ETHIOPIAN STANDARD

ES 6085: 2019

second edition
29-03-2019

Clean Cook Stove and Clean Cooking Solution - Performance Requirements and Test Methods

ICS:97.040.020

Published by Ethiopian Standards Agency

Foreword

This Ethiopian Standard has been prepared under the direction of the Technical Committee for Clean cook stove and clean cooking solution (TC 101) and published by the Ethiopian Standards Agency (ESA).

This Ethiopian Standard cancels and replaces ES 6085:2017 *"Improved Biomass cooking stoves – Performance Requirements and Test Methods for Household Biomass cooking Stoves " and ES 6086:2018 " Biomass Baking Stoves –Performance Requirements and Test methods for Household Biomass Baking Stoves."*

For the purpose of this Ethiopian Standard, the adopted text shall be modified as follows:

- The phrase “International Standard” shall be read as “Ethiopian Standard” and
- A full stop (.) shall substitute comma (,) as decimal marker.

Clean Cook Stove and Clean Cooking Solution - Performance Requirements and Test Methods

1. Scope

This Ethiopian standard is applicable to cook stoves used primarily for cooking or water heating in domestic, small-scale enterprise, and institutional applications, typically with firepower less than 20 kW and cooking vessel volume less than 150 l.

This document does not cover solar and electric stoves.

This Standard specifies the performance requirements (thermal and emission), safety and durability, test methods and inspection requirement.

2. Normative reference

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

ES ISO 21276, Clean cook stoves and clean cooking solutions — Vocabulary

ES ISO 19867-1, Clean cook stoves and clean cooking solutions — Harmonized laboratory test protocols —Part 1: Standard test sequence for emissions and performance, safety and durability.

ES ISO 23550, Safety and control devices for gas and/or oil burners and appliances — General requirements

ES ISO 23551 - part1, Safety and control devices for gas burners and gas-burning appliances — Particular requirements — Part 1: Automatic and semi-automatic valves.

ES ISO 23551 - part, Safety and control devices for gas burners and gas-burning appliances — Particular requirements — Part 2: Pressure regulators

ES ISO 23551 Part 3, Safety and control devices for gas burners and gas-burning appliances — Particular requirements — Part 3: Gas/air ratio controls, pneumatic type

ES ISO 23551 Part 5, Safety and control devices for gas burners and gas-burning appliances — Particular requirements —Part 5: Manual gas valves

ES ISO 23551 Part 6, Safety and control devices for gas burners and gas-burning appliances — Particular requirements —Part 6: Thermoelectric flame supervision controls

ES ISO 23551 Part 8, Safety and control devices for gas burners and gas-burning appliances — Particular requirements —Part 8: Multifunctional controls

ES ISO 23551 Part 9, Safety and control devices for gas burners and gas-burning appliances — Particular requirements —Part 9: Mechanical gas thermostats

ES ISO 23551 Part 10, Safety and control devices for gas burners and gas-burning appliances — Particular requirements —Part 10: Vent valves

3. Terms and definitions

For the purpose of this standard all terms and definitions described in ES ISO 19867-1 and ES ISO 21276 shall be used.

4. Stove Performance requirements

4.1. For all clean cook stoves under this standards performance level by Tiers shall comply the requirement specified in table 1.

Table 1 — performance target values

	Tier[b]	Thermal efficiency %	Emissions		Safety (score)[c]	Durability (score)[d]
			CO g/MJ_d	$PM_{2,5}mg/MJ_d$		
Better performance ↑	5	≥50	≤3,0	≤5	≥95	<10
	4	≥40	≤4,4	≤62	≥86	<15
	3	≥30	≤7,2	≤218	≥77	<20
	2	≥20	≤11,5	≤481	≥68	<25
	1	≥10	≤18,3	≤1030	≥60	<35
	0	<10	>18,3	>1030	<60	>35

[b]The tier level for each performance metric should be reported separately.

[c]Safety protocols (see ES ISO19867-1) cover solid-fuel stoves only. For gaseous, liquid and alcohol stoves shall be tested as per ES ISO 23550 and 23551 all parts.

[d]Durability protocols (see ES ISO19867-1) evaluate common material failures in biomass cook stoves. The protocol is not comprehensive of all failures that might be found in the field, nor are the tests found in the durability protocol applicable for all cook stoves. Instead the durability protocol seeks to cover the most prevalent durability concerns found across a range of cook stove technologies and construction materials.

5. Technical requirements

5.1. General requirement

5.1.1. The clean cook stove shall be designed to reduce emission and improve thermal efficiency

5.1.2. The clean cook stove shall have attractive appearance with smooth surface, without burr or rust outside.

5.1.3. The Stove structure shall be designed to ensure safety and convenience for use

5.1.4. The clean cook stove shall be supplied with instruction leaflet

5.1.5. No part of the appliance shall contain any material known to be harmful such as asbestos.

5.1.6. The thermal insulation shall withstand normal thermal and mechanical stresses.

5.1.7. The gas and air regulator shall be easily adjusted by the consumer without the use of any extra tools.

5.2. Specific requirement

5.2.1. Material requirements

5.2.1.1. The combustion chamber shall be thermally stable with minimum temperature of 800 ^oC

5.2.1.2. For alcohol stove all metallic parts of the fuel container shall be made of stainless steel, aluminum or enameled mild steel metal

5.2.1.3. For alcohol stove if absorbent is used, it shall be ceramic fiber wool or other equivalent material capable of retaining liquid alcohol by surface tension. The wool fibers shall be spill-proof when the burner turned on its side or upside down.

5.2.1.4. For alcohol stove the flame regulator shall block alcohol from evaporating from the canister in the closed position.

5.2.1.5. For biogas Parts and components of stove should be of cast iron, steel, non-ferrous metal or corrosion resistant material conforming to the applicable national standards where their durability, thermal resistance, corrosion shall be checked as per ES ISO 19867 – 1 Annex F2.

5.2.1.6. For gaseous stove the nozzles, nozzle holders and liquid containing plates shall be of metal material with operation temperature of 500 0C. This shall be tested as per ES ISO 23550 and 23551 all parts.

5.2.2. Performance requirement

5.2.2.1. The stove shall have the following performance indicators and shall be computed in accordance with ES ISO 19867-1:

Type of stove	Thermal [a] efficiency %	Emissions [a]		Safety [b]	Durability [a]
		CO g/MJd	$PM_{2.5}$ mg/MJ d		
Natural draft solid biomass stove	≥20	≤7.2	≤ 321	≥ 77	< 20
Forced draft solid biomass stove	≥30	≤4.4	≤218	≥ 77	< 20
Charcoal	≥30	≤ 4 .4	≤218	≥ 77	< 20
Biogas	≥40	≤ 4 .4	≤ 62	≥ 86	< 15
Ethanol	≥40	≤ 4.4	≤ 62	≥ 86	< 15
LPG	≥ 50	≤ 3.3	≤ 5	≥ 95	< 15
a: The performance test (thermal and emission) and Durability of clean stove shall be tested in accordance with ES ISO 19867-1. b: For safety test ES ISO 19867 – 1 is applicable for solid fuel stoves and for gaseous, liquid and alcohol fuel stoves ES ISO 23550 and 23551 all parts shall be applicable.					

5.2.3. Manufacturing requirements for clean stoves

5.2.3.1. Castings shall have a good finish, without cracks, stomata (holes) and sand holes.

5.2.3.2. Weldment shall be flat, uniform without perforations and slag stomata.

5.2.3.3. Stamped parts have a good finish without cracks, wrinkles, flashes and burrs.

5.2.3.4. Sheet metal surfaces and edges shall have a good finish without cracks, wrinkles, bumps and any type of imperfection.

5.2.3.5. Riveted pieces shall be firmly attached and the rivets shall not be loose and/or skewed. Rivet heads shall be smooth and shall not protrude.

5.2.3.6. Ceramic parts shall have a good finish without cracks and voids (if applicable).

5.2.3.7. For stoves made of different parts such as ceramic core and a metal cladding, the parts shall be firmly assembled.

5.2.4. Assembling/Installing

The clean cook stove shall be assembled/ installed as per the assembling /installing guideline which is provided by manufacturer.

5.2.5. Safety use requirement

5.2.5.1. The insulation between the steel sheets/cladding and ceramic liner shall be made of non-combustible material.

5.2.5.2. Flames touching the cook pot shall be concealed and not able to come into contact with hands or clothing.

5.2.5.3. Flames in exiting fuel chamber shall not protrude from any fuel loading area and combustion chamber during use.

5.2.5.4. When a clean cooking stove is working normally, the surface, handle, canister and chimney temperature shall be less than 60^{o}c.

6. Packaging and labeling

6.1. Packaging

6.1.1. Clean cook stove should be packed for distribution.

6.2. Labeling

Clean cook stove label shall include the following information

a) name and address of manufacturer

b) name of product

c) trade mark if any

d) model number if any

e) serial number

f) performance indicators by Tier(Thermal efficiency ,emission ,safety and durability)

g) production date

Bibliography

ES ISO 18125, solid Bio fuel-determination of calorific value

ES ISO 4224, Ambient air –determination of carbon-monoxide-non-dispersive infrared spectrometric method

ES ISO 25597, Stationary sources emission-test method for determining PM2.5 and PM10 mass in stack gasses

ES ISO 9096, stationary source emission-manual determination of mass concentration of particulate matter

ES ISO 12039, Stationary source emission-determination of carbon-monoxide, carbon-dioxide and oxygen-performance characteristics and calibration of automated measuring systems

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Ethiopian Standards Agency

Organization and Objectives

The Ethiopian Standards Agency (ESA) is the national standards body of Ethiopia established in 2010 based on regulation No. 193/2010.ESA is established due to the restructuring of Quality and Standards Authority of Ethiopia (QSAE) which was established in 1970.

ESA's objectives are:-

- ❖ Develop Ethiopian standards and establish a system that enable to check whether goods and services are incompliance with the required standards,
- ❖ Facilitate the country's technology transfer through the use of standards,
- ❖ Develop national standards for local products and services so as to make them competitive in the international market.

Ethiopian Standards

The Ethiopian Standards are developed by national technical committees which are composed of different stakeholders consisting of educational Institutions, research institutes, government or ganizations, certification, inspection, and testing organizations, regulatory bodies, consumer association etc. The requirements and/ or recommendations contained in Ethiopian Standards are consensus based that reflects the interest of the TC representatives and also of comments received from the public and other sources. Ethiopian Standards are approved by the National Standardization Council and are kept under continuous review after publication and updated regularly to take account of latest scientific and technological changes.
Orders For all Ethiopian Standards, International Standard and ASTM standards, including electronic versions, should be addressed to the Documentation and Publication Team at the Head office and Branch (Liaisons) offices. A catalogue of Ethiopian Standards is also a vailable freely and can be accessed in from our website.

International Involvement

ESA, representing Ethiopia, is a member of the International Organization for Standardization (ISO), and Codex Alimentarius Commission (CODEX). It also maintains close working relations with the in ternational Electro-technical Commission (IEC) and American Society for Testing and Materials (ASTM).It is a founding member of the African Regional Organization for standardization (ARSO).

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