



## Standard Test Method for Residues in Liquefied Petroleum (LP) Gases<sup>1</sup>

This standard is issued under the fixed designation D 2158; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

<sup>ε1</sup> NOTE—Table 1 was added editorially in November 1999.

### 1. Scope

1.1 This test method covers the determination of the extraneous materials weathering above 38°C that are present in liquefied petroleum gases.

1.2 Liquefied petroleum gases that contain alcohols to enhance their anti-icing behaviour can give erroneous results by this test method.

1.3 The result can be expressed in terms of measured volumes or indices derived from these volumes. In either case, the test method provides an indication of the quantity and nature of materials in the product that are substantially less volatile than the liquefied petroleum gas hydrocarbons.

1.4 Although this test method has been used to verify cleanliness and lack of heavy contaminants in propane for many years, it may not be sensitive enough to protect some equipment from operational problems or increased maintenance. A more sensitive test, able to detect lower levels of dissolved contaminants, may be required for some applications.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* For specific precautionary statements, see 6.9.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

D 96 Test Methods for Water and Sediment in Crude Oil by Centrifuge Method (Field Procedure)<sup>2</sup>

D 1796 Test Method for Water and Sediment in Fuel Oils by the Centrifuge Method (Laboratory Procedure)<sup>2</sup>

D 1835 Specification for Liquefied Petroleum (LP) Gases<sup>2</sup>

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.02 on Liquid Petroleum Gas.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 05.01.

E 1 Specification for ASTM Thermometers<sup>3</sup>

2.2 *Other Documents:*

IP Appendix A<sup>4</sup>

### 3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *residue*—the volume, measured to the nearest 0.05 mL, of the residual material boiling above 38°C resulting from the evaporation of 100 mL of sample under the specified conditions of this test method.

3.1.2 *R Number*—the residue multiplied by 200.

3.1.3 *oil stain observation*—the volume of solvent-residue mixture required to yield an oil ring that persists for 2 min under specified conditions on a prescribed filter paper.

3.1.4 *O Number*—10 divided by the oil stain observation.

### 4. Summary of Test Method

4.1 A 100-mL sample of liquefied petroleum gas is weathered in a 100-mL centrifuge tube. The volume of residue remaining at 38°C is measured and recorded as is also the appearance of a filter paper to which the residue has been added in measured increments.

### 5. Significance and Use

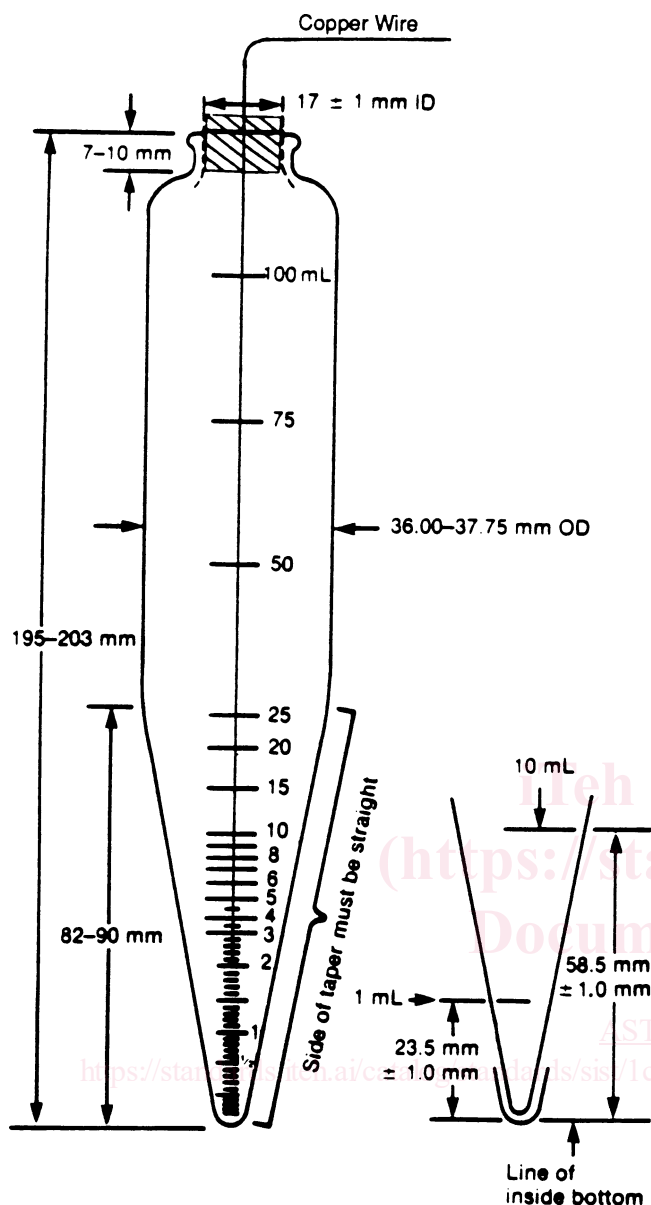
5.1 Control over the residue content (required by Specification D 1835) is of considerable importance in end-use applications. In liquid feed systems residues may lead to troublesome deposits and, in vapor offtake systems, residues that are carried over can foul regulating equipment. Those that remain will accumulate, can be corrosive, and will contaminate following product. Water, particularly if alkaline, can cause failure of regulating equipment and corrosion of metals.

### 6. Apparatus

6.1 *Centrifuge Tube*, 100-mL graduated, conforming to dimensions given in Fig. 1. The first 0.5 mL shall be graduated in 0.05-mL increments. The shape of the lower tip of the tube is especially important. The taper shall be uniform and the

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 14.03.

<sup>4</sup> Available from Institute of Petroleum, 61 Cavendish St., London, NIM 8AR.



INSIDE TAPER SHAPE

FIG. 1 Cone-Shaped Centrifuge Tube, 203 mm

bottom shall be rounded as shown in Fig. 1. Tubes shall be made of thoroughly annealed heat-resistant glass. Volumetric graduation tolerances, based on air-free water at 20°C, are given in Table 1. Detailed requirements for centrifuge tubes

TABLE 1 Centrifuge Tube Graduation Tolerances

Range, mL	Scale, Division, mL	Limit of Error, mL
0.0 to 0.1	0.05	0.02
0.1 to 0.3	0.05	0.03
0.3 to 0.5	0.05	0.05
0.5 to 1.0	0.1	0.05
1.0 to 3.0	0.1	0.1
3.0 to 5.0	0.5	0.2
5.0 to 25.0	1.0	0.5
25.0 to 100.0	1.0	1.0

appear in Test Methods D 96 and D 1796.

6.2 *Cooling Coil*, a minimum length of 6 m of 5 to 7-mm outside diameter copper tubing wound to a diameter of  $63.5 \pm 1.5$  mm outside diameter, and assembled in a suitable cooling bath. (See Fig. 2.)

NOTE 1—Mechanical refrigeration is permitted provided that the coolant temperature is in the range from -46 to -48°C.

6.3 *Syringe*, 2-mL (ordinary medical syringe), graduated in 0.1 mL and equipped with a needle  $200 \pm 5$  mm long. Alternatively, a 0.1-mL pipet may be used.

6.4 *Thermometers*, conforming to Specification E 1 or IP Appendix A.

- Low Range-Minus 38°C to + 50°C IP 1C/ASTM 5C or IP 2C/ASTM 6C
- High Range-Minus 20°C to + 50°C ASTM 57C

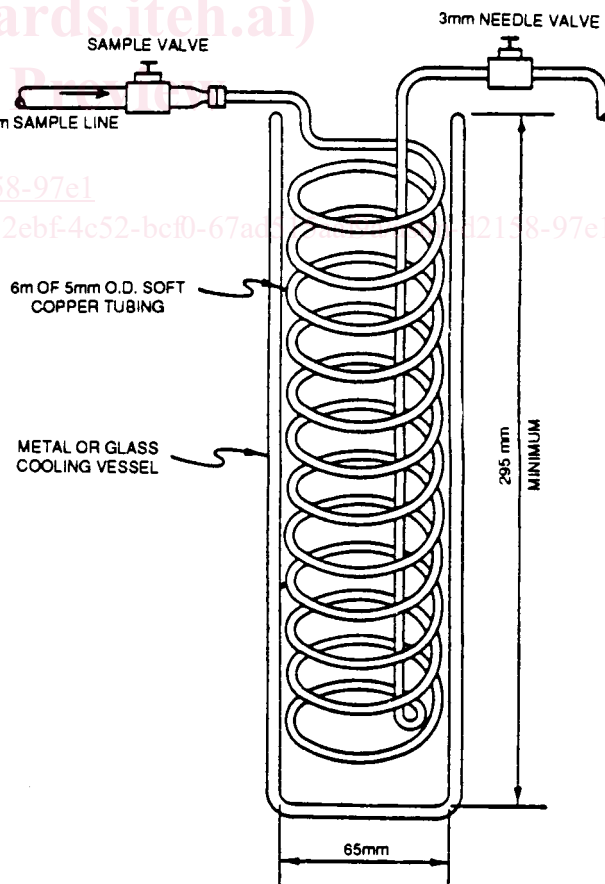
NOTE 2—When a thermometer or a water bath, or both, are not available, for example, a field test, a satisfactory alternative for screening is to warm the tip of the centrifuge tube with the hand.

NOTE 3—For routine testing, a general purpose thermometer with 0.5°C subdivisions and a maximum scale error of 0.5°C may be used.

NOTE 4—Intrinsically safe digital thermometers with accuracies equal or better than Specification E 1 or IP Appendix A may also be used.

6.5 *Filter Paper*, medium-grade, rapid, white, 125-mm diameter.

NOTE 5—The technical description of the filter paper is currently under review.



NOTE 1—Coils in the drawing are extended for clarity.

FIG. 2 Precooling Equipment