

Draft for Public Comment

Draft Zambian Standard

LIQUEFIED PETROLEUM GASES – Specifications

ZAMBIA BUREAU OF STANDARDS

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FOREWORD

This National Standard has been prepared by the Petroleum Products Quality Standards Technical Committee (TC4/14), in accordance with the procedures of ZABS. All users should ensure that they have the latest edition of this publication as standards are revised from time to time.

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Over the past years, technological changes in the Petroleum Sub - Sector have occurred. In endeavoring to match up with the regional and international advancements, it was necessary to revise ZS 426.

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ZAMBIA BUREAU OF STANDARDS

Draft Zambian Standard

LIQUEFIED PETROLEUM GASES – Specifications

1 SCOPE

This Zambian Standard specifies general and quality requirements, sampling and test methods for the following:

1.1 Liquefied Petroleum Gas Mixture

A type of petroleum gas mixture that consists predominantly of Propane (C₃) and Butane (C₄) hydrocarbons and is intended primarily for use as fuel in domestic, commercial and industrial installations where a fuel volatility between that of commercial propane and commercial butane is acceptable.

1.2 Commercial Propane

A type of petroleum gas that consists predominantly of C₃ hydrocarbons and is intended for use primarily as a fuel in domestic, commercial and industrial installations which are designed to use fuel of high volatility.

1.3 Commercial Butane

A type of liquefied petroleum gas that consists predominantly of C₄ hydrocarbons and is intended primarily as a propellant for aerosol in commercial applications and as a fuel in commercial and industrial installations where fuel volatility is not necessarily a criterion, for example, installations that use vaporisers.

2 NORMATIVE REFERENCES

The following Publications contain provisions which, through reference in this text, constitute provisions of this standard. All standards are subject to revision and, since any reference to a publication is deemed to be a reference to the latest edition of that publication, parties to agreements based on this standard are encouraged to take steps to ensure the use of the most recent editions of the standards indicated below:

ASTM D 1267	<i>Test Method for Vapour Pressure of Liquefied Petroleum (LP) Gases (LP Gas Method)</i>
ASTM D 1657	<i>Test Method for Density or Relative Density of Light Hydrocarbons by Pressure Thermohydrometer</i>
ASTM D 1838	<i>Test Method for Copper Strip Corrosion by Liquefied Petroleum (LP) Gases</i>
ASTM D 2158	<i>Test Method for Residues in Liquefied Petroleum (LP) Gases</i>
ASTM D 2163	<i>Test Method for Analysis of Liquefied Petroleum (LP) Gases and Propene Concentrates by Gas Chromatography</i>
ASTM D 2598	<i>Practice for Calculation of Certain Physical Properties of Liquefied Petroleum (LP) Gases from compositional analysis</i>
ASTM D 2784	<i>Test Method for Sulphur in Liquefied Petroleum Gases (oxy-hydrogen burner or lamp)</i>

ASTM D 3246	<i>Test Method for Sulphur in Petroleum Gases by Oxidative Microcoulometry</i>
ASTM D 3700	<i>Practice for Containing Hydrocarbon Fluid Samples using a Floating Piston Cylinder</i>
ASTM D 5305	<i>Test Method for the Determination of Ethyl Mercaptan in LP-gas Vapour</i>
ASTM D 5453	<i>Test Method for the Determination of Total Sulphur in Light Hydrocarbons, Motor Fuels and Oils by Ultraviolet Fluorescence</i>
ASTM D 6667	<i>Test Method for Determination of Total Volatile Sulfur in Gaseous Hydrocarbons and Liquefied Petroleum Gases by Ultraviolet Fluorescence</i>
ASTM D 1265	<i>Standard Practice for Sampling Liquefied Petroleum (LP) Gases, Manual Method</i>
ISO 4257	<i>Liquefied Petroleum Gases- Method of Sampling</i>
IP Petroleum Measurement Paper No 3	<i>Computer Implementation for Correcting Densities and Volumes to 20 °C, 1988</i>
IP 161	<i>Liquefied Petroleum Gases Determination of Gauge Vapour Pressure LPG Method</i>
IP 235	<i>Determination of the Density of Light Hydrocarbons Pressure Hydrometer Method</i>
IP 243	<i>Petroleum Products and Hydrocarbons Determination of Sulphur Content Wickbold Combustion Method (Identical to BS EN 24260)</i>
IP 317	<i>Determination of Residues in Liquefied Petroleum Gases Low Temperature Evaporation Method</i>
ISO 91:2017	<i>Petroleum and related products - Temperature and pressure volume correction factors (petroleum measurement tables) and standard reference conditions</i>
ZS 670-1	<i>Transportation of dangerous goods by road, rail, water and air. Part 1 : identification and classification of dangerous goods for transport</i>
ZS 670-2	<i>Transportation of dangerous goods by road, rail, water and air. Part: 2 Marking, labelling, testing and packaging of dangerous goods guidelines for transport in Zambia</i>
ZS 371	<i>Road tank vehicles for petroleum-based flammable liquids - Specification</i>
ZS 372	<i>Transportation of Petroleum Products Operational Requirements for Road Tank Vehicles - Code of Practice</i>

3 DEFINITIONS

For the purpose of this standard the following shall apply

3.1 Acceptable

Satisfactory to the parties concluding the purchase contract, but in the third-party inspections carried out by other institutions.

3.2 Aliphatic Hydrocarbons

Hydrocarbons of the open chain structure

NOTE: The more important aliphatic hydrocarbons are members of the paraffin and olefin series.

3.3 Approved

Approved by the appropriate of the following approving authorities:

- a) Within the scope of the Factories Act: The Chief Inspector of Factories
- b) Within the scope of the Mines and Minerals Act: The Director of Mine Safety
- c) Within the scope of the Railways Act: The Chief Inspector of Railways.
- d) Within the scope of the Energy Regulation Act; The Board

3.4 Lot

That quantity of liquefied petroleum gas in containers bearing the same brand name or trademark, grade designation and batch identification, from one manufacturer and submitted at any one time for inspection and testing.

4 REQUIREMENTS

4.1 General

4.1.1 Liquefied Petroleum Gas Mixture

The liquefied petroleum gas mixture shall be an aliphatic hydrocarbon mixture that consists predominantly of C₃ and C₄ hydrocarbons and is free from entrained moisture. It shall also comply with the appropriate requirements given in Table 1.

4.1.2 Commercial Propane

The liquefied petroleum gas mixture shall be an aliphatic hydrocarbon mixture that consists predominantly of C₃ hydrocarbons, is free from entrained moisture, and complies with the appropriate requirements given in Table 1.

4.1.3 Commercial Butane

The liquefied petroleum gas mixture shall be an aliphatic hydrocarbon mixture that consists predominantly of C₄ hydrocarbons, is free from entrained moisture, and complies with the appropriate requirements given in Table 1.

5 TEST METHODS

5.1 General

With the exception of the requirements for which special test methods are given below, use the appropriate test methods given in column 5 of Table 1 to determine the properties indicated in column 1.

5.2 Density at 20 °C

Measure the relative density at 15 °C accordance with ZS ASTM D 1657 or IP 235. Convert the density at 15 °C to density at 20 °C, either by using the conversion tables in ISO 91:2017.

5.3 Free Water Content

Using the samples referred to in 7.3, determine the free water content of the samples by visual inspection.

6 PACKAGING AND MARKING

6.1 Packaging

The condition of cylinders and road tank vehicles shall be such as not to be detrimental to the quality of the fuel during normal transportation and storage and shall have been approved by an approving authority (see 3.3). Where applicable, packaging and transport by road tanker shall comply with the requirements of the following standards.

- a) ZS 749 Portable Metal Containers for compressed, dissolved and liquefied Gases: Basic Design Criteria, use and maintenance-code of Practice
- b) ZS 429-4 The Handling, Storage, and distribution of Liquefied petroleum Gas (LPG) in domestic, commercial, and Industrial installations Part 4: Transportation of LPG in Bulk by Road - Code of Practice

6.2 Marking

The information on each cylinder shall be in accordance with ZS 703, ZS 670 and that on each road tank vehicle, in accordance with ZS 371.

The following information shall appear on each label, placard and shipping document for products made in accordance with this standard:

- a) The primary hazard-class warning diamond for class 2.1, with the words FLAMMABLE GAS in accordance with ZS 372;
- b) The shipping name of the product, i.e. PETROLEUM GAS, LIQUEFIED
- c) The type of fuel as stipulated under UN Code,
- d) The hazards involved in handling and transportation,
- e) The Transport Emergency Card (Tremcard)

7 SAMPLING

7.1 General

The sampling procedure outlined in 7.2 shall be applied in determining whether a Lot complies with the relevant requirements of this standard. The sample so drawn shall be deemed to represent the Lot.

7.2 Samples for Inspection and Testing

After checking for compliance with the relevant requirements of 6.1 and 6.2, use the appropriate sampling procedure described in ASTM D 3700, ASTM D 1265 and ISO 457, and use that sample to determine whether a Lot complies with the requirements of this standard. Deem the samples so drawn to represent the Lot for the respective properties.

7.3 Compliance with the Standard

The Lot shall be deemed compliant with the relevant requirements of this standard if upon inspection of the containers or road tank vehicles it is determined that the Lot was sampled and tested in accordance with 7.2.

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Table 1: Requirements for Liquid Petroleum Gas

CHARACTERISTIC	REQUIREMENTS			TEST METHOD
	Liquefied Petroleum Gas Mixture	Commercial Propane	Commercial Butane	
Density @ 20 ° C, kg/m³	520 - 565	500 min	575 max	ASTM 1657
Vapour Pressure @ 37.8° C, kPa (gauge)	750 - 1050	1100 - 1410	480 - 800	ASTM D 1267 ASTM D 2598
Total Sulphur Content, mg/kg, max	200	200	200	ASTM D 6667
Corrosion, Copper Strip (1 h at 37.8 C), classification, max	1	1	1	ASTM D 1838
Total C2 Hydrocarbons content, mol %, max	8.0	8.0	1.0	ASTM D 2163
Total C3 Hydrocarbons content, mol %, min	Report	Report	Report	ASTM D 2163
Total C4 Hydrocarbons content, mol %, min	Report	Report	Report	ASTM D 2163
Total C5 Hydrocarbons content, mol %, max	1.5	1.5	1.5	ASTM D 2163
Total C3 + C4 Hydrocarbons content, mol %, min	90.5	90.5	97.5	ASTM D 2163
Residual Matter: a) Residue on evaporation, ml/ 100 ml, max b) Oil stain observation (using 1.5 ml of solvent-residue mixture)	0.05 0.05 0.05 No oil ring should persist when assessed in terms of sub-clause 9.2.2 of ASTM D 2158			ASTM D 2158
Free Water Content (visible)	None	None	None	Visual
Odouriser, ethyl mercaptan, L/L, min	15	15	15	ASTM D5305

ANNEX A **(Normative)**

Information on the type of liquefied petroleum gas required shall be specified as indicated under 4.1.1, 4.1.2 and 4.1.3

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ANNEX B

(Informative)

Quality Verification of Liquefied Petroleum Gases

B.1 Quality Verification

- B.1.1 When a purchaser requires ongoing verification of the quality of liquefied petroleum gases, it is suggested that, instead of concentrating solely on evaluation of the final product, he also direct his attention to the manufacturer's quality system. In this connection it should be noted that ZS ISO 9001, ZS ISO 9002 and ZS ISO 9003 cover the provision of an integrated quality system.
- B.1.2 If the liquefied petroleum gas does not bear the certification mark and no information about the implementation of quality control or testing during manufacture is available to help in assessing the quality of a consignment, and the purchaser wished to establish by inspection and testing of samples of the final product whether a consignment of liquefied petroleum gas complies with the requirements of this standard, the sampling procedure given in 7.2 can be applied.

It shall be noted that such a sampling procedure applies to fully manufactured products only.