4 Examples for Section 5.3.2 (Table 59E)

(See ~~Table 1~~Table 2 for properties of the Reference Fluids)

Example 59/1 – Relative Density at Observed Temperature (~~T23/6,~~ γ_x) ~~RDtf~~ < Lower Boundary Using E~~P~~ ~~(35/65~~E (68/32) ~~&~~ and ~~Propane~~Ethane

```
    Input Data to Implementation Procedure T59
Density at obs. temp. (kg/m³) .. 210.00
Observed Temperature TF Tf (°C) ... -44.500
    Computed Data – last digit is rounded
  T59/1
    Input Data – rounded
Density, rounded to 0.1 ......... 210.0
Temperature rounded to 0.05 ..... -44.50
  T59/2
Tx Tx, Kelvin ..................... 228.65
  T59/3
Density relative to 60° water ..   0.210206843534

  T59/4
Tx Tx and relative density are within range, continue
  T59/5, Call Table 23 procedure to obtain relative density at 60°F
γ60 RD60 from Table 23 ............  -1.0

Input data is outside the range correlation range of Table 23, no solution the standard
```

Example 59/2 – ~~Utilize~~Use EP (65/35) ~~&~~and EP (35/65)

```
    Input Data to Implementation Procedure T59
Density at obs. temp. (kg/m³) .. 532.57
Observed Temperature T_F Tf (°C) ... -44.120
    Computed Data - last digit is rounded
  T59/1
    Input Data - rounded
Density, rounded to 0.1 ......... 532.6
Temperature rounded to 0.05 ..... -44.10
  T59/2
T_x Tx, Kelvin ...................... 229.05
  T59/3
Density relative to 60° water ..   0.533124594601

  T59/4
T_x Tx and relative density are within range, continue
  T59/5, Call Table 23 procedure to obtain relative density at 60°F
γ60 RD60 from Table 23 .............   0.440515294609

  T59/6, Call Table 24 Procedure to obtain C_TL CTL from 60°F to 20°C
C_TL CTL from Table 24 ..............   0.979997725752

20 °C relative density .........   0.431703986876

  T59/7, Values returned from Tables 23 &and 24 valid, continue
  T59/8
Density at 20°C (kg/m³) ........ 431.279190152813

  T59/9
Density at 20°C (rounded) ....... 431.3
```

Example 59/3 – ~~Utilize~~Use n-Pentane ~~&~~and i-Hexane

Input Data to Implementation Procedure T59
Density at obs. temp. (kg/m³) .. 673.66
Observed Temperature T_FTf (°C) ... −23.330
Computed Data – last digit is rounded
T59/1
Input Data – rounded
Density, rounded to 0.1 .... 673.7
Temperature rounded to 0.05 ..... −23.35
T59/2
T_XTx, Kelvin 249.80
T59/3
Density relative to 60° water .. 0.674363573757

T59/4
T_XTx and relative density are within range, continue
T59/5, Call Table 23 procedure to obtain relative density at 60°F
γ_{60}RD60 from Table 23 .... 0.638538685930

T59/6, Call Table 24 Procedure to obtain C_{TL} CTL from 60°F to 20°C
C_{TL} CTL from Table 24 .... 0.993367912870

20°C 20 °C relative density 0.634303841729

T59/7, Values returned from Tables 23 &and 24 valid, continue
T59/8
Density at 20°C (kg/m³) 633.679686748900

T59/9
Density at 20°C (rounded) 633.7

Example 59/4 – ~~Utilize~~Use EP (35/65) ~~&~~and Propane

Input Data to Implementation Procedure T59
Density at obs. temp. (kg/m³) ~~..~~ 245.49
Observed Temperature T_F~~Tf~~ (°C) ~~...~~. 87.770
Computed Data – last digit is rounded
T59/1
Input Data – rounded
Density, rounded to 0.1 ~~.........~~ 245.5
Temperature rounded to 0.05 ~~.....~~ 87.75
T59/2
T_x~~Tx~~, Kelvin ~~......................~~. 360.90
T59/3
Density relative to 60° water ~~..~~ 0.245741809941

T59/4
T_x~~Tx~~ and relative density are within range, continue
T59/5, Call Table 23 procedure to obtain relative density at 60°F
γ_{60}~~RD60~~ from Table 23 ~~.............~~. 0.488795025411

T59/6, Call Table 24 Procedure to obtain C_{TL} ~~CTL~~ from 60°F to 20°C
C_{TL} ~~CTL~~ from Table 24 ~~..............~~ 0.985452958065

20°C ~~20 °C~~ relative density ~~.........~~. 0.481684503679

T59/7, Values returned from Tables 23 ~~&~~and 24 valid, continue
T59/8
Density at 20°C (kg/m³) ~~.........~~ 481.210526127346

T59/9
Density at 20°C (rounded) ~~.......~~ 481.2

Example 59/5 – ~~Utilize~~Use n-Butane ~~&~~and i-Pentane

Input Data to Implementation Procedure T59
Density at obs. temp. (kg/m³) ~~..~~ 499.55
Observed Temperature T_F~~Tf~~ (°C) ~~..~~. 87.820
Computed Data – last digit is rounded
T59/1
Input Data – rounded
Density, rounded to 0.1 ~~.........~~ 499.6
Temperature rounded to 0.05 ~~....~~ 87.80
T59/2
T_X~~Tx~~, Kelvin ~~......................~~. 360.95
T59/3
Density relative to 60° water ~~..~~ 0.500092090617

T59/4
T_X~~Tx~~ and relative density are within range, continue
T59/5, Call Table 23 procedure to obtain relative density at 60°F
γ_{60}~~RD60~~ from Table 23 ~~............~~. 0.591794896225

T59/6, Call Table 24 Procedure to obtain C_{TL} ~~CTL~~ from 60°F to 20°C
C_{TL} ~~CTL~~ from Table 24 ~~..............~~ 0.991727237885

20°C ~~20 °C~~ relative density ~~........~~. 0.586899117828

T59/7, Values returned from Tables 23 ~~&~~and 24 valid, continue
T59/8
Density at 20°C (kg/m³) ~~........~~ 586.321609095772

T59/9
Density at 20°C (rounded) ~~......~~ 586.3

Example 59/6 – ~~Utilize~~Use Ethane ~~&~~and EP (65/35)

```
    Input Data to Implementation Procedure T59
Density at obs. temp. (kg/m³) .. 395.09
Observed Temperature TFTf (°C) ... 15.430
    Computed Data – last digit is rounded
  T59/1
    Input Data – rounded
Density, rounded to 0.1 ......... 395.1
Temperature rounded to 0.05 .....  15.45
  T59/2
TxTx, Kelvin ....................... 288.60
  T59/3
Density relative to 60° water ..   0.395489161335

  T59/4
TxTx and relative density are within range, continue
  T59/5, Call Table 23 procedure to obtain relative density at 60°F
γ60RD60 from Table 23 .............   0.395233433716

  T59/6, Call Table 24 Procedure to obtain CTL CTL from 60°F to 20°C
CTL CTL from Table 24 ..............   0.971608015812

20°C 20 °C relative density .........   0.384011972315

  T59/7, Values returned from Tables 23 &and 24 valid, continue
  T59/8
Density at 20°C (kg/m³) ......... 383.634104534331

  T59/9
Density at 20°C (rounded) ....... 383.6
```

Example 59/7 – ~~Utilize~~Use i-Butane ~~&~~and n-Butane

```
    Input Data to Implementation Procedure T59
Density at obs. temp. (kg/m³) .. 449.59
Observed Temperature TFTf (°C) ...  93.020
    Computed Data – last digit is rounded
  T59/1
    Input Data – rounded
Density, rounded to 0.1 ......... 449.6
Temperature rounded to 0.05 ....  93.00
  T59/2
TxTx, Kelvin ...................... 366.15
  T59/3
Density relative to 60° water ..   0.450042842157

  T59/4
TxTx and relative density are within range, continue
  T59/5, Call Table 23 procedure to obtain relative density at 60°F
γ60RD60 from Table 23 ............   0.565490291365

  T59/6, Call Table 24 Procedure to obtain CTL CTL from 60°F to 20°C
CTL CTL from Table 24 ..............   0.990501113383

20°C 20 °C relative density .........   0.560118763204

  T59/7, Values returned from Tables 23 &and 24 valid, continue
  T59/8
Density at 20°C (kg/m³) ......... 559.567606341195

  T59/9
Density at 20°C (rounded) ...... 559.6
```

Example 59/8 – UtilizeUse i-Hexane &and n-Hexane

Input Data to Implementation Procedure T59
Density at obs. temp. (kg/m³) .. 600.74
Observed Temperature T_FTf (°C) ... 80.650
Computed Data – last digit is rounded
T59/1
Input Data – rounded
Density, rounded to 0.1 .... 600.7
Temperature rounded to 0.05 ..... 80.65
T59/2
T_XTx, Kelvin 353.80
T59/3
Density relative to 60° water .. 0.601291671004

T59/4
T_XTx and relative density are within range, continue
T59/5, Call Table 23 procedure to obtain relative density at 60°F
γ_{60}RD60 from Table 23 .... 0.662699711760

T59/6, Call Table 24 Procedure to obtain C_{TL} CTL from 60°F to 20°C
C_{TL} CTL from Table 24 .... 0.994014419312

20°C 20 °C relative density 0.658733069163

T59/7, Values returned from Tables 23 &and 24 valid, continue
T59/8
Density at 20°C (kg/m³) 658.084875823243

T59/9
Density at 20°C (rounded) 658.1

Example 59/9 – Calculated Relative Density @ 60°F (γ_{60})RD60 Near 0.6880Upper Boundary Using n-Hexane &and n-Heptane

Input Data to Implementation Procedure T59
Density at obs. temp. (kg/m³) 736.80
Observed Temperature T_FTf (°C) . –44.230
Computed Data – last digit is rounded
T59/1
Input Data – rounded
Density, rounded to 0.1 736.8
Temperature rounded to 0.05 –44.25
T59/2
T_xTx, Kelvin . 228.90
T59/3
Density relative to 60° water 0.737525725314

T59/4
T_xTx and relative density are within range, continue
T59/5, Call Table 23 procedure to obtain relative density at 60°F
γ_{60}RD60 from Table 23 . 0.687974688885

T59/6, Call Table 24 Procedure to obtain C_{TL} CTL from 60°F to 20°C
C_{TL} CTL from Table 24 0.994560181470

20°C relative density . 0.684232231424

T59/7, Values returned from Tables 23 &and 24 valid, continue
T59/8
Density at 20°C (kg/m³) 683.558946908054

T59/9
Density at 20°C (rounded) 683.6

Example 59/10 – Calculated Relative Density @ 60°F (γ_{60})~~RD60~~ Near ~~0.3500~~Lower Boundary using EE (68/32) ~~&~~and Ethane

Input Data to Implementation Procedure T59
Density at obs. temp. (kg/m³) .. 224.56
Observed Temperature T_F~~Tf~~ (°C) 30.680
Computed Data – last digit is rounded
T59/1
Input Data – rounded
Density, rounded to 0.1 .... 224.6
Temperature rounded to 0.05 ..... 30.70
T59/2
T_X~~Tx~~, Kelvin 303.85
T59/3
Density relative to 60° water .. 0.224821224084

T59/4
T_X~~Tx~~ and relative density are within range, continue
T59/5, Call Table 23 procedure to obtain relative density at 60°F
γ_{60}~~RD60~~ from Table 23 .... 0.350001829424

T59/6, Call Table 24 Procedure to obtain C_{TL} ~~CTL~~ from 60°F to 20°C
C_{TL} ~~CTL~~ from Table 24 .... 0.948659643284

20 °C relative density 0.332032610649

T59/7, Values returned from Tables 23 ~~&~~and 24 valid, continue
T59/8
Density at 20°C (kg/m³) 331.705890560614

T59/9
Density at 20°C (rounded) 331.7

Example 59/11 – Relative Density at Observed Temperature (T23/6, γ_x) RDtf < Lower Boundary Using EE (68/32) & Ethane

```
    Input Data to Implementation Procedure T59
Density at obs. temp. (kg/m³) .. 339.63
Observed Temperature TFTf (°C) ... 18.130
    Computed Data – last digit is rounded
  T59/1
    Input Data – rounded
Density, rounded to 0.1 ......... 339.6
Temperature rounded to 0.05 .....  18.15
  T59/2
TxTx, Kelvin ...................... 291.30
  T59/3
Density relative to 60° water ..   0.339934495544

  T59/4
TxTx and relative density are within range, continue
  T59/5, Call Table 23 procedure to obtain relative density at 60°F
γ60RD60 from Table 23 .............  –1.0

Input data is outside the range correlation range of Table 23, no solutionthe standard
```

Example 59/12 – Relative Density at Observed Temperature (~~T23/6,~~ γ_x) ~~RDtf~~ > Upper Boundary Using n-Hexane & n-Heptane

Input Data to Implementation Procedure T59

Density at obs. temp. (kg/m³) ~~..~~ 727.86

Observed Temperature T_F ~~Tf~~ (°C) ~~...~~. –33.070

Computed Data – last digit is rounded

T59/1

Input Data – rounded

Density, rounded to 0.1 ~~.........~~ 727.9

Temperature rounded to 0.05 ~~.....~~ –33.05

T59/2

T_x ~~Tx~~, Kelvin ~~......................~~. 240.10

T59/3

Density relative to 60° water ~~..~~ 0.728616959088

T59/4

T_x ~~Tx~~ and relative density are within range, continue

T59/5, Call Table 23 procedure to obtain relative density at 60°F

γ_{60} ~~RD60~~ from Table 23 ~~.............~~. –1.0

Input data is outside the ~~range~~ correlation range of ~~Table 23, no solution~~ the standard

Example 59/13 – ~~Density~~ Input Density < Input Range Limit

```
    Input Data to Implementation Procedure T59
Density at obs. temp. (kg/m³) .. 209.74
Observed Temperature TFTf (°C) ... 11.530
    Computed Data – last digit is rounded
  T59/1
    Input Data – rounded
Density, rounded to 0.1 ......... 209.7
Temperature rounded to 0.05 ....  11.55
  T59/2
TXTx, Kelvin ...................... 284.70
  T59/3
Density relative to 60° water ..   0.209906548043

  T59/4
Relative density is less than 0.2100, no solutionoutside the input range of the standard
```

Example 59/14 – Input Density > Input Range Limit

```
    Input Data to Implementation Procedure T59
Density at obs. temp. (kg/m³) .. 739.3235
Observed Temperature TFTf (°C) ... 11.530
    Computed Data – last digit is rounded
  T59/1
    Input Data – rounded
Density, rounded to 0.1 ......... 739.34
Temperature rounded to 0.05 .....  11.55
  T59/2
TxTx, Kelvin ....................... 284.70
  T59/3
Density relative to 60° water ..    0.74012828623400.740028187737

  T59/4
Relative density is greater than or equal to 0.74005, no solutionoutside the input range
of the standard
```

Example 59/15 – Input Temperature < Input Range Limit

```
    Input Data to Implementation Procedure T59
Density at obs. temp. (kg/m³) .. 645.62
Observed Temperature TfTf (°C) ... -46.030
    Computed Data – last digit is rounded
  T59/1
    Input Data – rounded
Density, rounded to 0.1 ......... 645.6
Temperature rounded to 0.05 .... -46.05
  T59/2
TxTx, Kelvin ....................... 227.10
  T59/3
Density relative to 60° water ..   0.646235896122

  T59/4
TxTx less than 227.15, no solutionis outside the input range of the standard
```

Example 59/16 – Input Temperature > Input Range Limit

```
    Input Data to Implementation Procedure T59
Density at obs. temp. (kg/m³) .. 645.62
Observed Temperature T_F Tf (°C) ... .  93.070
    Computed Data – last digit is rounded
  T59/1
    Input Data – rounded
Density, rounded to 0.1 ......... 645.6
Temperature rounded to 0.05 .....  93.05
  T59/2
T_x Tx, Kelvin ...................... . 366.20
  T59/3
Density relative to 60° water ..   0.646235896122

  T59/4
T_x Tx is outside the input range of the standard greater than 366.15, no solution
```

6 Sample Sections of Printed Tables

Sample tables based on all the implementation procedures are found on the following pages. These tables are representative of the format and appearance of the printed tables, but complete or partial sets of printed tables may be produced in any reasonable set of variable increments required. Note, these printed tables are not the Standard; the implementation procedures are the Standard.

Even though the implementation procedures are the standard, printed tables can be used. Interpolation should not be used with any printed table since the C_{TL} equations are not necessarily linear.

TABLE 23E – FOR NGL &AND LPG LIQUIDS
RELATIVE DENSITY REDUCTION TO 60°F

TEMP. (°F)	OBSERVED RELATIVE DENSITY 0.5000	0.5001	0.5002	0.5003	0.5004	0.5005	0.5006	0.5007	0.5008	TEMP. (°F)
	CORRESPONDING RELATIVE DENSITY 60/60°F									
100.0	0.5316	0.5316	0.5317	0.5318	0.5319	0.5320	0.5321	0.5322	0.5323	100.0
100.1	0.5316	0.5317	0.5318	0.5319	0.5320	0.5321	0.5322	0.5323	0.5323	100.1
100.2	0.5317	0.5318	0.5319	0.5320	0.5321	0.5322	0.5322	0.5323	0.5324	100.2
100.3	0.5318	0.5319	0.5320	0.5320	0.5321	0.5322	0.5323	0.5324	0.5325	100.3
100.4	0.5319	0.5319	0.5320	0.5321	0.5322	0.5323	0.5324	0.5325	0.5326	100.4
100.5	0.5319	0.5320	0.5321	0.5322	0.5323	0.5324	0.5325	0.5326	0.5326	100.5
100.6	0.5320	0.5321	0.5322	0.5323	0.5324	0.5324	0.5325	0.5326	0.5327	100.6
100.7	0.5321	0.5322	0.5323	0.5323	0.5324	0.5325	0.5326	0.5327	0.5328	100.7
100.8	0.5322	0.5322	0.5323	0.5324	0.5325	0.5326	0.5327	0.5328	0.5329	100.8
100.9	0.5322	0.5323	0.5324	0.5325	0.5326	0.5327	0.5328	0.5328	0.5329	100.9
101.0	0.5323	0.5324	0.5325	0.5326	0.5327	0.5327	0.5328	0.5329	0.5330	101.0
101.1	0.5324	0.5325	0.5326	0.5326	0.5327	0.5328	0.5329	0.5330	0.5331	101.1
101.2	0.5325	0.5325	0.5326	0.5327	0.5328	0.5329	0.5330	0.5331	0.5332	101.2
101.3	0.5325	0.5326	0.5327	0.5328	0.5329	0.5330	0.5331	0.5331	0.5332	101.3
101.4	0.5326	0.5327	0.5328	0.5329	0.5330	0.5330	0.5331	0.5332	0.5333	101.4
101.5	0.5327	0.5328	0.5329	0.5329	0.5330	0.5331	0.5332	0.5333	0.5334	101.5
101.6	0.5328	0.5328	0.5329	0.5330	0.5331	0.5332	0.5333	0.5334	0.5335	101.6
101.7	0.5328	0.5329	0.5330	0.5331	0.5332	0.5333	0.5334	0.5334	0.5335	101.7
101.8	0.5329	0.5330	0.5331	0.5332	0.5333	0.5333	0.5334	0.5335	0.5336	101.8
101.9	0.5330	0.5331	0.5331	0.5332	0.5333	0.5334	0.5335	0.5336	0.5337	101.9
102.0	0.5330	0.5331	0.5332	0.5333	0.5334	0.5335	0.5336	0.5337	0.5338	102.0
102.1	0.5331	0.5332	0.5333	0.5334	0.5335	0.5336	0.5336	0.5337	0.5338	102.1
102.2	0.5332	0.5333	0.5334	0.5335	0.5335	0.5336	0.5337	0.5338	0.5339	102.2
102.3	0.5333	0.5334	0.5334	0.5335	0.5336	0.5337	0.5338	0.5339	0.5340	102.3
102.4	0.5333	0.5334	0.5335	0.5336	0.5337	0.5338	0.5339	0.5340	0.5340	102.4
102.5	0.5334	0.5335	0.5336	0.5337	0.5338	0.5339	0.5339	0.5340	0.5341	102.5
102.6	0.5335	0.5336	0.5337	0.5338	0.5338	0.5339	0.5340	0.5341	0.5342	102.6
102.7	0.5336	0.5337	0.5337	0.5338	0.5339	0.5340	0.5341	0.5342	0.5343	102.7
102.8	0.5336	0.5337	0.5338	0.5339	0.5340	0.5341	0.5342	0.5343	0.5343	102.8
102.9	0.5337	0.5338	0.5339	0.5340	0.5341	0.5342	0.5342	0.5343	0.5344	102.9
103.0	0.5338	0.5339	0.5340	0.5341	0.5341	0.5342	0.5343	0.5344	0.5345	103.0
103.1	0.5339	0.5339	0.5340	0.5341	0.5342	0.5343	0.5344	0.5345	0.5346	103.1
103.2	0.5339	0.5340	0.5341	0.5342	0.5343	0.5344	0.5345	0.5345	0.5346	103.2
103.3	0.5340	0.5341	0.5342	0.5343	0.5344	0.5344	0.5345	0.5346	0.5347	103.3
103.4	0.5341	0.5342	0.5343	0.5343	0.5344	0.5345	0.5346	0.5347	0.5348	103.4
103.5	0.5342	0.5342	0.5343	0.5344	0.5345	0.5346	0.5347	0.5348	0.5349	103.5
103.6	0.5342	0.5343	0.5344	0.5345	0.5346	0.5347	0.5348	0.5348	0.5349	103.6
103.7	0.5343	0.5344	0.5345	0.5346	0.5347	0.5347	0.5348	0.5349	0.5350	103.7
103.8	0.5344	0.5345	0.5346	0.5346	0.5347	0.5348	0.5349	0.5350	0.5351	103.8
103.9	0.5345	0.5345	0.5346	0.5347	0.5348	0.5349	0.5350	0.5351	0.5352	103.9

TABLE 24E – FOR NGL ~~&~~ AND LPG LIQUIDS
TEMPERATURE VOLUME CORRECTION TO 60°F

TEMP. (°F)	0.4000	0.4001	0.4002	0.4003	0.4004	0.4005	0.4006	0.4007	TEMP. (°F)
	RELATIVE DENSITY 60/60 DEGREES °F								
	FACTOR FOR CORRECTING VOLUME TO 60°F								
50.0	1.03140	1.03137	1.03135	1.03133	1.03130	1.03128	1.03125	1.03123	50.0
50.1	1.03110	1.03107	1.03105	1.03102	1.03100	1.03098	1.03095	1.03093	50.1
50.2	1.03079	1.03077	1.03075	1.03072	1.03070	1.03068	1.03065	1.03063	50.2
50.3	1.03049	1.03047	1.03044	1.03042	1.03040	1.03037	1.03035	1.03033	50.3
50.4	1.03019	1.03017	1.03014	1.03012	1.03010	1.03007	1.03005	1.03003	50.4
50.5	1.02989	1.02986	1.02984	1.02982	1.02979	1.02977	1.02975	1.02973	50.5
50.6	1.02958	1.02956	1.02954	1.02952	1.02949	1.02947	1.02945	1.02942	50.6
50.7	1.02928	1.02926	1.02924	1.02921	1.02919	1.02917	1.02915	1.02912	50.7
50.8	1.02898	1.02896	1.02893	1.02891	1.02889	1.02887	1.02884	1.02882	50.8
50.9	1.02867	1.02865	1.02863	1.02861	1.02859	1.02856	1.02854	1.02852	50.9
51.0	1.02837	1.02835	1.02833	1.02830	1.02828	1.02826	1.02824	1.02822	51.0
51.1	1.02807	1.02804	1.02802	1.02800	1.02798	1.02796	1.02794	1.02791	51.1
51.2	1.02776	1.02774	1.02772	1.02770	1.02768	1.02765	1.02763	1.02761	51.2
51.3	1.02746	1.02744	1.02742	1.02739	1.02737	1.02735	1.02733	1.02731	51.3
51.4	1.02715	1.02713	1.02711	1.02709	1.02707	1.02705	1.02703	1.02701	51.4
51.5	1.02685	1.02683	1.02681	1.02679	1.02676	1.02674	1.02672	1.02670	51.5
51.6	1.02654	1.02652	1.02650	1.02648	1.02646	1.02644	1.02642	1.02640	51.6
51.7	1.02624	1.02622	1.02620	1.02618	1.02616	1.02614	1.02612	1.02610	51.7
51.8	1.02593	1.02591	1.02589	1.02587	1.02585	1.02583	1.02581	1.02579	51.8
51.9	1.02563	1.02561	1.02559	1.02557	1.02555	1.02553	1.02551	1.02549	51.9
52.0	1.02532	1.02530	1.02528	1.02526	1.02524	1.02522	1.02520	1.02518	52.0
52.1	1.02501	1.02499	1.02497	1.02495	1.02494	1.02492	1.02490	1.02488	52.1
52.2	1.02471	1.02469	1.02467	1.02465	1.02463	1.02461	1.02459	1.02457	52.2
52.3	1.02440	1.02438	1.02436	1.02434	1.02432	1.02430	1.02429	1.02427	52.3
52.4	1.02409	1.02407	1.02406	1.02404	1.02402	1.02400	1.02398	1.02396	52.4
52.5	1.02379	1.02377	1.02375	1.02373	1.02371	1.02369	1.02367	1.02366	52.5
52.6	1.02348	1.02346	1.02344	1.02342	1.02340	1.02339	1.02337	1.02335	52.6
52.7	1.02317	1.02315	1.02313	1.02312	1.02310	1.02308	1.02306	1.02304	52.7
52.8	1.02286	1.02284	1.02283	1.02281	1.02279	1.02277	1.02276	1.02274	52.8
52.9	1.02255	1.02254	1.02252	1.02250	1.02248	1.02247	1.02245	1.02243	52.9
53.0	1.02225	1.02223	1.02221	1.02219	1.02218	1.02216	1.02214	1.02212	53.0
53.1	1.02194	1.02192	1.02190	1.02188	1.02187	1.02185	1.02183	1.02182	53.1
53.2	1.02163	1.02161	1.02159	1.02158	1.02156	1.02154	1.02153	1.02151	53.2
53.3	1.02132	1.02130	1.02128	1.02127	1.02125	1.02123	1.02122	1.02120	53.3
53.4	1.02101	1.02099	1.02098	1.02096	1.02094	1.02093	1.02091	1.02089	53.4
53.5	1.02070	1.02068	1.02067	1.02065	1.02063	1.02062	1.02060	1.02059	53.5
53.6	1.02039	1.02037	1.02036	1.02034	1.02032	1.02031	1.02029	1.02028	53.6
53.7	1.02008	1.02006	1.02005	1.02003	1.02002	1.02000	1.01998	1.01997	53.7
53.8	1.01977	1.01975	1.01974	1.01972	1.01971	1.01969	1.01967	1.01966	53.8

53.9	1.01946	1.01944	1.01943	1.01941	1.01940	1.01938	1.01937	1.01935	53.9

TABLE 53E – FOR NGL &AND LPG LIQUIDS
DENSITY REDUCTION TO 15°C

	OBSERVED DENSITY									
TEMP. (°C)	210.0	215.0	220.0	225.0	230.0	235.0	240.0	245.0	250.0	TEMP. (°C)
	CORRESPONDING DENSITY AT 15°C									
31.0	352.6	352.6	352.7	352.9	353.2	353.5	353.9	354.5	355.2	31.0
32.0	356.8	356.8	356.9	357.0	357.2	357.5	357.8	358.1	358.5	32.0
33.0	359.6	359.6	359.7	359.7	359.9	360.1	360.3	360.7	361.1	33.0
34.0	362.1	362.2	362.2	362.3	362.4	362.6	362.9	363.3	363.7	34.0
35.0	364.7	364.7	364.7	364.8	365.0	365.2	365.5	365.9	366.3	35.0
36.0	367.2	367.2	367.3	367.4	367.5	367.8	368.1	368.4	368.9	36.0
37.0	369.7	369.8	369.8	369.9	370.1	370.3	370.6	371.0	371.5	37.0
38.0	372.3	372.3	372.4	372.5	372.7	372.9	373.2	373.6	374.1	38.0
39.0	374.8	374.9	374.9	375.1	375.2	375.5	375.8	376.2	376.7	39.0
40.0	377.4	377.4	377.5	377.6	377.8	378.0	378.4	378.8	379.3	40.0
41.0	379.9	380.0	380.1	380.2	380.4	380.6	380.9	381.4	381.9	41.0
42.0	382.5	382.5	382.6	382.7	382.9	383.2	383.5	383.9	384.5	42.0
43.0	385.1	385.1	385.2	385.3	385.5	385.8	386.1	386.5	387.0	43.0
44.0	387.6	387.7	387.7	387.9	388.1	388.3	388.7	389.1	389.6	44.0
45.0	390.2	390.2	390.3	390.4	390.6	390.9	391.2	391.7	392.2	45.0
46.0	392.7	392.8	392.9	393.0	393.2	393.5	393.8	394.3	394.8	46.0
47.0	395.3	395.4	395.4	395.6	395.8	396.0	396.4	396.8	397.4	47.0
48.0	397.9	397.9	398.0	398.1	398.4	398.6	399.0	399.4	399.9	48.0
49.0	400.4	400.5	400.6	400.7	400.9	401.2	401.5	402.0	402.5	49.0
50.0	403.0	403.1	403.1	403.3	403.5	403.8	404.1	404.6	405.1	50.0
51.0	405.6	405.6	405.7	405.9	406.1	406.3	406.7	407.1	407.7	51.0
52.0	408.1	408.2	408.3	408.4	408.6	408.9	409.3	409.7	410.2	52.0
53.0	410.7	410.8	410.9	411.0	411.2	411.5	411.8	412.3	412.8	53.0
54.0	413.3	413.3	413.4	413.6	413.8	414.1	414.4	414.9	415.4	54.0
55.0	415.8	415.9	416.0	416.1	416.4	416.6	417.0	417.4	418.0	55.0
56.0	418.4	418.5	418.6	418.7	418.9	419.2	419.6	420.0	420.5	56.0
57.0	421.0	421.0	421.1	421.3	421.5	421.8	422.1	422.6	423.1	57.0
58.0	423.6	423.6	423.7	423.9	424.1	424.4	424.7	425.1	425.7	58.0
59.0	426.1	426.2	426.3	426.4	426.7	426.9	427.3	427.7	428.2	59.0
60.0	428.7	428.8	428.9	429.0	429.2	429.5	429.9	430.2	430.7	60.0
61.0	431.1	431.1	431.2	431.3	431.5	431.7	432.0	432.4	432.8	61.0
62.0	433.2	433.3	433.4	433.5	433.7	433.9	434.2	434.6	435.0	62.0
63.0	435.4	435.5	435.5	435.7	435.8	436.1	436.4	436.7	437.1	63.0
64.0	437.6	437.6	437.7	437.8	438.0	438.2	438.5	438.9	439.3	64.0
65.0	439.8	439.8	439.9	440.0	440.2	440.4	440.7	441.0	441.4	65.0
66.0	441.9	442.0	442.1	442.2	442.3	442.6	442.8	443.2	443.6	66.0
67.0	444.1	444.1	444.2	444.3	444.5	444.7	445.0	445.3	445.8	67.0
68.0	446.3	446.3	446.4	446.5	446.7	446.9	447.2	447.5	447.9	68.0
69.0	448.4	448.5	448.6	448.7	448.8	449.0	449.3	449.7	450.1	69.0

70.0	450.6	450.7	450.7	450.8	451.0	451.2	451.5	451.8	452.2	70.0

TABLE 54E – FOR NGL &AND LPG LIQUIDS
TEMPERATURE VOLUME CORRECTION TO 15°C

TEMP. (°C)	400.00	405.00	410.00	415.00	420.00	425.00	430.00	435.00	TEMP. (°C)
	DENSITY AT 15 DEGREES °C								
	FACTOR FOR CORRECTING VOLUME TO 15°C								
10.0	1.02824	1.02719	1.02623	1.02535	1.02453	1.02377	1.02306	1.02220	10.0
10.5	1.02551	1.02456	1.02368	1.02288	1.02214	1.02145	1.02081	1.02003	10.5
11.0	1.02276	1.02190	1.02112	1.02040	1.01974	1.01912	1.01855	1.01785	11.0
11.5	1.01999	1.01923	1.01854	1.01791	1.01732	1.01678	1.01628	1.01566	11.5
12.0	1.01720	1.01654	1.01595	1.01540	1.01489	1.01443	1.01399	1.01346	12.0
12.5	1.01438	1.01384	1.01333	1.01287	1.01245	1.01206	1.01169	1.01125	12.5
13.0	1.01155	1.01111	1.01070	1.01033	1.00999	1.00967	1.00938	1.00902	13.0
13.5	1.00870	1.00836	1.00806	1.00777	1.00752	1.00728	1.00706	1.00679	13.5
14.0	1.00582	1.00559	1.00539	1.00520	1.00503	1.00487	1.00472	1.00454	14.0
14.5	1.00292	1.00281	1.00270	1.00261	1.00252	1.00244	1.00237	1.00227	14.5
15.0	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	15.0
15.5	0.99705	0.99717	0.99728	0.99737	0.99746	0.99754	0.99762	0.99771	15.5
16.0	0.99409	0.99432	0.99453	0.99473	0.99491	0.99507	0.99523	0.99541	16.0
16.5	0.99109	0.99145	0.99177	0.99207	0.99234	0.99259	0.99282	0.99310	16.5
17.0	0.98807	0.98855	0.98899	0.98938	0.98975	0.99008	0.99040	0.99077	17.0
17.5	0.98503	0.98563	0.98618	0.98668	0.98714	0.98757	0.98796	0.98843	17.5
18.0	0.98196	0.98269	0.98335	0.98396	0.98452	0.98503	0.98551	0.98608	18.0
18.5	0.97886	0.97972	0.98050	0.98122	0.98187	0.98248	0.98304	0.98371	18.5
19.0	0.97573	0.97673	0.97763	0.97846	0.97921	0.97991	0.98055	0.98133	19.0
19.5	0.97257	0.97371	0.97474	0.97567	0.97653	0.97732	0.97805	0.97893	19.5
20.0	0.96939	0.97066	0.97182	0.97287	0.97383	0.97472	0.97553	0.97652	20.0
20.5	0.96617	0.96759	0.96887	0.97004	0.97111	0.97209	0.97300	0.97409	20.5
21.0	0.96293	0.96449	0.96590	0.96719	0.96837	0.96945	0.97045	0.97165	21.0
21.5	0.95965	0.96136	0.96291	0.96432	0.96561	0.96679	0.96788	0.96919	21.5
22.0	0.95633	0.95820	0.95989	0.96142	0.96282	0.96411	0.96529	0.96671	22.0
22.5	0.95299	0.95501	0.95684	0.95850	0.96002	0.96141	0.96269	0.96422	22.5
23.0	0.94960	0.95179	0.95376	0.95556	0.95719	0.95868	0.96006	0.96171	23.0
23.5	0.94618	0.94854	0.95066	0.95258	0.95434	0.95594	0.95742	0.95919	23.5
24.0	0.94273	0.94525	0.94753	0.94959	0.95146	0.95318	0.95476	0.95665	24.0
24.5	0.93923	0.94193	0.94436	0.94656	0.94856	0.95039	0.95207	0.95408	24.5
25.0	0.93570	0.93858	0.94117	0.94351	0.94564	0.94758	0.94937	0.95150	25.0
25.5	0.93212	0.93519	0.93794	0.94043	0.94269	0.94475	0.94665	0.94891	25.5
26.0	0.92850	0.93176	0.93468	0.93732	0.93971	0.94190	0.94390	0.94629	26.0
26.5	0.92483	0.92829	0.93138	0.93417	0.93671	0.93902	0.94113	0.94365	26.5
27.0	0.92112	0.92478	0.92805	0.93100	0.93367	0.93611	0.93834	0.94100	27.0
27.5	0.91736	0.92123	0.92469	0.92780	0.93062	0.93318	0.93553	0.93832	27.5
28.0	0.91355	0.91764	0.92128	0.92456	0.92753	0.93022	0.93269	0.93562	28.0
28.5	0.90969	0.91400	0.91784	0.92129	0.92441	0.92724	0.92983	0.93290	28.5
29.0	0.90577	0.91032	0.91436	0.91798	0.92126	0.92423	0.92695	0.93016	29.0

29.5	0.90180	0.90659	0.91084	0.91464	0.91807	0.92119	0.92404	0.92740	29.5

TABLE 59E – FOR NGL &AND LPG LIQUIDS
DENSITY REDUCTION TO 20°C

TEMP. (°C)	210.0	215.0	220.0	225.0	230.0	235.0	240.0	245.0	250.0	TEMP. (°C)
	OBSERVED DENSITY									
	CORRESPONDING DENSITY AT 20°C									
31.0	332.9	332.9	333.1	333.3	333.6	334.0	334.5	335.2	336.1	31.0
32.0	338.0	338.1	338.1	338.3	338.5	338.9	339.2	339.7	340.2	32.0
33.0	341.6	341.6	341.7	341.8	341.9	342.2	342.5	343.0	343.5	33.0
34.0	344.8	344.8	344.9	345.0	345.1	345.4	345.7	346.2	346.7	34.0
35.0	347.9	347.9	348.0	348.1	348.3	348.5	348.9	349.3	349.9	35.0
36.0	351.0	351.0	351.1	351.2	351.4	351.6	352.0	352.4	353.0	36.0
37.0	354.0	354.0	354.1	354.2	354.4	354.7	355.0	355.5	356.0	37.0
38.0	357.0	357.0	357.1	357.2	357.4	357.7	358.0	358.5	359.1	38.0
39.0	359.9	359.9	360.0	360.1	360.3	360.6	361.0	361.5	362.0	39.0
40.0	362.8	362.9	362.9	363.1	363.3	363.6	363.9	364.4	365.0	40.0
41.0	365.7	365.8	365.8	366.0	366.2	366.5	366.8	367.3	367.9	41.0
42.0	368.6	368.6	368.7	368.9	369.1	369.3	369.7	370.2	370.8	42.0
43.0	371.4	371.5	371.6	371.7	371.9	372.2	372.6	373.1	373.6	43.0
44.0	374.3	374.3	374.4	374.6	374.8	375.1	375.4	375.9	376.5	44.0
45.0	377.1	377.1	377.2	377.4	377.6	377.9	378.3	378.7	379.3	45.0
46.0	379.9	379.9	380.0	380.2	380.4	380.7	381.1	381.5	382.1	46.0
47.0	382.7	382.7	382.8	383.0	383.2	383.5	383.9	384.3	384.9	47.0
48.0	385.5	385.5	385.6	385.8	386.0	386.3	386.6	387.1	387.7	48.0
49.0	388.2	388.3	388.4	388.5	388.7	389.0	389.4	389.9	390.5	49.0
50.0	391.0	391.0	391.1	391.3	391.5	391.8	392.2	392.6	393.2	50.0
51.0	393.7	393.8	393.9	394.0	394.3	394.6	394.9	395.4	396.0	51.0
52.0	396.5	396.5	396.6	396.8	397.0	397.3	397.7	398.1	398.7	52.0
53.0	399.2	399.2	399.4	399.5	399.7	400.0	400.4	400.9	401.4	53.0
54.0	401.9	402.0	402.1	402.2	402.5	402.7	403.1	403.6	404.1	54.0
55.0	404.6	404.7	404.8	405.0	405.2	405.5	405.8	406.3	406.9	55.0
56.0	407.3	407.4	407.5	407.7	407.9	408.2	408.5	409.0	409.6	56.0
57.0	410.0	410.1	410.2	410.4	410.6	410.9	411.2	411.7	412.3	57.0
58.0	412.7	412.8	412.9	413.1	413.3	413.6	413.9	414.4	414.9	58.0
59.0	415.4	415.5	415.6	415.8	416.0	416.3	416.6	417.1	417.6	59.0
60.0	418.1	418.2	418.3	418.5	418.7	419.0	419.3	419.7	420.2	60.0
61.0	420.6	420.7	420.8	420.9	421.1	421.3	421.6	422.0	422.5	61.0
62.0	422.9	423.0	423.1	423.2	423.4	423.6	423.9	424.3	424.8	62.0
63.0	425.2	425.3	425.4	425.5	425.7	425.9	426.2	426.6	427.0	63.0
64.0	427.5	427.6	427.7	427.8	428.0	428.2	428.5	428.9	429.3	64.0
65.0	429.8	429.9	429.9	430.1	430.2	430.5	430.8	431.1	431.6	65.0
66.0	432.1	432.1	432.2	432.4	432.5	432.8	433.1	433.4	433.9	66.0
67.0	434.4	434.4	434.5	434.6	434.8	435.0	435.3	435.7	436.1	67.0
68.0	436.7	436.7	436.8	436.9	437.1	437.3	437.6	437.9	438.4	68.0
69.0	438.9	439.0	439.1	439.2	439.3	439.6	439.8	440.2	440.6	69.0

70.0	441.2	441.3	441.3	441.4	441.6	441.8	442.1	442.4	442.9	70.0

TABLE 60E – FOR NGL ~~&~~AND LPG LIQUIDS
TEMPERATURE VOLUME CORRECTION TO 20°C

TEMP. (°C)	DENSITY AT 20 DEGREES °C 400.00	405.00	410.00	415.00	420.00	425.00	430.00	435.00	TEMP. (°C)
	FACTOR FOR CORRECTING VOLUME TO 20°C								
10.0	1.05537	1.05348	1.05172	1.05009	1.04852	1.04671	1.04502	1.04346	10.0
10.5	1.05278	1.05096	1.04928	1.04772	1.04623	1.04449	1.04288	1.04138	10.5
11.0	1.05017	1.04844	1.04683	1.04534	1.04392	1.04226	1.04073	1.03930	11.0
11.5	1.04754	1.04589	1.04437	1.04295	1.04159	1.04002	1.03856	1.03721	11.5
12.0	1.04490	1.04333	1.04189	1.04055	1.03926	1.03777	1.03639	1.03511	12.0
12.5	1.04224	1.04076	1.03939	1.03813	1.03691	1.03551	1.03420	1.03300	12.5
13.0	1.03956	1.03817	1.03688	1.03569	1.03455	1.03323	1.03201	1.03087	13.0
13.5	1.03686	1.03556	1.03436	1.03324	1.03218	1.03094	1.02980	1.02874	13.5
14.0	1.03415	1.03294	1.03182	1.03078	1.02979	1.02864	1.02758	1.02660	14.0
14.5	1.03142	1.03030	1.02926	1.02830	1.02739	1.02633	1.02535	1.02445	14.5
15.0	1.02866	1.02764	1.02669	1.02581	1.02497	1.02401	1.02311	1.02228	15.0
15.5	1.02589	1.02496	1.02410	1.02331	1.02254	1.02167	1.02086	1.02011	15.5
16.0	1.02310	1.02227	1.02150	1.02078	1.02010	1.01932	1.01859	1.01792	16.0
16.5	1.02029	1.01955	1.01887	1.01824	1.01764	1.01695	1.01631	1.01572	16.5
17.0	1.01746	1.01682	1.01623	1.01569	1.01517	1.01457	1.01402	1.01351	17.0
17.5	1.01460	1.01407	1.01357	1.01312	1.01268	1.01218	1.01172	1.01129	17.5
18.0	1.01173	1.01130	1.01090	1.01053	1.01018	1.00977	1.00940	1.00906	18.0
18.5	1.00883	1.00850	1.00820	1.00792	1.00766	1.00735	1.00707	1.00681	18.5
19.0	1.00591	1.00569	1.00549	1.00530	1.00512	1.00492	1.00473	1.00455	19.0
19.5	1.00297	1.00286	1.00275	1.00266	1.00257	1.00247	1.00237	1.00228	19.5
20.0	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	20.0
20.5	0.99701	0.99712	0.99723	0.99732	0.99741	0.99752	0.99761	0.99770	20.5
21.0	0.99399	0.99422	0.99443	0.99463	0.99481	0.99502	0.99522	0.99539	21.0
21.5	0.99095	0.99130	0.99162	0.99191	0.99219	0.99251	0.99280	0.99307	21.5
22.0	0.98788	0.98835	0.98878	0.98917	0.98955	0.98998	0.99037	0.99073	22.0
22.5	0.98478	0.98538	0.98592	0.98642	0.98689	0.98743	0.98793	0.98838	22.5
23.0	0.98166	0.98238	0.98304	0.98364	0.98421	0.98487	0.98547	0.98602	23.0
23.5	0.97851	0.97936	0.98013	0.98084	0.98152	0.98228	0.98299	0.98364	23.5
24.0	0.97533	0.97631	0.97720	0.97802	0.97880	0.97968	0.98050	0.98125	24.0
24.5	0.97212	0.97323	0.97425	0.97518	0.97606	0.97707	0.97799	0.97884	24.5
25.0	0.96887	0.97012	0.97127	0.97231	0.97330	0.97443	0.97546	0.97641	25.0
25.5	0.96560	0.96699	0.96826	0.96942	0.97052	0.97177	0.97292	0.97397	25.5
26.0	0.96229	0.96383	0.96523	0.96651	0.96772	0.96910	0.97036	0.97152	26.0
26.5	0.95895	0.96064	0.96217	0.96357	0.96490	0.96640	0.96778	0.96904	26.5
27.0	0.95558	0.95741	0.95908	0.96061	0.96206	0.96369	0.96518	0.96656	27.0
27.5	0.95217	0.95416	0.95597	0.95762	0.95919	0.96095	0.96257	0.96405	27.5
28.0	0.94872	0.95087	0.95282	0.95461	0.95629	0.95820	0.95993	0.96153	28.0
28.5	0.94523	0.94755	0.94965	0.95157	0.95338	0.95542	0.95728	0.95899	28.5
29.0	0.94170	0.94419	0.94644	0.94850	0.95043	0.95261	0.95460	0.95643	29.0

29.5	0.93814	0.94080	0.94321	0.94540	0.94746	0.94979	0.95191	0.95385	29.5

7 References

1. *Manual of Petroleum Measurement Standards*, Chapter 11.1 — Temperature and Pressure Volume Correction Factors for Generalized Crude Oils, Refined Products, and Lubricating Oils, American Petroleum Institute, Washington D.C. (2004).

2. *Manual of Petroleum Measurement Standards*, Chapter 11.2.1 — Compressibility Factors for Hydrocarbons: 0–90° API Range, American Petroleum Institute, Washington D.C. (1984).

3. *Manual of Petroleum Measurement Standards*, Chapter 11.2.1M — Compressibility Factors for Hydrocarbons: 638 – 1074 Kilograms per Cubic Metre Range, American Petroleum Institute, Washington D.C. (1986).

4. *Manual of Petroleum Measurement Standards*, Chapter 11.2.2 — Compressibility Factors for Hydrocarbons: 0.350 – 0.637 Relative Density (60°F/60°F) and –50°F to 140°F Metering Temperature, American Petroleum Institute, Washington D.C. (1984).

5. *Manual of Petroleum Measurement Standards*, Chapter 11.2.2M — Compressibility Factors for Hydrocarbons: 350 – 637 Kilograms per Cubic Metre Density (15°C) and 46°C to 60°C Metering Temperature, American Petroleum Institute, Washington D.C. (1986).

6. ASTM-IP Petroleum Measurement Tables, ASTM, Philadelphia, American Edition, (1952), pp. 177-482.

7. "Standard Factors for Volume Correction and Specific Gravity Conversion of Liquefied Petroleum Gases", GPA-2142, Gas Processors Association, Tulsa, (1957).

8. "Composite Pressure and Temperature Volume Correction Tables for Liquefied Petroleum Gas (LPG) and Natural Gasoline", Technical Publication TP-16, Gas Processors Association, Tulsa, (1988).

9. Petroleum Measurement Tables, Volume XII, Intraconversion Between Volume Measures and Density Measures, ASTM, Philadelphia, (1982), pp. 155-164.

10. "Temperature Correction for the Volume of Light Hydrocarbons — Tables 24E and 23E", Technical Publication TP-25, American Petroleum Institute, Washington D.C./ASTM, Philadelphia/Gas Processors Association, Tulsa, (1998).

11. J. F. Ely, "Volume Correction Factors for Natural Gas Liquids – Phase II", Research Report RR-148, Gas Processors Association, Tulsa, (1995).

12. C. D. Holcomb, J. W. Magee, W. M. Haynes, “Density Measurements on Natural Gas Liquids”, Research Report RR-147, Gas Processors Association, Tulsa, (1995).

13. J. F. Ely, “Volume Correction Factors for Natural Gas Liquids – Phase I”, Research Report RR-133, Gas Processors Association, Tulsa, (1991).

14. “Temperature Correction for the Volume of NGL and LPG — Tables 23E, 24E, 53E, 54E, and 60E”, Technical Publication TP-27, American Petroleum Institute, Washington D.C./ASTM, Philadelphia/Gas Processors Association, Tulsa, (2007).

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Page 63: [81] Formatted	Keith Fry	8/22/2016 9:15:00 AM

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Page 63: [104] Formatted	Keith Fry	8/22/2016 9:15:00 AM

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Tab stops: 2.3", Right,Leader: … + 2.6", Decimal aligned + 3.7", Decimal aligned + 4.8", Decimal aligned + 5.9", Decimal aligned + Not at 2.5" + 3" + 4" + 5" + 6"

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