

FINAL DRAFT BELIZE NATIONAL STANDARD
SPECIFICATION FOR UNLEADED GASOLINE FOR MOTOR VEHICLES

Committee Representation

The preparation of this standard for the Standards Advisory Council established under the Standards Act 1992, was carried out under the supervision of the Bureau's Technical Committee for Fuels and Lubricants, which at the time comprised the following members:

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Mr. Freddy Flores

REPERESNTING

Puma Energy Ltd.

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REPERESNTING

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Mr. Israel Marin

Belize Diesel & Equipment Co.
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ALBA PetroCaribe Belize Energy
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Mr. Lloyd Orellano

Belize Bureau of Standards

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DRAFT BELIZE NATIONAL STANDARD**SPECIFICATION FOR UNLEADED GASOLINE FOR MOTOR VEHICLES**

0 FOREWORD

- 0.1 The Belize Bureau of Standards has recommended that this standard be declared a compulsory standard, to protect the consumer or user against danger to health, to protect the environment, and to ensure a product of acceptable quality for use in Belize.
- 0.2 This standard introduces two grades of unleaded gasoline; Premium and Regular as defined by Section 5.2 – Table 1. Consideration has been given to the properties of gasoline that are affected by climatic conditions, and the limits specified for these properties are the appropriate limits for this country.
- 0.3 Automotive gasolines are essentially blends of hydrocarbons derived from petroleum and may contain selected additives that impart specific features to the finished gasoline. The hydrocarbons are derived from fractional distillation of crude oil, and associated processes that increase either the amount or the quality of the gasoline obtained. The resulting components vary from individual hydrocarbons such as, normal butane, to products that contain hundreds of different hydrocarbons. The properties of commercial gasolines are influenced by the refinery practices employed and the nature of the crude oils from which they are produced. Finished gasolines encompass a boiling range of about 30 °C to 225 °C.
- 0.4 In preparing this standard, assistance was derived from:
- a) RTCA 75.01.20:04 - Petroleum Products, Specification for Super Gasoline, Central America.
 - b) RTCA 75.01.20:04 - Petroleum Products, Specification for Regular Gasoline, Central America.
 - c) TTS 269: 2007 (1st Revision) - Unleaded Gasoline for Motor Vehicles - Specification, Trinidad & Tobago.
 - d) NOM-086-SEMARNAT-SENER-SCFI-2005- Specification for fossil fuels for protection of the environment, Mexico.
 - e) DGNTI COPANIT 71-381-2008 - Petroleum and its derivatives, Specification for gasoline, Panama.
 - f) Jamaica Quality Control Regulations for Unleaded Gasoline, August 31, 2009.

1 SCOPE

This standard specifies requirements and test methods for two grades of unleaded gasoline: Premium and Regular for use in spark-ignition internal combustion engines in Belize.

2 NORMATIVE REFERENCES

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- a) ASTM D 86, *Standard Test Method for Distillation of Petroleum Products at Atmospheric Pressure*;
- b) ASTM D 95, *Standard Test Method for Water in Petroleum Products and Bituminous Materials by Distillation*;
- c) ASTM D 130, *Standard Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test*;
- d) ASTM D 235, *Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)*;
- e) ASTM D 323, *Standard Test Method for Vapour Pressure of Petroleum Products (Reid Method)*;
- f) ASTM D 381, *Standard Test Method for Gum Content in Fuels by Jet Evaporation*;
- g) ASTM D 525, *Standard Test Method for Oxidation Stability of Gasoline (Induction Period Method)*;
- h) ASTM D 1266, *Standard Test Method for Sulphur in Petroleum Products (Lamp Method)*;
- i) ASTM D 1298, *Standard Test Method for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method*;
- j) ASTM D 1319, *Standard Test Method for Hydrocarbon Types in Liquid Petroleum Products by Fluorescent Indicator Adsorption*;
- k) ASTM D 2533, *Standard Test Method for Vapor-Liquid Ratio of Spark-Ignition Engine Fuels*;
- l) ASTM D 2699, *Standard Test Method for Research Octane Number of Spark-Ignition Engine Fuel*;
- m) ASTM D 2700, *Standard Test Method for Motor Octane Number of Spark-Ignition Engine Fuel*;
- n) ASTM D 3227, *Standard Test Method for (Thiol Mercaptan) Sulphur in Gasoline, Kerosine, Aviation Turbine and Distillate Fuels (Potentiometric Method)*;
- o) ASTM D 3231, *Standard Test Method for Phosphorus in Gasoline*;

- p) ASTM D 3237, *Standard Test Method for Lead in Gasoline by Atomic Absorption Spectroscopy*;
- q) ASTM D 3606, *Standard Test Method for Determination of Benzene and Toluene in Finished Motor and Aviation Gasoline by Gas Chromatography*;
- r) ASTM D 4052, *Standard Test Method for Density and Relative Density of Liquids by Digital Density Meter*;
- s) ASTM D 4057, *Standard Practice for Manual Sampling of Petroleum and Petroleum Products*;
- t) ASTM D 4294, *Standard Test Method for Sulphur in Petroleum and Petroleum Products by Energy Dispersive X-Ray Fluorescence Spectrometry*;
- u) ASTM D 4814, *Standard Specification for Automotive Spark-Ignition Engine Fuel*;
- v) ASTM D 4815, *Standard Test Method for Determination of MTBE, ETBE, TAME, DIPE, tertiary-Amyl Alcohol and C1 to C2 Alcohols in Gasoline by Gas Chromatography*; and
- w) ASTM D 5191, *Standard Test Method for Vapor Pressure of Petroleum Products (Mini Method)*.

3 TERMS AND DEFINITIONS

For the purpose of this standard, the following terms and definitions shall apply:

- 3.1 **additive** means a substance added to gasoline usually in small quantities, to impart desirable properties to or prevent deterioration of the gasoline.
- 3.2 **adulteration** means the blending of a higher grade gasoline with lower grades or solvents.
- 3.3 **anti-knock index** (A.K.I.) means a calculated value obtained by adding the Research Octane Number (RON) and the Motor Octane Number (MON), and dividing the sum by two.

NOTE 1 Anti-knock Index is also referred to as Octane Index (O.I.). **NOTE 2** $A.K.I. = (RON + MON)/2$.
- 3.4 **gasoline** means a volatile mixture of liquid hydrocarbons, generally containing small amounts of additives, suitable for use as a fuel in spark-ignition internal combustion engines.
- 3.5 **knock** means a characteristic high-pitch metallic noise, or pinging sound that occurs when the unburnt gases ahead of the flame front spontaneously ignite, resulting in an excessive rate of pressure rise.
- 3.6 **motor octane number (MON)** means the octane number determined by the Motor Method under more severe conditions than those used in the Research Method, that is, high temperature in the entry mixture and relatively high engine speed.
- 3.7 **octane number** means a measure of the anti-knock characteristics of gasoline.

- 3.8 **oxygenate** means an oxygen-containing ashless, organic compound, such as an alcohol or ether, which may be used as a fuel or fuel supplement.
- 3.9 **research octane number (RON)** means the octane number arrived at by the Research Method which measures the anti-knock behaviour of a gasoline under slightly severe conditions of operation or rather low temperature in the entry mixture or blend and relatively low revolutions in the motor.

4 LABELLING

The following information shall be legibly marked on each dispensing pump and each storage tank of unleaded gasoline intended for sale to the public:

- a) the nominal RON value of the unleaded gasoline; and
- b) the grade designation and/or associated registered trademark that is registered with the Belize Bureau of Standards.

5 REQUIREMENTS

5.1 General requirements

- 5.1.1 When tested in accordance with clause 6.2 there shall be no adulteration of gasoline.
- 5.1.2 When sampled in accordance with Annex A and tested in accordance with the methods given in Table 5, the gasoline shall comply with the limiting requirements given in that table.
- 5.1.3 The gasoline shall be visually free of water, sediment, and suspended matter; it shall be clear and bright.
- 5.1.4 Adulteration of gasoline is not allowed. It shall be detected by the use of an approved identifying agent or marker by the Belize Bureau of Standards.

5.2 Grade designations and requirements for anti-knock values

- 5.2.1 Gasoline shall be designated as Premium or Regular, depending on the nominal RON.
- 5.2.2 When sampled in accordance with Annex A, and tested in accordance with ASTM D 2699 or ASTM D 2700, the values for each grade expressed as RON shall be not less than the minimum values given in Table 1 for the respective grade.
- 5.2.3 Where there is only one determination of an anti-knock value which is less than the nominal value, then the product shall be considered to have failed the specification limit, with 95% confidence, only if the determination X is such that:

$$X < A - 0.84 \frac{X R}{\sqrt{2}}$$

where:

- X is the anti-knock value;

- R is the reproducibility of the test method given in Tables 2 and 3; and
- A is the minimum RON or MON for the grade.

NOTE 1 Reproducibility is a quantitative expression of the random error associated with operators working in different laboratories, each obtaining a single result on a portion of the same sample. It is the difference between two such single and independent results that would be exceeded in the long run in only one case in twenty in the normal and correct operation of the test method. This is known as the 95% probability level.

NOTE 2 Extensive data obtained from consumer and producer laboratories over a number of years for many samples of conventional gasolines have shown that the reproducibility of fuel ratings between laboratories varies with octane number level.

Table 1 — Anti-knock values for grades of gasoline

Property	Grade designation		Test method
	Premium	Regular	
RON	95.0	83.0	ASTM D 2699
MON	85.0	78.0	ASTM D 2700

Table 2 - RON limit of premium gasoline

Limit	RON	Reproducibility, R
Max.	95.0	0.7
Min.	92.0	0.7

NOTE The reproducibility of the test method as specified in Table 2 is based on information contained in ASTM D 2699-06a.

Table 3 — Mon limit of regular gasoline

Limit	MON	Reproducibility, R
Max.	85.0	0.9
Min.	82.0	0.9

NOTE The reproducibility of the test method as specified in Table 3 is based on information contained in ASTM D 2700.

5.3 Colour coding

5.3.1 Each grade of gasoline shall be coloured as specified in Table 4.

Table 4 — Colour coding

Grade designation	RON	Colour ^a
Premium	95.0	Red
Regular	85.0	Orange

^a Great precision in colour matching is not required as the colour has no effect on the performance of the gasoline. The gasoline is coloured to aid identification by the customer.

6 TEST METHODS

6.1 General

Tests for the properties outlined in Tables 1 and 5 shall be performed using the corresponding test methods given in those tables.

6.2 Test for detecting adulteration

Adulteration of Premium gasoline shall be tested by the following method:

5 ml of a reagent which consists of 50% glycerine, 45% water and 5% sodium hydroxide shall be added to 95 ml of premium gasoline. This shall be left to stand for approximately two minutes, against a white background. A purple colour will be observed if there is adulteration.

Table 5 — Specification limits and test methods for all grades of unleaded gasoline

Property Description	ASTM Test Method	Units	Regular	Premium
Additives	-	-	Report	Report
Color	Visual	-	orange	red
Lead Content	D-3237	mg /L	13 max	13 max
Copper Strip Corrosion (3h at 50 ⁰ C)	D-130	-	No. 1 max	No. 1 max
Oxidation stability	D-525	minutes	240 min	240 min
Total sulfur content	D-2622	% mass	0.10 max	0.10 max
Doctor test or Mercaptan sulfur	D-4952 D-3227	(-) % mass	Negative 0.003 max	Negative 0.003 max
Reid vapour pressure @ 37.8 ⁰ C	D-323	kPa (psi)	69 (10) max	69 (10) max
API Gravity @ 15.56 °C (60 ⁰ F)	D-287/ D-1298	⁰ API	Report	Report
Density @ 15 ⁰ C	D-1298	kg/m ³	Report	Report
Existent gum	D-381	mg/100ml	4 max	4 max
Dist. 10% evap.	D-86	⁰ C	65 max	65 max
Dist. 50% evap.	D-86	°C	77-121	77-121
Dist. 90% evap.	D-86	⁰ C	190 max	190 max
Final boiling point	D-86	°C	225 max	225 max
Residue				2 max
	D-86	% vol	2 max	
Motor Octane Number (MON)	D-2700	-	report	report
Research Octane Number (RON)	D-2699	-	88.0 min	95.0 min
Octane Index (RON+MON)/2	D-2699/ D-2700	-	83.0 min	89.0 min
Aromatic content	D-1319	% vol	Report	Report
Olefins	D-1319	% vol	Report	Report
Benzene content	D-3606/ D-4053	% vol	5.0 max.	5.0 max
Oxygen Content	D-4815	% vol	Report	Report
Odor			marketable	

Annex A (normative)

Sampling of gasoline

A.1 General

A.1.1 For the purpose of this standard, all sampling shall be carried out in accordance with the relevant procedures of ASTM D 4057 and, additionally as detailed in A.2.

NOTE Attention is drawn to the special precautions required in obtaining samples for the determination of Reid Vapour Pressure (see ASTM D 323).

A.2 Sampling from gasoline pumps

A.2.1 Sampling cans

A.2.1.1 Cans for sampling from gasoline pumps shall be of 1l and 5l capacities.

A.2.1.2 The construction of the cans shall comply with the appropriate safety requirements for cans that are to hold highly flammable material. They shall be provided with screw caps incorporating a petroleum resistant washer in good condition.

A.2.2 Preparation of cans

There shall be cans kept solely for the purpose of taking gasoline samples. New cans shall be rinsed with gasoline before being used, to remove any residual traces of oil left during manufacturing operations, and then allowed to dry. Before use, all cans shall be checked to ensure that they are in sound condition and free from leaks.

A.2.3 Sampling procedures

A.2.3.1 From the pump nozzle, 5l of petrol shall be drawn carefully into a cool 5l can using a clean dry metal funnel. Immediately afterwards, this sample shall be decanted carefully into the requisite number of 1l cans, using a funnel and filling the cans within 15 mm of the brim.

Note: Plastic funnels shall not be used.

A.2.3.2 If more than 5l are needed, the operation shall be repeated immediately and before the pump has been used for any other

purpose. The screw caps shall be tightened fully and the cans checked to ensure that there are no leaks.

NOTE 1 Where practicable, the sampling should not be carried out in direct sunlight because not only is there an increased possibility of losing the volatile components of the sample, but also the hazard of fire or explosion is increased. Changes in fuel quality, especially octane number, may also occur.

NOTE 2 A quantity of 1l is sufficient for the determination of octane number and certain other tests but it is advisable to provide each laboratory with 2l of sample in case further work is needed: it is essential that these 2l be of identical material.

A.3 Storage, labelling and transport

A.3.1 Samples shall be kept in a cool place although it is not necessary to keep them refrigerated.

A.3.2 Full and legible information relating to the source of the sample shall be attached to the can in such a manner that it will not easily become detached.

NOTE 1 Where practicable, the storage of the sample should not be in direct sunlight because not only is there an increased possibility of losing the volatile components of the sample but also the hazard of fire or explosion is increased. There is also the possibility that the cans will ‘balloon’.

NOTE 2 If required, the sample may be sealed and labelled to maintain its legal integrity.

NOTE 3 If the sample has to be sent to a laboratory by public transport, it will be necessary to comply with the general regulations covering transportation of flammable materials and with the requirements of the transport authority concerned. Information on the appropriate procedures and the type of packaging required should be obtained from the transport authority involved.