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DRAFT TANZANIA STANDARD

Ethanol Cookstoves- Minimum Energy Performance and Labelling Requirements

TANZANIA BUREAU OF STANDARDS

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Tanzania Bureau of Standards (TBS) is the statutory national standards body for Tanzania established under the Standards Act No. 3 of 1975, repealed and replaced by the Standards Act No. 2 of 2009.

The Electrical Engineering Divisional Standards Committee, under whose supervision this Tanzania Standard was prepared, consists of representatives from the following organizations:

College of Engineering and Technology, University of Dar es Salaam

Tanzania Telecommunications Company Limited

Tanzania Electric Supply Company Limited

Ministry of Energy

Ministry of Information, Communication and Information Technology

Energy and Water Utilities Regulatory Authority

Tanzania Electric Goods Company Limited

Tanzania Electrical Mechanical and Electronics Service Agency

Tanzania Renewable Energy Association

Engineers Registration Board (ERB)

Dar es salaam Institute of Technology

The organizations marked with an asterisk (*) in the above list, together with the following were directly represented on the Technical Committee entrusted with the preparation of this Tanzania Standard:

1. Scope

This Tanzania Standard specifies requirements for minimum energy performance, maximum emissions, safety, durability, and labelling of ethanol cookstoves intended for domestic cooking applications.

This document also specifies test methods and procedures for assessing compliance of ethanol cookstoves with the stated requirements.

This standard does not apply to appliances not primarily used for cooking.

For Public Comments

2. Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

TZS 644 / ISO 3170, Hydrocarbon liquids — Manual sampling

TZS 1445 / ISO 3165, Sampling of chemical products for industrial use — Safety in sampling

TZS 2273-2 / ISO 10101-2, Natural gas — Determination of water by the Karl Fischer method — Part 2: Volumetric procedure

TZS 2273-3 / ISO 10101-3, Natural gas — Determination of water by the Karl Fischer method — Part 3: Coulometric procedure

TZS 2522 / ISO 1388-2, Ethanol for industrial use — Methods of test — Part 2: Detection of alkalinity or determination of acidity to phenolphthalein.

ISO 22854, Liquid petroleum products — Determination of hydrocarbon types and oxygenates in automotive-motor gasoline and in ethanol (E85) automotive fuel — Multidimensional gas chromatography method

TZS 2911, Ethanol Fuelled Cooking Appliances — Specification

TZS 2913-1/ISO 19867-1, Clean cookstoves and clean cooking solutions — Harmonized laboratory test protocols — Part 1: Standard test sequence for emissions and performance, safety and durability

TZS 3119, Denatured Ethanol for Use as Cooking and Appliance Fuel — Specification

3. Terms and definitions

For the purpose of this standard, terms and definitions in TZS 2913-1/ ISO 19867-1, TZS 473, ISO/TR 21276 and the following shall apply:

3.1

domestic ethanol cookstove

an ethanol cookstove intended for household or similar use and cook on a pot size of less than 25 liters

3.2

maximum heat input

highest achievable heat input under the allowable ethanol supply pressure range defined in this standard

3.3

user-grasped part

a component intended to be held, turned, or manipulated by the user during normal operation, including but not limited to control knobs, handles, and levers

3.4

flame stability

ability of a burner flame to remain continuously lit and correctly anchored at the burner ports without lift-off, flashback, or extinction under normal and specified disturbance conditions

3.6

test phase

a defined period of operation during a test, conducted at specified operating conditions, for which performance metrics are measured and calculated independently

4. General, safety and durability requirements

4.1 General

All ethanol cookstoves within the scope of this standard shall be designed, constructed, and manufactured to ensure safe operation under normal and reasonably foreseeable conditions of use. Compliance with this requirement shall be demonstrated by valid test procedures including meeting the applicable standards specified in Table 1.

Table 1: General Requirements

Quality / Safety Element	Quantified Metric	Standard/ Clause
Fuel reservoir integrity	No visible leakage under static fill and after 10 thermal cycles (ambient to operating temperature)	ISO 16111
Tip-over performance	Maximum spilled fuel $\leq$ 10 mL and self-extinguishing within 60 seconds	ISO 19867-1
Refueling safety	Appliance shall prevent refueling during operation OR include mandatory cool-down period $\geq$ 10 minutes	ISO 17999
Fuel-contact material compatibility	No cracking, swelling $>10\%$, or softening after 168-hour soak in E3050 fuel	ISO 23936-2
Flame containment	Flame shall remain within designated combustion zone under normal and disturbed conditions	ISO 19867-1

NOTE: Ethanol fuel used for compliance testing shall conform to as TZS 3119.

4.2 Requirements for compliance

For the purposes of compliance with this standard, an ethanol cookstove shall comply with all safety, durability, marking, and all other mandatory technical and performance requirements.

4.3 Relationship to energy performance and labelling

Compliance with Clause 4 is a precondition for classification under the energy performance star rating system defined in Clause 5.4 and for the application of labels specified in Clause 6 and Annexes A and B.

Cookstoves that do not meet the requirements of Clause 4 shall not be labelled or marketed as compliant with this standard.

5. Energy performance and emissions requirements

Ethanol cookstoves within the scope of this standard shall meet the minimum energy performance requirements specified in this clause when tested in accordance with Clause 5.2.

5.1 Thermal efficiency and emissions requirements

All cookstoves within the scope of this standard shall meet the requirements specified in Table 2.

Table 2. Minimum thermal efficiency and maximum emissions requirements

Thermal Efficiency (%)	CO (g/MJd)
≥ 40	≤ 4.4

5.2 Test methods

5.2.1 Domestic ethanol cookstoves

Domestic ethanol cookstoves shall be tested for energy performance and emissions in accordance with TZS 2913-1:2021 / ISO 19867-1

All test phases, operating conditions, cooking vessel sizes, water volumes, fuel measurement procedures, and calculation methods specified in TZS 2913-1:2021 / ISO 19867-1 shall apply without modification, unless otherwise stated in this standard.

5.2.2 Test fuel conditions

Fuel used for compliance testing under this standard shall be representative of commercially supplied denatured ethanol intended for cooking applications and shall be sampled, handled, stored, and verified in accordance with the requirements of this clause.

Fuel integrity shall be maintained at all times to prevent contamination, evaporation, or alteration of composition prior to testing.

5.2.2.1 Sampling

Sampling of denatured ethanol for compliance testing shall be conducted in accordance with: TZS 1445 / ISO 3165 and TZS 644 / ISO 3170

Sampling shall:

- a) Be performed by trained personnel;
- b) Use clean, dry sampling equipment constructed of materials compatible with ethanol;
- c) Avoid exposure to contaminants, moisture, or foreign substances;
- d) Minimize headspace in sampling containers to reduce evaporative losses.

5.2.2.2 Sample Containers and Storage

Fuel samples shall:

- a) Be stored in clean, dry, airtight containers constructed of materials compatible with ethanol and approved denaturants.
- b) Be sealed immediately after filling.
- c) Be clearly labeled with:
 - Batch identification
 - Date of sampling
 - Sampling location
 - Declared alcoholic strength.

Prior to use in compliance testing, samples shall be stored in a cool, well-ventilated area away from direct sunlight and maintained at ambient laboratory temperature (20 ± 5 °C) for not less than 24 hours prior to testing.

Unless analytically verified, fuel shall not be stored longer than 30 days prior to compliance testing.

5.2.2.3 Verification Prior to Testing

Before commencement of compliance testing, the laboratory shall verify:

- a) Alcoholic strength at 20 °C using density measurement or equivalent analytical method;
- b) Water content, where required;
- c) Absence of visible sediment, contamination, or phase separation.

Alcoholic strength may be determined using density measurement at 20 °C in accordance with recognized alcoholometric tables, ISO 1388 series methods for ethanol testing, or equivalent validated analytical methods.

Fuel not meeting the requirements specified in Clause 5.2.3.2 shall not be used for compliance testing.

5.2.3 Test Fuel Specification for Compliance Testing

5.2.3.1 General

Compliance testing shall be conducted using denatured ethanol meeting the requirements of this clause. The test fuel shall be representative of commercially distributed cooking-grade denatured ethanol.

5.2.3.2 Composition Requirements

Table 3. Composition Requirements

Characteristic	Requirement
Ethanol strength	90–100 % v/v at 20 °C
Water content	≤ 10 % v/v
Higher alcohols (C ₃ –C ₈)	≤ 2 % v/v
Hydrocarbon denaturants	≤ 1 % v/v
Visible contamination	None

5.2.3.4 Test Fuel Temperature

Fuel used during compliance testing shall be conditioned to 20 ± 5 °C prior to introduction into the appliance.

5.4 Energy performance star rating classification

Cookstoves that meet the minimum energy efficiency and maximum emission requirements outlined in Table 2 shall be classified in accordance with Table 3, respectively.

Table 4. Energy Performance Star-Rate Classification

Energy star rate	1	2	3	4	5
Efficiency η_c (%)	≥ 40	≥ 49	≥ 58	≥ 66	≥ 75
CO (g/ MJd)	≤ 4.4				

5.5 Reporting

Test reports shall be prepared in accordance with TZS 2913-1:2021 / ISO 19867-1 and any other applicable requirements specified in this standard, and shall include, as a minimum, the information required by that standard.

6. Labelling

6.1 The label shall be visibly affixed on the cookstoves, and shall be legible with the following information:

- a) Brand name;
- b) Model/Model number;
- c) Appliance type: LPG Cookstove;
- d) Fuel type: Biogas;
- e) Energy Efficiency Rating (1–5 stars);
- f) Thermal efficiency (%);
- g) CO emission performance in mg/MJd; and
- h) Reference number of the applicable Tanzania Standard.

6.2 Label Specification and user guide

6.2.1 The label sizes for both, institutional and domestic biogas cookstoves shall be 192mm x 96mm

Where the label is printed in a larger format, its content shall, nevertheless, remain proportionate to the specification. .

6.2.2 The label's background colour, text font sizes, user guide and the colour codes of all other symbols shall be as specified in Annex A and Annex B.

ANNEX A

(Normative)

ENERGY LABEL SPECIFICATION AND USER GUIDE FOR DOMESTIC COOKSTOVES

The Energy Efficiency labels shall be affixed to the CookStoves in a clearly visible and upright position. The label shall be self-adhesive or non-sticky and shall be as per the example attached in **A.1**

A.1. Energy Label Sample

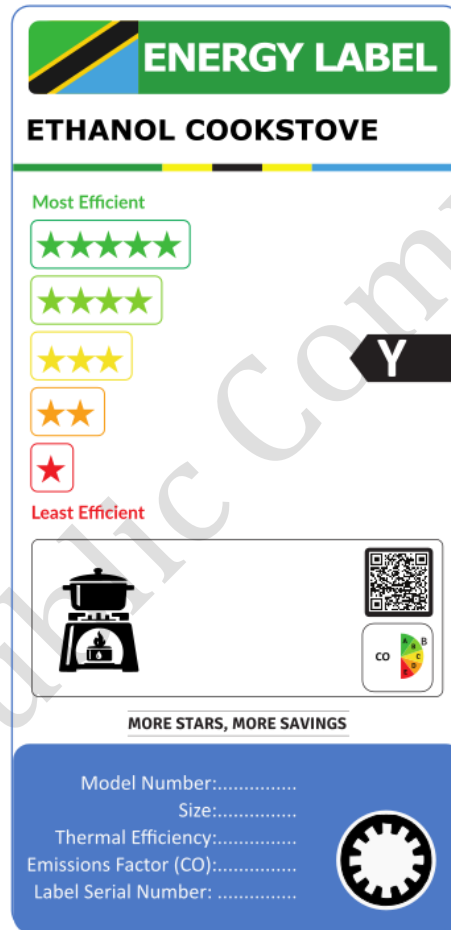


Figure A.1 Typical example for domestic ETHANOL CookStoves energy label

The following information shall be included on the label:

A.2. Dimensions and positions of Label Elements

The dimensions and positions of the elements constituting the label shall be as indicated below:

- a) **NATIONAL FLAG:** The Tanzania flag shall be in a 20-mm wide square area, placed 3 mm from the left and top margins of the label.

- b) **“ENERGY LABEL” title:** This shall be 20 mm wide and 70 mm long, positioned 3 mm from the top and right margin of the label.
- c) **Type of Unit:** The word ‘**ETHANOL COOKSTOVE**’ shall be 4 mm from the left margin and 27 mm from the top margin.
- d) **Colour bars:** They shall be 1.5 mm wide. The first and last bars, starting from the left, shall be 30 mm long, while each intermediate bar shall be 10 mm long. All bars shall be positioned 34 mm from the top margin
- e) **Most efficient” text:** The text shall be located 4 mm from the left margin and 42 mm from the top margin.
- f) **Least efficient” text:** The text shall be located 4 mm from the left margin and 97 mm from the top margin.
- g) **Stars bars:** The enclosing bar for the 5-star rating shall measure 8.5 mm in width and 50 mm in length. The subsequent bars for the 4-star, 3-star, 2-star, and 1-star ratings shall maintain the same width of 8.5 mm with a uniform spacing of 1.5 mm between each subsequent bar. The length of the enclosing bar shall decrease in length by 10 mm for each level, starting from 50 mm for the 5-star rating and reducing progressively. The 5star enclosing bar shall be positioned 4 mm from the left margin and 47 mm from the top margin.
- h) **Stars:** Shall be 8mm wide, 8.4 mm long, with a uniform spacing of 1.6 mm between each star, and centered within the star bar.
- i) **The pointing arrow:** The arrow indicating the CookStoves star rating shall be 10 mm wide and 23 mm long, with a pointer angle of 73.74°, positioned 3 mm from the right margin and aligned centrally with the corresponding star bar (ranging from 1 to 5)."
- j) **CookStoves icon:** The CookStoves icon shall fit within a rectangle measuring 32 mm in height and 30 mm in width, positioned 3 mm from the left margin and 50 mm above the bottom margin
- k) **Symbol squares:** The symbol squares for the QR code and CO emission colour codes shall each measure 20 mm by 20 mm. The emission colour code squares shall be spaced 2 mm apart and positioned 5 mm from the right margin and 50 mm above the bottom margin. The QR code square shall be placed 5 mm from the right margin and 2 mm away from the CO emission square, vertically.
- l) **Footer:** The bar shall be 40 mm wide and 96 mm long.

A.3 Label Design and Colour Specifications

- **Background:** The background of the label shall be 100% white.
- **Border:** The label border shall be 0.5 mm wide.
- **Typeface:** The typefaces used shall be Verdana and Calibri.
- **Colour Specifications (CMYK format):** The label's colours shall follow the CMYK format:
 - **Label and squares Border:** 100, 50, 0, 0
 - **National flag Logo:** Original colours as per the official logo
 - **Background of the Energy Label section:** 100, 0, 100, 50.
 - **The text colour for 'ENERGY LABEL'** shall be 100% white (CMYK: 0, 0, 0, 0), while the text colour for '**COOKSTOVE**' shall be 100% black
 - **Bars enclosing the star ratings:** Similar to the corresponding star's colour codes

A.3.1 Star bars size

The star efficiency rating bars shall follow these dimensions:

- **5-star bar:** 8.5 mm width, 50 mm length.
- **4-star bar:** 8.5 mm width, 40 mm length.
- **3-star bar:** 8.5 mm width, 30 mm length.
- **2-star bar:** 8.5 mm width, 20 mm length.
- **1-star bar:** 8.5 mm width, 10 mm length.

A.3.2 The star colours for energy efficiency rating:

- **5 stars (most efficient):** 100, 0, 100, 0.
- **4 stars:** 30, 0, 100, 0.
- **3 stars:** 0, 0, 100, 0.
- **2 stars:** 0, 30, 100, 0.
- **1 star (least efficient):** 0, 100, 100, 0.

A.3.3 Energy Efficiency Class Number (star rating) inside the stars arrow:

The energy efficiency class number shall be:

- **Colour:** 100% white.
- **Font:** Calibri Bold, size 33 pt.
- The rectangular black section of the arrow shall contain the star rating number, which is centered.

A.3.4 CookStoves icon

- Colour shall be 100% black.
- The background color shall be 100% white.

A.3.5 QR Code

The QR code shall be 100% black.

A.3.6 Additional Text Elements

- **The phrase “MORE STARS, MORE SAVINGS”:**
 - **Font:** Calibri Bold, size 14 pt.
 - **Colour:** 100% black.
- **Texts within the symbol squares:**
 - **Font:** Verdana Bold, 12 pt for the main element, Verdana Regular 10 pt for the unit.
 - **Colour:** 100% black.

A.3.7 Emission classification & Colours Codes

The emission graphic shall be labeled from A to E using the specified color codes and shall display the emission rating as shown in Figure A.1.

- **Green portion (A):** 100, 0, 100, 0.
- **Light green (B):** 30, 0, 100, 0
- **Yellow (C):** 0, 0, 100, 0

- **Orange portion (D):** 0, 30, 100, 0.
- **Red portion (E):** 0, 100, 100, 0.

A.3.8 Footer

- **Background shall be:** 100, 50, 0, 0.
- **The texts:**
 - **Font:** Calibri, size 12 pt.
 - **Colour:** 100% white.

A.3.9 The Standard Mark

The standard mark shall be as follows:

- 20mm square wide
- Positioned 5mm from the right and bottom margin
- The colour codes shall be as the original from TBS
- The background colour shall be 100% white
- The text for standard number shall be as specified in the original standard mark.