

*Draft for
Public Comment*

Draft Zambian Standard

LIQUEFIED PETROLEUM GASES – Specification

*This draft is for Public Comments
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Zambian Standard*

ZAMBIA BUREAU OF STANDARDS

DATE OF PUBLICATION

This Zambian Standard has been prepared and published under the authority of the Standards Council of the Zambia Bureau of Standards on

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The preparation of this Zambian Standard was undertaken by the Petroleum Products Technical Committee (TC 4/14) upon which the following organizations were represented:

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CONTENTS

1		
SCOPE		1
1.1	LIQUEFIED PETROLEUM GAS MIXTURE	1
1.2	COMMERCIAL PROPANE	1
1.3	COMMERCIAL BUTANE.....	1
2	NORMATIVE REFERENCES	1
3	DEFINITIONS	3
4	REQUIREMENTS	3
4.1	GENERAL	3
4.1.2	COMMERCIAL PROPANE	3
4.1.3	COMMERCIAL BUTANE.....	4
5	TEST METHODS	4
5.1	GENERAL	4
5.2	RELATIVE DENSITY AT 20 C.....	4
5.3	FREE WATER CONTENT.....	4
6	PACKAGING AND MARKING	4
6.1	PACKAGING	4
6.2	MARKING.....	4
7	SAMPLING	5
7.1	GENERAL	5
7.2	DEFINITIONS	5
7.3	SAMPLES FOR INSPECTION AND TESTING.....	5
7.4	COMPLIANCE WITH THE STANDARD.....	5
TABLE 1.	REQUIREMENTS FOR LIQUEFIED PETROLEUM GASES	
.....	6	
ANNEX A		7
ANNEX B		7
ANNEX C		8

FOREWORD

This National Standard has been prepared by the Petroleum Products 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 Products 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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Draft Zambian Standard

LIQUEFIED PETROLEUM GASES – Specification

1 SCOPE

This Zambian Standard specifies requirements for the following

1.1 Liquefied Petroleum Gas Mixture

A type of petroleum gas mixture that consists predominantly of C₃ and 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 fuel in domestic, commercial and industrial installations which are designed to use a 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

ASTM D 1267	Test Method for Vapour Pressure of Liquefied Petroleum (LP) Gases (LP Gas Method)
ASTM D 1657	Test Method for Density or Relative Density of Light Hydrocarbons by Pressure Thermohydrometer
ASTM D 1838	Test Method for Copper Strip Corrosion by Liquefied Petroleum (LP) Gases
ASTM D 2158	Test Method for Residues in Liquefied Petroleum (LP) Gases
ASTM D 2163	Test Method for Analysis of Liquefied Petroleum (LP) Gases and Propene Concentrates by Gas Chromatography
ASTM D 2598	Practice for Calculation of Certain Physical Properties of Liquefied Petroleum (LP) Gases from compositional analysis
ASTM D 2784	Test Method for Sulphur in Liquefied Petroleum Gases (oxy-hydrogen burner or lamp)
ASTM D 3246	Test Method for Sulphur in Petroleum Gases by Oxidative Microcoulometry
ASTM D 3700	Practice for Containing Hydrocarbon Fluid Samples using a Floating Piston Cylinder
ASTM D 5305	Test Method for the Determination of Ethyl Mercaptan in LP-gas Vapour
ASTM D 5453	Test Method for the Determination of Total Sulphur in Light Hydrocarbons, Motor Fuels and Oils by Ultraviolet Fluorescence
IP Petroleum Measurement Paper No 3	Computer Implementation for Correcting Densities and Volumes to 20 C, 1988

IP 161	Liquefied Petroleum Gases Determination of Gauge Vapour Pressure LPG Method
IP 235	Determination of the Density of Light Hydrocarbons Pressure Hydrometer Method
IP 243	Petroleum Products and Hydrocarbons Determination of Sulphur Content Wickbold Combustion Method (Identical to BS EN 24260)
IP 317	Determination of Residues in Liquefied Petroleum Gases Low Temperature Evaporation Method
ISO 91:2017	Petroleum and related products - Temperature and pressure volume correction factors (petroleum measurement tables) and standard reference conditions
ZS 670-1	Transportation of dangerous goods by road, rail, water and air. Part 1 : identification and classification of dangerous goods for transport
ZS 670-2	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
ZS 371	Road tank vehicles for petroleum-based flammable liquids - Specification
ZS 372	Transportation of Petroleum Products Operational Requirements for Road Tank Vehicles - Code of Practice

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, Cap 441 of the Laws of Zambia: The Chief Inspector of Factories
- b) Within the scope of the Mines and Minerals Act, Cap 213 of the Laws of Zambia: The Director of Mine Safety
- c) Within the scope of the Railways Act, Cap 453 of the Laws of Zambia: The Chief Inspector of Railways.
- d) Within the scope of the Energy Regulation Act, Cap 436 of the Laws of Zambia; The Board

In case the paint which is meant for both interior and exterior use, it shall meet the requirements specified for both Type 1 and Type 2 paints.

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, 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.

ZS 749 Portable Metal Containers for compressed, dissolved and liquefied Gases: Basic Design Criteria, use and maintenance-code of Practice

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 7.3 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 Definitions

- 7.2.1 Defective: A test sample of the liquefied petroleum gas that fails in one or more respects to comply with the relevant requirements of this standard.
- 7.2.2 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.

7.3 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, 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.

7.4 Compliance with the Standard

Deem the lot to comply with the relevant requirements of this standard if on inspection of the containers or tankers in the lot and on testing of the sample taken in accordance with 7.3, no defective is found.

CHARACTERISTIC	REQUIREMENTS			TEST METHOD
	Liquefied Petroleum Gas Mixture	Commercial Propane	Commercial Butane	
Density @ 20 C, kg/m ³	520 - 565	500 min	575 max	ASTM 1657 IP 235
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 2874 ASTM D 5433 IP 243
Corrosion, Copper Strip (1 h at 37.8 C), classification, max	1	1	1	ASTM D 1838
Total C ₂ Hydrocarbons content, mol %, max	8.0	8.0	1.0	ASTM 2163 IP 264
Total C ₃ + C ₄ Hydrocarbons content, mol %, min	90.5	90.5	97.5	ASTM 2163 IP 264
Total C ₅ Hydrocarbons content, mol %, max	1.5	1.5	1.5	
Residual Matter:				ASTM D 2158 IP 317
a) Residue on evaporation, ml/ 100 ml, max	0.05	0.05	0.05	
b) Oil stain observation (using 1.5 ml of solvent-residue mixture)	No oil ring should persist when assessed in terms of sub-clause 9.2.2 of ASTM D 2158 / IP 317			
Free Water Content (visible)	None	None	None	Visual
Odouriser, ethyl mercaptan, l/l, min	15	15	15	ASTM D5305

ANNEX A
(Normative)

NOTE TO PURCHASERS

The following requirement shall be specified in tender invitations and in each order or contract: The type of liquefied petroleum gas required (see 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 7.3 can be applied.

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