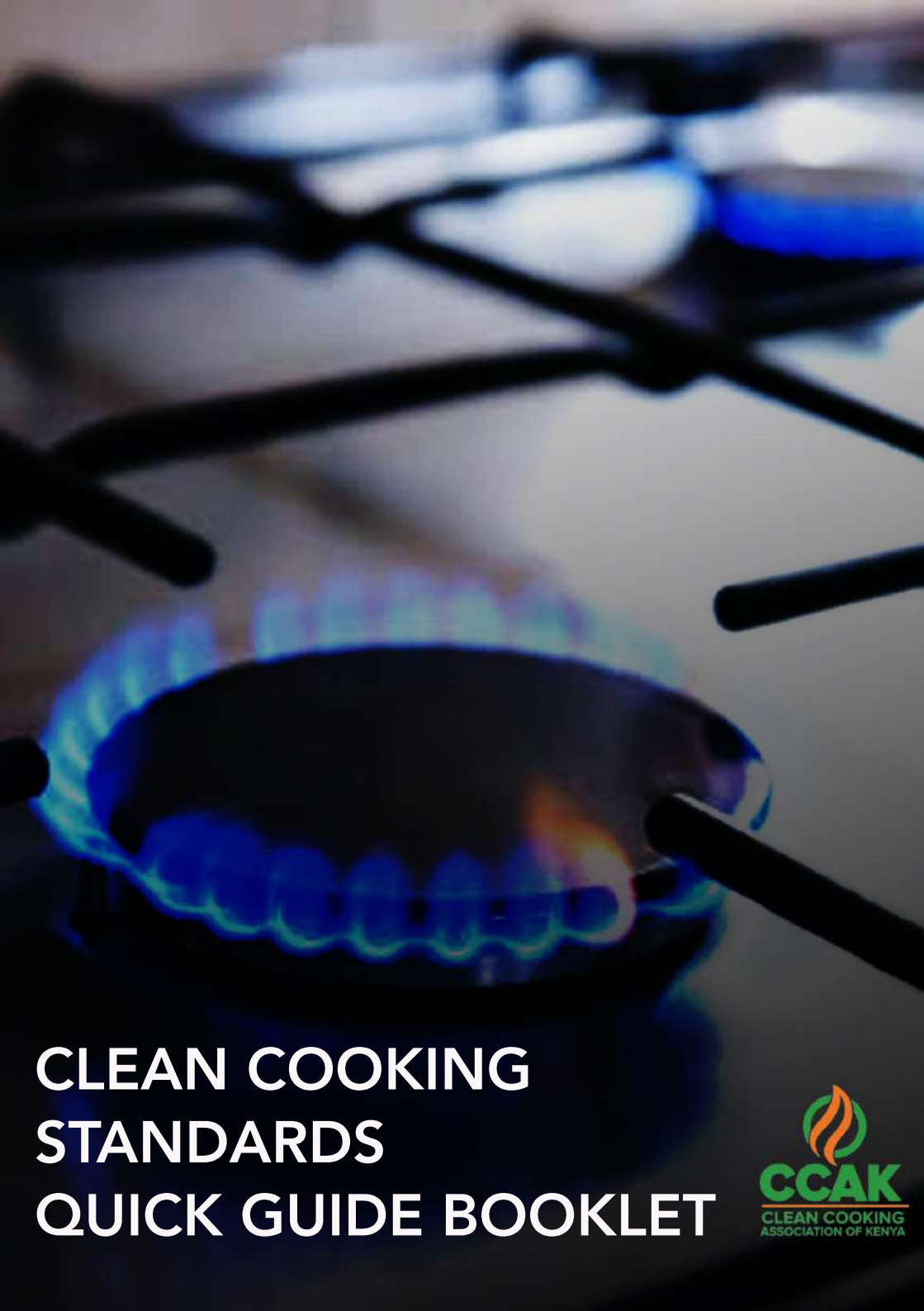


CLEAN COOKING STANDARDS QUICK GUIDE BOOKLET

CCAK
CLEAN COOKING ASSOCIATION OF KENYA

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Executive Summary

Clean Cooking Association of Kenya (CCAK), in its role as the sector champion and advocate for the clean cooking sector in the country, has collaborated with various stakeholders to develop this Quick Guide Booklet. Prepared by Lwanergy Infiniti Consulting, the booklet aims to enhance the understanding and adoption of clean cooking technologies and fuels in Kenya.

In partnership with the Kenya Bureau of Standards (KEBS), Kenya Industrial Research and Development Institute (KIRDI), ministerial departments, private sector entities, relevant NGOs, and sector members, CCAK has compiled sixteen approved clean cooking sector standards and the Global LEAP Electric Pressure Cooker Test Method into a comprehensive yet accessible guide.

This Quick Guide Booklet summarizes the contents of these standards, providing an easy-to-understand resource for stakeholders in the clean cooking sector. However, it is important to note that this booklet guide is NOT and should NOT be used as a replacement of the Kenya Standards but as a general information tool to understand the Standards as published. Users are advised to refer to the complete Kenya Standards documents when utilizing this guide.

The development of this Quick Guide Booklet underscores CCAK's commitment to promoting access to and adoption of clean cooking technologies and fuels in Kenya. By simplifying the understanding of relevant standards, this initiative empowers stakeholders to make informed decisions and contribute to the ongoing efforts in transitioning towards sustainable cooking practices.

Acknowledgement

The Clean Cooking Association of Kenya, in collaboration with GIZ and sector stakeholders, aims to enhance the understanding of clean cooking sector standards among its members. This initiative aims to enable quality production of technology and fuels, as well as catalyze the transition towards the adoption of clean cooking technologies and fuels by embracing clean energy standards awareness within the cooking sector.

We extend our sincere gratitude to the Kenya Bureau of Standards (KEBS) for their guidance in formulating the standard documents. Their efforts have been instrumental in streamlining and safeguarding the clean cooking and heating sector against harmful practices.

Our acknowledgment also goes to Lwanergy Infiniti Consulting Limited, whose invaluable contribution has simplified the understanding of the clean cooking sector standards through the development and design of this cooking sector standards quick guide booklet.

Furthermore, we would like to express our appreciation to the Clean Cooking Sector Technical Review Committee for their comprehensive review and input into the quick guide booklet. Their expertise has been crucial in ensuring the accuracy and relevance of the information provided.

The successful completion of this initiative is a testament to the collaborative efforts and dedication of all those involved. We are grateful for the contributions that have made this achievement possible.

What is a Quick Guide?

- Provides an overview or summary of key information related to a specific topic, product,or process. (Handy reference material for users)
- Primary purposed is to provide an easily accessible resource that allows users find the information needed and as a convenient reference tool that promotes efficiency and productivity

What this standard quick guide booklet is about

- This Quick Guide Booklet summarizes the contents of the selected clean cooking technologies and fuels standards reference in the tables of content.
- This Guide Booklet provides an easy-to-understand resource for stakeholders in the clean cooking sector, thereby underscoring CCAK's commitment to promoting access to and adoption of clean cooking technologies and fuels in Kenya.
- The Booklet simplifies the understanding of relevant standards, hence empowering stakeholders to make informed decisions and contribute to the ongoing efforts in transitioning towards sustainable cooking practices.

Scope of cooking solutions covered

- This standard booklet covers approved KEBS clean cooking technologies and fuels as reference in the table of content.

How to use the quick standard booklet

- Clean Cooking Association of Kenya requires that this quick guide booklet be used handy with the approved Kenya Standards.
- This booklet guide is NOT and should NOT be used as a replacement of the Kenya Standards but as a general information tool to understand the Standards as published.
- Users are advised to refer to the complete Kenya Standards documents when utilizing this guide.

About the Standards Quick Guide Booklet

What is a Kenyan Standard?

- A Kenyan Standard is a document established through consensus and approved by the Kenya Bureau of Standards (KEBS). It provides rules, guidelines, or characteristics for products, services, and related processes or production methods, with the aim of achieving an optimal level of order and consistency.
- A standard may focus solely on or include requirements related to terminology, symbols, packaging, marking, or labeling as they apply to a product, process, or production method.
- The primary purpose of a standard is to ensure that products and services meet their intended purpose and are comparable and compatible across different providers or manufacturers.

Who does the standards apply to?

- Standards apply to all sector stakeholders who distribute, produce, or handle theproducts referenced in the each and every approved standards.
- Standards also apply to consumers to ascertain quality on what they have purchased or intend to purchase.

Why use the standard?

- Standards specify the requirements for referenced products, their use, sources of raw materials and various key criteria to be adhered to while dealing in the products.
- Standard documents serve as a tool to enable efficient trading of biofuels with equipment manufacturers, as well as a tool for communication that enable good understanding between the seller and buyer.
- Standards facilitate authority permission procedures and reporting.

How to access the standards?

Standards are accessed through the Kenya Bureau of Standards by either online through their website, https://webstore.kebs.org/ or by a physical visit to the KEBS library.

- Approved standards are purchased from KEBS for use by the sector members during their production works.
- Standards are non-transferable and non-produceable. Sector members are advised to purchase own standards to guide their production activities.


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1) KS 1814: 2019 Biomass Cookstoves Performance requirements.

KS 1814:2019 illustrates the specific requirements for biomass stoves. It is a guidance to both the domestic and institutional stoves that utilize solid biomass fuels derived from organic products of agriculture and forest systems. Detailed Composition of the KS 1814:2019.

a)Standard scope.

- The standard specifies the performance requirements for both domestic and institutional stoves that utilize solid biomass fuels derived from organic products of agriculture and forest systems.

b)Standard normative reference.

- KS 1814:2019 has referenced KS 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.

c) Standard Terms and definitions.

- This section explains the definition to various biomass cookstoves related terms. The terms and definitions in the KS ISO 19867-1 have been approved to apply to the standard. These are captured in pages 1,2,3, and 4 of the KS 1814:2019.

d) Standard Symbols and abbreviations.

- Symbols used in the standard document have been defined under this section. These should apply for the purpose of the KS1814:2019.

e)Durability requirements.

- KS 1814:2019 has specified requirements for the cladding material thickness and protection against corrosion. Ceramic liner material and firing temperatures have also been outlined in this section.
- Additionally, specifications and requirement for the pot rests, insulation, water jackets, working life and the prohibition of use of hazardous materials as referenced from the EMCA Act has been explained under this section.

f) Safety requirements.

- Safety of the biomass stove has been captured under this section in various perspectives. The following components of safety have been well specified: Sharp edges and points, cookstoves tipping, containment of fuel, obstructions near cooking surface, surface temperature, heat transmission to surroundings, chimney and chimney building, flames surrounding the cook pot and flames/ fuel exiting fuel chamber.

g)Thermal performance requirements.

- A reference has been made under this section to the test methodology under the KS ISO 19867-1. The section specifies thermal efficiency for charcoal ceramic, wood ceramic cookstoves and for both the firewood and charcoal metallic stoves.
- The standard specifies the minimum thermal efficiency for the forced draft stoves which shall not be less than 45% for domestic biomass stoves and 45 % for institutional biomass stoves. Minimum cooking power for charcoal and firewood stove has been specified in accordance with KS ISO 19867-1.

h)Emissions.

- The standard captures emission components under page 7-8.
- Test methodology specified to be in accordance with KS ISO 19867-1. Maximum emissions for the PM2.5 and CO have been specified in Table 3-Stove emission requirements. (Ceramic firewood, Ceramic charcoal and charcoal, firewood others). This as well captured the gasifier stoves emissions specifications are explained.
- All institutional stoves shall be fitted with chimney and to focus on fugitive emissions with CO and PM2.5. emission.

i) Workmanship and finish.

- Defects on cookstoves and protection against corrosion are explained in this section. This shall ensure the stoves are in good appearance, durability, performance, and safety aspects during use.

j) Marking, packaging, storage, and usage.

- This section elaborates on the information to be displayed on marking the stoves (both portable and non-portable). They should be legibly and indelibly marked in a prominent position. For the packaging, this should comply with the user requirements. Refer to page 8 for required information for marking and packaging.

k)Standard Annexures.

- The standard is referenced a normative annex and an informative annex. These explains the following;

I. Determination of thermal conductivity of ceramic liner - This normative section explains the general requirements for determining thermal conductivity of ceramic liner, procedure, transient hot wire for comparison and calculations.
II. Default values for PM2.5 and CO - This captures the Default emission factors, rates, equivalent concentrations and % homes meeting specified criteria for PM2.5 and for CO.


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2) KS 2759:2018 Ethanol Fueled cooking Appliances - Specifications.

KS 2759:2018 outlines the requirements for ethanol-fueled appliances used for cooking and heat generation in households. However, it does not cover the requirements for lamps. The standard specifies the sector requirements for ethanol-fueled appliances, including materials, construction, performance, finishing, packaging, marking, instructions, warnings, inspection, and test methods. These requirements ensure the suitability of the appliances for use with ethanol fuel in household cooking and heating applications.

Detailed Composition of the KS 2759:2018.

a)Standard scope.

- The scope specifies the requirements for ethanol fueled appliances for cooking and heat generation, with exception for lamps.

b)Standard normative reference.

- This standard has referenced ASTM E3050-16, Denatured ethanol for use as cooking and appliance fuel and ARP 448, Ethanol gel used for cooking and other gel burning appliances.

c) Standard Terms and definitions.

- The standards document has provided definitions for the terms and definitions which shall apply. These are: "acceptable," "appliance", "denatured technical alcohol", "ethanol gel" and "roll boiling"

d) Standard Requirements.

- This section of the standard elaborates the general materials required for the appliances, its construction, performance of the appliance which includes the filling, ignition, combustion, power output, flame regulator, emissions, rigidity, stability, surface temperature, durability, and finish. Additional specific material requirements are also described in the section.

e) Packing, Marking and Warning, Instructions, and warning.

- In this section, KS 2759 specifies the right packing of the appliances during transportation to prevent damage. Marking, instructions and warning on usage and handling are also provided. These increases visibility, safety and ensure proper use of appliances.

f)Inspections and Method of tests.

- This section describes the inspection criteria and the test methods. It further elaborates on the test room conditions and preparation of appliances and their inspection.
- Nine tests have been described in the section which includes: combustion performance test, determination of power output, emission test, rigidity test, stability test, shutting of the appliance test, surface temperature durability test and corrosion resistance test for ethanol gel fuel stove.

3) KS 2838:2019: Denatured Technical Alcohol for use as cooking and appliance fuel - Specifications

KS 2838:2019 elaborates on the usage, composition, identification, test methods and marking requirements for the technical alcohol which offers affordable clean cooking fuel to low-income households replacing the use of paraffin and dirty fuels for lighting and cooking.
It defines handling of the denatured technical alcohol to be in accordance with the current government of Kenya's Customs and Excise Regulations, with an exception for the oral medicine use.

Detailed Composition of the KS 2838:2019.

a)Standard scope.

The scope specifies the usage of technical denatured alcohol as for cooking and for appliance fuel. The usage must be in accordance with the current Kenya Customs and Excise Regulations with an exception for oral medical use.

b)Standard normative reference.

KS 2838:2019 has referenced KS 608, Neutral spirit for manufacture of alcoholic beverages — Specification; KS 1181, Specification for methyl isobutyl ketone (4-methyl penta n-2-one) and KS EAS 38, Labelling of pre-packaged foods — General requirements under the normative reference.

c)Standard Terms and definitions.

The standard has provided definitions for the term's denaturant and the denatured technical alcohol. A denaturant is defined as a completely miscible chemical substance added to alcohol to render it unpalatable and unfit for human consumption, whereas denatured technical alcohol is made by the addition of denaturants.

d)Standard Requirements.

This section of the standard illustrates the necessary composition of the denatured technical alcohol for use as cooking and for appliance fuel. For satisfaction of use, the following must be tested: Appearance, Density, Alcohol content, pH, colored dye, residue on evaporation, miscibility, water content, acidity, aldehydes, and ketones.

These characteristics must be tested in accordance to the methods specified in the standards document in Table1 –Requirements for technical alcohol for use as cooking and appliance fuel.

e) Workmanship, Sampling, Packaging and Labelling.

KS 2838:2019 has additional context on Workmanship which protects the denatured technical alcohol from any adulteration or contaminant that may render it unsafe for the specified usage. The section on sampling and sample size is referenced for Annex E of the standard's document KS 2838.

Packaging for the denatured technical alcohol is elaborated to be in safe and suitable containers protected from any foreign substances or Oduors and any contamination to the product should be protected.

The standard specifies the label requirements as per the KS EAS 38. These shall comprise of the name of the product, name and address of the manufacturer, net contents, names of the denaturant, batch/lot number, minimum ethyl alcohol content, year of manufacture, country of origin and the words "highly flammable" or "highly poisonous"

f) Standard Annexures.

The standard is referenced to five normative annexures. These includes the test for:

I. Determination of residue on evaporation

- The evaporation content should not exceed 0.01% by volume mass of the 100ml of denatured alcohol tested.

II. Miscibility with water

- The denatured technical alcohol should be miscible when mixed with distilled water.

III. Detection of alkalinity or determination of acidity

- The test explains the content of the reagent to be used.
- The test results as per the Annex C, shall not have an acidity percentage by mass exceeding 0.010.

IV. Determination of aldehydes and ketones

- The test explains the content of the reagent to be used.
- The test results as per Annex D, shall not have an Aldehydes and ketones percentage by mass exceeding 0.2.



example of denatured Technical Alcohol used as cooking and appliance fuel

4) Solid Biomass: KS ISO 17225 – (1-9) of the Solid biofuels — Fuel specifications and classes.

The KS ISO 17225 – (1-9) was prepared by KEBS/TC 092 on Renewable Energy and energy management which mirrors ISO/TC 238 on Solid biofuels. The series illustrates the scope, normative references, terms and definitions, symbols and abbreviated terms and specifications for relevant fuels separately covered in series 1-9.

Detailed Composition of the KS ISO 17225-(1-9).

This guide illustrates the components of nine series of the KS ISO 17225 as below:



Part 1: General requirements
Part 2: Graded Wood Pellets
Part 3: Graded wood briquettes
Part 4: Graded wood chips
Part 5: Graded firewood
Part 6: Graded non-woody pellets
Part 7: Graded non-woody briquettes
Part 8: Graded thermally treated and densified biomass fuels.
Part 9: Graded hog fuel and wood chips for industrial use

The KS ISO 17225 series component is explained into five key sections namely; the Scope, Normative reference, Terms and definitions, Symbols and Abbreviated Terms, Specifications/Classifications, and Annexes.

Part 1: General Requirements.

a)Scope.

This part of the KS ISO 17225 explains the fuel quality classes and specifications for solid biofuels of raw and processed materials. These are categorized into originating sources as; forestry and arboriculture; agriculture and horticulture; and aquaculture.

The part also clarifies on the chemically treated materials as not to include halogenated organic compounds or heavy metals at levels higher than those in the typical virgin material values or higher than typical values of the country of origin as displayed in the series Annex B.

b) Normative reference.

The standard has referenced documents which some or all of their content constitutes requirements of this Part 1 of the KS ISO 17225. These incudes ISO 14780, ISO 16559, ISO 16948, ISO 16967, ISO 16968, ISO 16993, ISO 16994, ISO 17827-1, ISO 17827-2, ISO 17828, ISO 17829, ISO 17831-1, ISO 17831-2, ISO 18122, ISO 18123, ISO 18125, ISO 18134-1, ISO 18134-2, ISO 18135, ISO 18847, ISO 21945, ISO 21404, and ISO 18846.

c) Standard Terms and definitions.

- This part of KS ISO 17225 has references terminologies as to be found from the ISO 16559, Solid biofuels — Terminology, definitions and descriptions.
- Two different terminologies are further described in the classic series; chemical treatment (with examples in informative Annex C) and commercial application (A note to not confuse commercial application with industrial applications is provided).

d) Symbols and abbreviated terms.

- This section expounds on the standard's abbreviated terms which are confirmed to fully conform to the SI system of units. The designation symbols must be used in combination with a number to specify property levels in Tables 3 to 15 of the document. The section further describes the designation of chemical properties, where chemical symbols such as S (sulfur), Cl (chlorine), and N (nitrogen) are used and the property class is added at the end of the symbol.

e) Principle.

- This section outlines the specification of the solid biofuels into: a) origin and source as per Clause 6; and b) major traded forms and properties, as per Clause 7.
- Table 1 of this document provides contents for the specification of origin and source, while Table 2 provides the contents for the major traded forms. The standard's document further provides the specification of properties as per Tables 3 to 15, while the major traded forms of solid biofuels as per Tables 3 to 14. Under the same section, Table 15 is provided as general master table to be used for a specification of solid biofuels not covered by Tables 3 to 14.

f) Classification of origin and sources of solid biofuels

This section is described into:

I. General

- Under this classification, a basis on the biofuel origin and source is considered. This is as displayed in the hierarchical classification system in Table 1. The groupings are well described within this section, and they include;

a) Woody biomass;
b) Herbaceous biomass;
c) Fruit biomass;
d) Aquatic biomass;
e) Blends and mixtures.

- Several notes are provided under this classification section including eliminating the use of driftwood from saltwater as a fuel.

biofuel forms with an allowance of other traded forms to be used.

i) Woody biomass

This is explained as per section 6.2 of the standard document. It expounds on the classification of various woody biomass comprising of: Forest, plantation and other virgin wood, By-products and residues from wood processing industry, used wood, Blends and mixtures.

ii)Herbaceous biomass

These are classified into three; Herbaceous biomass from agriculture and horticulture, By-products and residues from food and herbaceous processing industry, Blends, and mixtures – which refers to blends and mixtures of herbaceous biomass in the groups 2.1 to 2.2 provided in Table 1 of the standard document. It further explains the mixing as being intentional (blends) or unintentional (mixtures).

iii) Fruit biomass

These are classified into; Orchard and horticulture fruit, By-products and residues from food and fruit processing industry, and Blends and mixtures.

iv) Aquatic biomass

This describes Aquatic species divided into: algae, water hyacinths, lake and sea weed.

v)Biomass blends and mixtures

This describes the intentional and non-intentional nature of mixing of different biomasses.

I. Specification of solid biofuels based on traded forms and properties

The document expounds on the two specifications:

i) Traded forms of solid biofuels –

This explains on the different traded sizes and shapes of solid biofuels. It affirms the size and shape to be influencing the handling of the fuel as well as its combustion properties. It further provides a reference Table 2 for various biofuel forms with an allowance of other traded forms to be used.

ii)Specification of properties of solid biofuels

Under this section, the standard refers to listed documents in Clause 2 to be used for sampling procedures (ISO 18135 or ISO 21945), sample preparation (ISO 14780) and analysis of determination of properties of solid biofuels.

- This section provides for references to the denominations given in Tables 3 to 15 for normative and informative properties.
- The section states that only chemically treated biomass referred to as in Tables 3 to 15 should be considered – but not any other. For wood waste which can contain halogenated organic compounds or heavy metals more than virgin wood as a result of treatment with wood preservatives or coating, are not included. The section further refers to Annex C of the standard for the chemical treatments.
- Tables of specification references are additionally displayed from this section as outlined below:

  Table 3 — Specification of properties for briquettes
  Table 4 — Specification of properties for pellets
  Table 5 — Specification of properties for wood chips and hog fuel
  Table 6 — Specification of properties for log wood, firewood
  Table 7 — Specification of properties for sawdust
  Table 8 — Specification of properties for shavings
  Table 9 — Specification of properties for bark
  Table 10 — Specification of properties for bales of straw, reed canary grass and Miscanthus
  Table 11 — Specification of properties for energy grain
  Table 12 — Specification of properties for olive residues
  Table 13 — Specification of properties for fruit seeds
  Table 14 — Specification of properties for charcoals
  Table 15 — General master table for specification of properties for other solid biofuels

- The standard further provides annexes for both normative and informative references as below:
- Annex A (informative): Illustrations of typical forms of wood fuels and examples of particles sizes for wood chips and hog fuel

  A.1 Visually classifying wood fuels based on a typical particle size
  A.2 Visual differentiation between wood chips and hog fuel
  A.3 Examples of particle size distribution for wood chips and hog fuel

- Annex B (informative): Typical values of solid biomass fuels

  Table B.1 — Typical values for virgin wood materials, without or with insignificant amounts of bark, leaves, and needles
  Table B.2 — Typical values for virgin bark materials
  Table B.3 — Typical values for virgin wood materials, logging residues
  Table B.4 — Typical values for virgin wood materials, short rotation coppice
  Table B.5 — Typical values for virgin straw materials, with insignificant amounts of grains

Table B.6 — Typical values for virgin cereal grain materials
Table B.7 — Typical values for virgin reed canary grass
Table B.8 — Typical values for virgin grass in general (hay) and miscanthus
Table B.9 — Typical values for olive and grape cake
Table B.10 — Typical values for fruit stones and shells
Table B.11 — Typical values for selected types of husks, stalks, cotton gin trash and malva.

- Annex C (informative): Examples of possible causes for deviant levels for different properties and of consequences of handling and treatments for the properties of biomass.

Table C.1 — Examples of possible causes for deviant levels for different properties.
Table C.2 — Examples of consequences of handling and treatments for the properties of biomass

- Annex D (informative): Calculation of the net calorific value at different bases and energy density as received.

D.1 The net calorific value of dry basis
D.2 The net calorific value as received
D.3 Energy density as received

- Annex E (informative): Comparison of moisture content as received and dry basis.

Table E.1 — Comparison of moisture content as received (M) and dry basis (U)

Part 2: Graded Wood Pellets

a)Scope.

- This series of KS ISO 17225 recommends the use of graded wood pellets for residential, small commercial and public buildings as well as industrial energy generation applications, which require classified pellet quality. It further justifies why the need for high quality fuel for residential, small and commercial and public building.
- The document states to determine fuel quality classes and specifications of graded wood pellets for non-industrial and industrial use, hence this series (Part2) covers only wood pellets produced from: Forest, plantation and other virgin wood; By-products and residues from wood processing industry; and chemically untreated used wood.
- This part omits the thermally treated biomass pellets e. torrefied pellets.

b) Normative reference.

- Part 2 of KS ISO 17225 has referenced documents which some or all of their content constitutes its requirements. These incudes; ISO 14780, ISO 16559, ISO 16948, ISO 16968, ISO 16994, ISO 17225-1:2021, ISO 17828, ISO 17829, ISO 17830, ISO 17831-1, ISO 18122, ISO 18125, ISO 18134-1, ISO 18134-2, ISO 21404, ISO 21945, and ISO 18135.

c) Standard Terms and definitions.

- This part of the KS ISO 17225 has referenced terminologies as to be found from the ISO 16559, Solid biofuels — Terminology, definitions and descriptions.
- Additional terminologies are further described in the standard series as; additive, biofuel pellet, chemical treatment, coarse pellet fines – CPF, commercial application, fines – F, woody biomass, and wood pellet.

d) Symbols and abbreviated terms.

- This section expounds on the standard's abbreviated terms which are confirmed to fully conform to the SI unit's systems. It further explains that the designation symbols must be used in combination with a number to specify property levels as referenced in Tables 1 and 2. Additionally, it explains the designation of chemical properties, such as symbols for S (sulfur), Cl (chlorine), and N (nitrogen) which are to be used and the property class is added at the end of the symbol.

e) Specification of graded wood pellets

- The document expounds on the specifications of the wood pellets as reference to be in accordance with Table 1, Table 2 and Figure 1 of this standard part. It further refers to the sampling, sample preparation and analysis of the properties of the wood pellets to be carried out as per the methods mentioned in the normative references in Clause 2 of the standard.

- This section explains as well on the property classes of the virgin wood and chemically untreated wood residues, vis-à-vis the chemically treated wood by-products and residues from wood processing industry.
- Tables of specification references are additionally displayed from this section as outlined below:

  Table 1 — Specification of graded wood pellets for commercial and residential applications

  Table 2 — Specification of graded wood pellets for industrial use

Part 3: Graded wood briquettes

a) Scope.

- This series of KS ISO 17225 supports the use of graded wood briquettes for residential, small commercial and public building applications. It further justifies the need for high quality fuel for both residential, small commercial and public building applications.
- This series requires a general understanding of the standards based on and supporting KS ISO 17225-1. It is recommended to obtain and use KS ISO 17225-1 in conjunction with this document.
- The document states to determine the fuel quality classes and specifications of graded wood briquettes. It specifically covers wood briquettes produced from; Forest, plantation and other virgin wood, By-products and residues from wood processing industry and chemically untreated used wood.
- This part omits the thermally treated biomass briquettes.

b) Normative reference.

- Part 3 of KS ISO 17225 has referenced documents which some or all of their content constitutes its requirements. These incudes; ISO 14780, ISO 16559, ISO 16948, ISO 16968, ISO 16994, ISO 17225-1, ISO 18122, ISO 18125, ISO 18134-1, ISO 18134-2, ISO 18135, ISO 18847, and ISO 21945.

c) Standard Terms and definitions.

- This part of KS ISO 17225 has referenced terminologies as to be found from the ISO 16559, Solid biofuels — Terminology, definitions and descriptions.
- Additional terminologies are further described in the standard series as; additive, biofuel briquette, chemical treatment, commercial application, woody biomass, and wood briquette.
- This series eliminates the trace amounts of e.g., grease or other lubricants that are introduced into the fuel processing stream as part of normal mill operations from being considered as additives.

d) Symbols and abbreviated terms.

- This section expounds on the standard's abbreviated terms which are confirmed to fully conform to the SI system of units. It further explains that the designation symbols must be used in combination with a number to specify property levels as referenced in Tables 1. Additionally, it explains the designation of chemical properties, such as symbols for S (sulfur), Cl (chlorine), and N (nitrogen) which are to be used and the property class is added at the end of the symbol.


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e) Specification of graded wood briquettes

- This series part explains the specifications of the wood briquettes as reference to be in accordance with Table 1, and Table 2 of this standard part. It further refers to the Sampling, sample preparation and analysis of the properties of the wood pellets to be carried out as per the methods mentioned in the normative references in Clause 2 of the standard.
- This section explains as well on the property classes of the virgin wood and chemically untreated wood residues, vis-à-vis the chemically treated wood by-products, residues, fibers and wood constituents.
- Figures and Tables of specification references are additionally displayed from this section as outlined below:
  Table 1 — Particle size of graded wood chips
  Table 2 — Specification of graded wood chips
- In its last section, the series outlines list of Annexes and bibliography for reference.
- Annex A (informative): General guidelines for bulk density of graded wood chips
  Table A.1 — Range of bulk densities

Part 5: Graded firewood

a)Scope.

- This series of the KS ISO 17225 supports the use of graded firewood for residential, small commercial and public buildings which require classified firewood quality.
- This series requires a general understanding of the standards based on and supporting KS ISO 17225-1. It is recommended to obtain and use KS ISO 17225-1 in conjunction with this document.

b) Normative reference.

- The standard document has referenced various contents which constitutes its requirements. These incudes; ISO 14780, ISO 16559, KS ISO 17225-1:2021, ISO 18134-1, ISO 18134-2, and ISO 21945.

c)Standard Terms and definitions.

- This part of the KS ISO 17225 has referenced terminologies as to be found from the ISO 16559, Solid biofuels — Terminology, definitions, and descriptions.
- Additional terminologies are further described in the standard series as; firewood, and commercial application.



- A clarification is provided for the firewood uniform length, typically ranging from 15 cm to 100 cm. Similarly, its noted that cut-offs from virgin wood to be also used as a firewood.
- The section provides additional note to not confuse "commercial applications" with "industrial applications", which can utilize a much wider array of materials and have vastly different fuel requirements.

d)Symbols and abbreviated terms.

- This section expounds on the standard's abbreviated terms which are confirmed to fully conform to the SI system of units. It further explains that the designation symbols have to be used in combination with a number to specify property levels as referenced in Table 1.

e)Specification of graded firewood

- This series part explains the specifications of the graded firewood as referenced to be in accordance with Table 1, and Figure 1 of this standard part.
- This section states that firewood amounts to be given in cubic meters or in kilograms, with the conversion rates between the volumes affected by the size of the logs and how they are arranged. Comparison of different cubic meters is shown in Annex B of the document.
- The document recommends fuel analysis to be carried out to identify chemical impurities such as halogenated organic compounds or heavy metals only in situations where any operator in the fuel supply chain has reason to suspect serious contamination of the biomass or of the soil (e.g., coal slag heaps) or if planting has been used specifically for the sequestration of chemicals or growing biomass is fertilized with sewage sludge (issued from waste water treatment or chemical process).
- Clarification on the "firewood decay" is explained as a loss of mass and energy, however, an exclusion to this is when damages by insects, incipient rot and mold occurs, this is not considered to be loss of mass and energy.
- This document requires the quality of the firewood to be provided either in the product declaration or by a corresponding label in the package.

- Figures and Tables of specification references are additionally displayed from this section as outlined below:

  Figure 1 — Dimensions of oven-ready firewood
  Table 1 — Specification of graded firewood



- In its last section, the series outlines list of Annexes and bibliography for reference.
- Annex A (informative): Comparison of moisture content as received and dry basis

  Table A.1 — Comparison of moisture content as received (M) and dry basis (U)
- Annex B (informative): Measurement of firewood

  Figure B.1 — Comparison of different cubic meters (1 m each side)

  Figure B.2 — Measurement of firewood diameter

- Annex C (informative): Calculation of energy density

  C.1 Calculation of net calorific value as received (Q)

  C.2 Calculation of energy density (E)

Part 6: Graded non-woody pellets

a)Scope.

- This series of the KS ISO 17225 recommends the use of graded non-woody pellets in specially designed appliances for residential, small commercial and public buildings as well as industrial energy generation applications, which require classified pellet quality.
- The document states to determine the fuel quality classes and specifications of graded non-woody pellets and covers only non-woody pellets produced from: Herbaceous biomass; Fruit biomass; Aquatic biomass and Biomass blends and mixtures
- This part omits the thermally treated biomass pellets e. torrefied pellets.

b) Normative reference.

- Part 6 of KS ISO 17225 has referenced documents which some or all of their content constitutes its requirements. These incudes; ISO 14780, ISO 16559, ISO 16948, ISO 16968, ISO 16994, ISO 17225-1:2021, ISO 17828, ISO 17829, ISO 17831-1, ISO 18122, ISO 18125, ISO 18134-1, ISO 18134-2, ISO 18135, ISO 21404, ISO 21945, and ISO 18846.

c)Standard Terms and definitions.

- This part of the KS ISO 17225 has referenced terminologies as to be found from the ISO 16559, Solid biofuels — Terminology, definitions and descriptions.
- Additional terminologies are further described in the standard series as; additive, biofuel pellet, chemical treatment, commercial application, non-woody biomass, and non-woody pellet.

d) Symbols and abbreviated terms.

- This section expounds on the standard's abbreviated terms which are confirmed to fully conform to the SI unit system. It further explains that the designation symbols must be used in combination with a number to specify property levels as referenced in Tables 1.
- Additionally, it explains the designation of chemical properties, such as symbols for S (sulfur), Cl (chlorine), and N (nitrogen) which are to be used and the property class is added at the end of the symbol.

e) Specification of graded wood pellets

- The document expounds on the specifications of the non-woody pellets as referenced to be in accordance with Table 1 and Figure 1 of this standard part.

- The documents clarify the chemical treatment before harvesting biomass which does not need to be stated. However, in cases where any operator in the fuel supply chain has reason to suspect severe contamination of the biomass or the soil (e.g., coal slag heaps) or if planting has been explicitly used for the sequestration of chemicals or growing biomass is fertilized by sewage sludge (originating from wastewater treatment or chemical process), then fuel analysis should be carried out to identify chemical impurities such as halogenated organic compounds or heavy metals.

- The standard also states the requirement of clearly describing the "actual origin of the raw materials in case of raw materials belonging to chemically treated herbaceous and fruit biomass as referenced in part 1 of the KSISO 17225-Table 1.
- To further protect the user, the standard series expects the end-user to receive pellets with a low level of fines; therefore, the producer shall state the number of fines when leaving the final point of loading for delivery to the end-user.
- Tables and figures of specification references are additionally displayed from this section as outlined below:

Figure 1 — Dimension of pellets
Table 1 — Specification of pellets produced from herbaceous biomass, fruit biomass, aquatic biomass and blends and mixtures



Part 7: Graded non-woody briquettes

a)Scope.

- This series of the KS ISO 17225 recommends using graded non-woody briquettes in specially designed appliances for residential, small commercial, and public building applications and industrial use.
- The document states to determine the fuel quality classes and specifications of graded non-woody briquettes and covers only non-woody briquettes produced from Herbaceous biomass; Fruit biomass; Aquatic biomass, and Biomass blends and mixtures
- This part omits the thermally treated biomass briquettes, i.e., torrefied briquettes.

b) Normative reference.

- Part 7 of KS ISO 17225 has referenced documents which some or all of their content constitutes its requirements. These incudes; ISO 14780, ISO 16559, ISO 16948, ISO 16968, ISO 16994, ISO 17225-1:2021, ISO 18122, ISO 18125, ISO 18134-1, ISO 18134-2, ISO 18135, ISO 18847, and ISO 21945.

c)Standard Terms and definitions.

- This part of the KS ISO 17225 has referenced terminologies as to be found from the ISO 16559, Solid biofuels — Terminology, definitions and descriptions.
- Additional terminologies are further described in the standard series as; additive, biofuel briquette, chemical treatment, commercial application, non-woody biomass, and non-woody briquette.

d)Symbols and abbreviated terms.

- This section expounds on the standard's abbreviated terms which are confirmed to fully conform to the SI system of units. It further explains that the designation symbols must be used in combination with a number to specify property levels as referenced in Table 1.
- Additionally, it explains on the designation of chemical properties, such as symbols for S (sulfur), Cl (chlorine), and N (nitrogen) which are to be used and the property class is added at the end of the symbol.

e)Specification of graded non-woody briquettes

- The document expounds on the specifications of the non-woody briquettes as referenced to be following Table 1 and Figure 1 of this standard part.



The document clarifies the chemical treatment before harvesting of biomass which does not need to be stated; however, in cases where any operator in the fuel supply chain has reason to suspect severe contamination of the biomass or the soil (e.g., coal slag heaps) or if planting has been explicitly used for the sequestration of chemicals or growing biomass is fertilized by sewage sludge (originating from wastewater treatment or chemical process), then fuel analysis should be carried out to identify chemical impurities such as halogenated organic compounds or heavy metals.

Tables and figures of specification references are additionally displayed from this section as outlined below:

Figure 1 — Dimensions of briquettes

Table 1 — Specification of graded non-woody briquettes

Part 8: Graded thermally treated and densified biomass fuels

a)Scope.

This series of the KS ISO 17225 recommends the use of thermally treated and densified biomass for household, small commercial and public building as well as industrial energy generation applications, which require classified quality.

The standard document states to determine the fuel quality classes and specifications of graded densified solid biofuels produced from thermally treated biomass for non-industrial and industrial use. This covers pellets and briquettes produced from the following raw materials as per Table 1 of KS ISO 17225-1:2014: Forest, plantation, and other virgin wood; By-products and residues from wood processing industry; chemically untreated used wood; herbaceous biomass; Fruit biomass; Aquatic biomass with their subcategories included.

b)Normative reference.

Part 8 of KS ISO 17225 has referenced documents which some or all their content constitutes its requirements. These are; ISO 16948, ISO 16968, ISO 16994, KS ISO 17225-1:2014, ISO 17828, ISO 17829, ISO 17831-1, ISO 18122, ISO 18123, ISO 181251 ISO 18134-1, ISO 18134-2, ISO 18846, and ISO 18847.

c)Standard Terms and definitions.

This part of the KS ISO 17225 has referenced terminologies as to be found from the ISO 16559, Solid biofuels — Terminology, definitions and descriptions.

Additional terminologies are further described in the standard series as; pellets made by thermal processing, briquettes made by thermal processing, and commercial application.

d)Symbols and abbreviated terms.

- This section expounds on the standard's abbreviated terms, which are confirmed to conform to the SI unit's system fully. It further explains that the designation symbols must be combined with a number to specify property levels, as referenced in Tables 1 and 4. It also describes the designation of chemical properties, such as symbols for S (sulfur), Cl (chlorine), and N (nitrogen), which are to be used, and the property class is added at the end of the symbol.

e) Specification of graded pellets & briquettes produced by thermal processing

- The document expounds on the specifications of graded pellets produced by thermal processing as referenced to be in accordance with Table 1, Table 2 and Figure 1 of this standard part, while the specifications for of graded briquettes produced by thermal processing in accordance with Table 3, 4 and Figure 2.
- The document requires the quality of the fuel to be given either in the product declaration or by a corresponding label on the package.
- Tables and figures of specification references are additionally displayed from this section as outlined below:

Table 1 — Specification of graded pellets produced by thermal processing of woody biomass

Table 2 — Specification of graded pellets produced by thermal processing of non-woody biomass

Table 3 — Specification of graded briquettes produced by thermal processing of woody biomass

Table 4 — Specification of graded briquettes produced by thermal processing of non-woody biomass

Figure 1 — Dimension of pellets

Figure 2 — Examples of briquette shapes with associated dimensions

Part 9: Graded hog fuel and wood chips for industrial use

a)Scope.

- This series of the KS ISO 17225 supports the use of graded hog fuel and wood chips for industrial heat and power generation applications, which require graded hog fuel and wood chips.
- This series requires a general understanding of the standards-based on and supporting KS ISO 17225-1. It is recommended to obtain and use KS ISO 17225-1 in conjunction with this document.
- The document determines the fuel quality classes and specifications of graded hog fuel and wood chips for industrial use. It covers only hog fuel and wood chips produced from the following raw materials: -Forest, plantation, and other virgin wood; By-products and residues from wood processing industry; Used wood; and Blends and mixtures.

b)Normative reference.

- The standard document has referenced various contents which constitutes its requirements. These incudes; ISO 14780, ISO 16559, ISO 16948, ISO 16968, ISO 16994, KS ISO 17225-1, ISO 17827-1, ISO 18122, ISO 18125, ISO 18134-1, ISO 18134-2, ISO 18135, ISO 19743, and ISO 21945.

c) Standard Terms and definitions.

- This part of the KS ISO 17225 has referenced terminologies as to be found from the ISO 16559, Solid biofuels — Terminology, definitions, and descriptions.
- Additional terminologies are further described in the standard series as; chemical treatment, contamination, heavy extraneous materials, and inorganic matter.

d) Symbols and abbreviated terms.

- This section expounds on the standard's abbreviated terms which are confirmed to fully conform to the SI unit's system. It further explains that the designation symbols have to be used in combination with a number to specify property levels as referenced in Tables 1 and 2.
- Additionally, it explains on the designation of chemical properties, such as symbols for S (sulfur), Cl (chlorine), and N (nitrogen) which are to be used and the property class is added at the end of the symbol.

e) Specification of graded hog fuel and wood chips for industrial use

- This series part explains on the specifications of the wood briquettes as reference to be in accordance with Table 1, and Table 2 of this standard part. It further refers to the Sampling, sample preparation and analysis of the properties of the wood pellets to be carried out as per the methods mentioned in the normative references in Clause 2 of the standard.
- This section explains as well on the property classes of the virgin wood and chemically untreated by-products and wood residues with or without bark. It also extends the origin and source chemically treated industrial by-products and residues, chemically untreated used wood, forest, plantation, used wood and blends and mixtures.
- Figures and Tables of specification references are additionally displayed from this section as outlined below:

  Table 1 — Particle size of graded hog fuel and wood chips for industrial use
  Table 2 — Specification of graded hog fuel and wood chips for industrial use


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5) KS 2912:2020: Solid Biofuel – Sustainable Charcoal and Carbonized Briquettes for household and commercial use – Specification

The KS 2912:2020 explains the scope, normative references, terms and definitions, requirements, inspection, and methods of test, packing and marking of…. The standard document was referenced from the SANS 1399:2008, South African Standard, wood charcoal and carbonized briquettes for household use. It was prepared by the Solid Biofuels and Industrial Solvents Technical Committee in conjunction with Chemical Technical Committee under the guidance of the Standards Projects Committee.

Detailed Composition of the KS 2912:2020

a)Scope.

- KS 2912:2020 outlines the requirements and test methods for the sustainably produced charcoal and carbonized briquettes under its scope. The scope highlights the sources of raw materials from which the products must be produced from (refer to the standard scope – page 1 of the KS 2912:2020)

b) Normative reference.

- KS 2912: 2020 has referenced KS ISO 3310-2, Test sieves – Technical requirements and testing – Part 2: Test sieves of perforated metal plate. Additionally, the section clarifies the use of editions cited, or the latest editions of the referenced documents in case the references are undated.

c)Standard Terms and definitions.

- This standard has defined specific terminologies to be considered by its users. These includes definitions of; acceptable, ash content, binder, biochar, charcoal, sustainable charcoal, sustainable feedstock, efficient carbonization technology, carbonized briquette, fixed carbon content, moisture content, untreated wood, volatile matter content, foreign matter, additives, defective, calorific value, and density.

d)Requirements.

- Under this section of the KS 2912: 2020 has described the type of raw material to be biomass materials which shall have to be such as to be acceptable. It further elaborates on the products being free from foreign matter, while the additives and binders must be such as to be acceptable.
- This section as well clarifies on the physical requirements and the chemical requirements of the sustainably produced charcoal and carbonized briquettes.

- For physical requirements, the standard guides on the required shape and sizes of the product. These further are guided as per the sieve analysis tests, resistance to dropping tests for both charcoal and carbonized briquettes. Guidance on the allowable retention mass for both the tests are provided under this section.
- Chemical requirements are addressed within this section as per the moisture content test, volatile matter content test, ash content, fixed carbon content and calorific value tests, where bare minimum limits are provided as per the tests in section 5 of the KS 2912:2020.

e)Inspection and methods of test.

- KS 2912:2020 elaborates on test and inspection methods as per the physical and chemical requirement of sustainable produced charcoal and carbonized briquettes.
- For inspection, the standard requires a visual inspection of the samples drawn for tests in line with the guidance in Annex B of the standard (B2.2.1) for those products whose tests for compliance are not provided under section 5 (inspection and methods of test)
- Physical requirement tests under this section are provided for sieve analysis and drop resistance for both charcoal and carbonized briquettes. It clearly elaborates on the apparatus to be used, test specimens, procedures, and expression of results. Reference for check compliances for both the products is guided as per the section 4 of the KS: 2912:2020 – Requirements.
- Chemical requirements tests are explained under this section, covering tests for moisture content, volatile matter content, ash content, fixed carbon content, calorific value. Guidance is provided on the test principle, selection of apparatus, test specimens, procedure of tests, expression of results and precision of results.
- A disclaimer is provided for the precision of results of Moisture content from different laboratories, due to the variance on humidity conditions from various laboratories, hence reproducibility has not yet been established.
- Under this section, guidance is provided on the specific particulars to be incorporated into the test report, which includes; identification of the product or samples, a reference to the KS 2912:2020, the test results, any deviations noted, any unusual features noted and the dates of the tests.



example of Solid Biofuel – Sustainable Charcoal and Carbonized Briquettes for household and commercial use

f) Packing & Marking.

- Section 6 and 7 of the KS 2912:2020 clarifies on the requirements for packaging and marking of the sustainable charcoal and briquettes, which shall be packed and sealed in multi-wall bags, corrugated board containers or any suitable packaging materials acceptable as per the standard. Units accepted for packaging are of 1kg to 50kg.
- Markings on the packages must be legible and indelible.

g)Standard Annexes.

- KS 2912:2020 has provided both informative (Annex A) and normative (Annex B) annexes to the users of this standard. These are to be referenced as notes to purchasers, and quality verification of charcoal and carbonized briquettes.
- Quality verification further guides on the quality verification, assessment of compliance and criteria of compliance.

6) KS 475:2001: SPECIFICATION FOR PRESSURE COOKERS (First Revision, 2001)



KS 475:2001 is a revision of the KS 06-475: 1985 version which aimed at correcting the errors in bursting pressure tests for the pressure cookers. It explains the scope, terms and definitions, material and constructions, performance, marking and instructions sampling, inspection and acceptance as well as explaining the appendices guiding the use of the standard. KS 475:2001 was prepared by the Cutlery and Table Metal Hollowware Technical Committee.

Detailed Composition of the KS 475:2001

a)Scope.

- This standard's scope specifies the safety performance of the domestic pressure cookers using the external heat source, and capable of maintaining working steam pressure not exceeding 1.4bar and total internal volume of up to 10ltrs.

b)Standard Terms and definitions.

- Various definitions have been provided for use with the standard document, including definition for domestic pressure cookers, body, vessel, gross capacity, volume, nomination operating pressure, pressure regulating device, safety pressure relief device, primary and secondary pressure relief device, destructible pressure relief device, resettable pressure relief device, automatic pressure relief device and the temperature responsive pressure relief device.



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c) Material and Construction

- KS 475:2001 elaborates on the general requirements for the materials for all parts of the cooker. This section of the standard stresses on the general parts bot to discolor or spoil the flavor of food cooked or cause toxicity of the food. The section informs that the parts not to be affected by contact with food cooked in such a way that its operations, efficiency or safety of the cooker become impaired.
- Further this section provides elaboration on the requirements and specifications for the aluminium alloys, stainless steels, operating pressure regulation, safety pressure relief, handles, and the integral timing device.

d)Performance

- This is section four of the standards explaining then general methods of test for performance requirements which are additionally annexed under the Appendix B of the standard document.
- It further explains on the performance requirements for the operating pressure regulation, proof pressure, safety pressure relief, bursting pressure, security of lid under pressure, temperature of handles and the strength of handle and means of attachment.

e)Marking and Instructions.

- KS 475:2001 explains the required marking and instructions necessary for safe use of the pressure cookers to be legibly and permanently marked. This section explains in details the requirements to meet the threshold of the pressure cooker markings and instructions.

f) Sampling, Inspection and Acceptance.

- This section of the KS 475:2001 explains the requirements for a pressure cooker to be considered satisfactory. The tests are further addressed to be in accordance with the standards appendices B1, B4 and B5.
- Criteria for acceptance of the tests are referenced as well within this standard section. These includes the operating test for pressure regulating devices, safety pressure relief devices, security of the lid or cover under pressure and bursting pressure.

g)Standard Appendices.

- KS 475:2001 has provided two appendices to aid the standard's usage. These include the appendix A which explains the requirements for aluminium materials and stainless-steel materials for the pressure cooker.
- Appendix B further elaborates the methods of tests for operating pressure regulation, proof pressure, safety pressure relief, bursting pressure, security lid, handle temperature, strength of handles and means of attachment.

7) KS EAS 939: 2019: Grill for domestic LPG cylinders - Specification

The KS EAS 939: 2019 necessitated the need for harmonizing requirements governing the quality of products and services in the East African Community, hence removal of the trade barriers of goods and services within the East African community. The standard elaborates on the scope and field of application, normative references, terms and definitions, shape and dimensions, requirements, packaging and marking as well as the standard annexes. The standard document was developed by the technical committee EASC/TC 038, Liquefied Petroleum and Natural Gas Equipment and Accessories.

Detailed Composition of the KS EAS 939:2019.

a)Scope.

KS EAS 939:2019 explains the specifications of the requirements and test methods for grills which are directly used on 6kilograms domestic liquefied petroleum gas cylinders.

b)Normative reference.

KS EAS 939:2019 does not contain any normative references.

c) Standard Terms and definitions.

This standard has defined specific terminologies to be considered by its users. These include definitions of; LPG (liquified petroleum gas), test type, and grill.

d)Shape and dimensions

KS EAS 939:2019 specifies the shape and dimensions of the grill under this section which are well illustrated by the figures.

e) Requirements.

The standard document explains the requirements for performance of the grill, the material for the grill, and the finish of the grill.

f) Packaging & Marking.

This section clarifies on the requirements for packaging and marking of the grill. This should be done in a manner to avoid damage during transportation and storage, and must be legibly and indelibly marked with the specifications outlined in the standard under section 6.2.1

g) Standard Annexes.

KS EAS 939:2019 has provided Annex A – grill designs, and Annex B – strength test.

8) KS 9-4: 2018: Gas cylinders - Refillable welded low carbon steel cylinders for liquefied petroleum gas (LPG) exceeding 1.5 litre water capacity.

KS 9-4: 2018 was prepared by the Boilers and Pressure Vessels Technical Committee. It intends to be used in requalification and inspection of gas cylinder by stipulating procedures for the requalification and inspection, including intervals between periodic qualification.

Detailed Composition of the KS 9-4: 2018.

a)Scope.

- The scope for this standard clarifies the interval, inspection, and testing procedures for requalification of refillable welded low carbon steel LPG cylinders of water capacity exceeding 1.5litres and up to 150litres. The cylinders must be protected by a system, for prevention of external corrosion and designed and manufactured in accordance with KS ISO 4706, or equivalent design construction.

b)Normative reference.

- KS 9-4: 2018 has referenced six different standards, these are ISO 8504-1, KS ISO 4706, KS ISO 22991, KS 9-3, KS 91 and KS 2024.

c)Terms and definitions.

- This standard has defined specific terminologies to be considered by its users. These includes definitions of; competent body, competent person, requalification, requalification test station, liquefied petroleum gas, and recertification.

d)Requalification criteria

- The standard provides for three requalification criteria as outlined in section 4 of the standard.

e) Requalification process.

- Three processes are explained within this standard document; vetting, preparation of cylinders and cylinder repairs.
- Tables are provided for guidance as; Table 1- physical defects in the cylinder wall, Table 2-corrosion on the cylinder wall, and Table 3 -Material defects in the cylinder body.

f) Heat Treatment, Hydraulic Test, shot blasting, Painting, Valving, Pneumatic test, Purging

- These test requirements are explained in clauses 6 -12 of the KS 9-4: 2018. All the instructions and guidelines provided in the standard for the above clauses must be adhered to.


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f) Marking and Final Inspection

- Cylinders are expected to be legibly and indelibly marked as per the guidance provided in section 13.1 of the KS 9-4: 2018.
- Further, section 14 provides for the certification with serial numbers of the re-qualified and tested cylinders to be issued upon successful completion of the requalification.

g)Standard Annexes.

- KS 9-4: 2018 has provided Annex A – pneumatic proof test and leak, Annex B – pneumatic proof test and leak, Annex C -Inspection of cylinder threads, Annex D – Rejection and scrapping of cylinders, and Annex E – Reports.

9) KS 2584: 2015: Biogas - Glossary, abbreviations and fundamental principles: Part 1: General

KS 2584: 2015 was prepared by the Biogas Technical Sub-Committee under the Renewable Energy and Energy Management Technical committee. The standard references various documents as; Biogas handbook, by Teodorita Al Seadi, Dominik Rutz, Michael Kottner, Tobias Finsterwalder, Silke Volk, Rainer Janssen; As well referenced is the Code of Practice for On-Farm Biogas Production and Use (piggeries) and PNS/PAES 413:2003, Agricultural Structures – Biogas plant

KS 2584: 2015 elaborates on the scope, definitions and abbreviations, Fundamental principles of anaerobic digestion, annexes and Bibliography.

Detailed Composition of the KS 2584: 2015

a)Scope

- This section explains on the role of the standard, where it indicates that KS 2854:2015 is meant to provide definitions of specific terms and abbreviations used in the context of the biogas technology. This as well includes the overview of fundamental principles of biogas technology.

b)Definitions and abbreviations

- KS 2584:2015 has provided for both definitions and the abbreviations explanation as used in the context of biogas technology. These are fully provided within section 2 (2.1 – definitions, and 2.2 – abbreviations)
- These definitions and abbreviations are used within the KS 2566 – 1,2 and 3:2015 hence should be considered when dealing in the biogas technology.

c) Fundamental principles of anaerobic digestion

- This section of the standard introduces the process of biogas production through the anaerobic digestion of decaying plant or animal matter.
- The section provides Table 1- properties and composition of biogas; Further, KS 2584:2015 explains on the anaerobic digestion process, which details the hydrolysis and acidification process, acetogenesis, methanogenesis, digestion process parameters' optimization, substrate characteristics, dilution, agitation, nutrients, temperature fluctuations, pH, hydraulic retention time, and the inhibitory factors.
- Provided within this section of the standard are tables and figures as Table 1 – properties and composition of biogas, Figure 1- anaerobic digestion process, Table 2 – nutrient content of common animals' excrements, Table 3 – gas production potential of various types of manure in m3/kg, Table 4 – Limiting concentrations for some bio-methanization inhibitors, and Table 5 – C/N Ration on some biodegradable materials.

d) Standard Annexes and Bibliography

- This standard document provides an informative Annex A – biogas conditioning, as well as the bibliography.
- Tables demonstrating the annexes' provisions are well displayed in the standard document as; Table A.1 – Water vapour removal methods and Table A.2 – Hydrogen sulphide (H2S) removal methods.

10) KS 2566-1: 2015: Design and Construction of domestic biogas plants – Code of Practice: -Part 1: General

KS 2566-1: 2015 was prepared by the Biogas Technical Sub-Committee under the guidance of Standards Project Committee. This standard explains the scope and field of application, normative references, definition of terms, classification, design and construction, testing, and operations and maintenance of domestic biogas plants, including appendices guiding the use of the standard.

Detailed Composition of the KS 2566-1: 2015

a) Scope and field of application.

- This standard's scope specifies on the design and construction, health and safety, operation and maintenance of all the aspects of biogas production, conveyance, quality improvement and utilization in domestic biogas plants.

b)Normative references.

- Referenced in the standard are ISO 18225, plastic piping systems – Multilayer piping systems for outdoor gas installations – specifications for systems and, KS ISO 2928, Rubber hoses and hose assemblies for liquified petroleum gas (LPG) in the liquid or gaseous phase and natural gas up to 25 bar (2,5 MPa) – Specification.

c) Definitions

- KS 2566-1: 2015 has referenced definitions as per the ones provided in KS 2584.

d)Classification

- This section of the standard provides classification in accordance to plant setup, number of digestors, gas chambers and design, as well as the feeding method.
- Details of the classification according to the four categories above are further provided in the sections 4.1 to 4.4 of the standard document.

e) Design and Construction

- KS 2566-1: 2015 explains the pre-project considerations, construction materials and equipment, design considerations, functional requirement of biogas plant components, construction and installation requirements of a biogas plant.
- The above are detailed in the sections 5.1 to 5.5 of the standard document. Tables and illustrations are as well provided for various parameters such as Table 1 – Average biogas requirement for different basic applications, Table 2 – Materials in contact with manure, Table 3 – materials in contact with biogas, biogas resistant materials, Table 4 – Retention time for animal manure for mesophilic temperature range (20oC – 35oC), Table 5- Optimum height/length ratios of digesters and tanks for volume up to 70m3 and wall thickness of up to 25cm, Table 6- Gas production potential of various types of manure in m3/kg, Table 7 – Pipe diameter for different pipe lengths and flow-rate (maximum pressure loss <5mbar), and Table 8 – maximum excavation slope on various grounds.

f) Testing.

- This section of the standard provides various test guidelines, including visual inspection, water leakage test, air tightness test method, pressure testing of piping, dimensional check of the plant, and marking.
- Further, the standard section 6.6 on marking explains on the key information to be placed suitably as marking for the biogas plant; such as model of the plant, capacity of the plant, among others.

g) Operation and maintenance of domestic biogas plants.

KS 2566-1: 2015 has guided on the commissioning and start-up of a biogas plant by highlighting procedures for the same. Further, it explains on the plant operation, plant maintenance, health and safety, common operation and maintenance problems, and the bio-slurry management.

Tables are provided for this section 7 of the standard for guidance on various specifications as; table 9- feeding material needed, table 10 – common operation and maintenance problems, likely causes and potential solutions, and finally, Table 11 – N, P, K values in different types of organic fertilizers.

h) Standard Annexes

Annexes are provided for guidance to the use of the standard. KS 2566-1: 2015 has provided both normative annexes and informative annexes. These are details as Annex A - substrate requirements, Annex B – Parts of biogas plant, Annex C – Formula used in calculating the dimensions (with 15% freeboard), and Annex D – Sample calculation for the design and utilization of floating-drum plant.

Figures and tables demonstrating the annexes' provisions are well displayed in the standard per each annex section; Table A.1 – Estimated daily quantity of available manure, Table A.2 – Daily feed requirement of continuous flow biogas digester, Figure B.1 – Parts of floating type plant with externa; guide frame, B.2 and B.3 – parts of fixed type plant; D.1 – mixing chamber, and figure D.2 – Floating drum gasholder.

11) KS 2566-2: 2015: Design and Construction of domestic biogas plants – Code of Practice: - Part 2: Fixed dome

KS 2566-2: 2015 was prepared by the Biogas Technical Sub-Committee under the guidance of Standards Project Committee. These standard references IS 9478, Family size biogas plants-Code of practice, SLS 1292, Code of practice for design and construction of biogas systems part 1- Domestic biogas systems, and the Philippine Agricultural Engineering Standard, PAES 413: 2001, Agricultural structures – Biogas Plant.

Detailed Composition of the KS 2566-2: 2015

a)Scope and field of application.

This standard's scope outlines requirements for design and construction of domestic biogas plants that are specific to the fixed dome design and its variants. It shall be read in conjunction with KS 2566-1.

b)Normative references.

- Referenced in the standard are KS 2566-1; Design and construction of domestic biogas plants – Code of practice – part 1: General, and KS 2584, Biogas – Glossary, abbreviations and fundamental principles.

c)Definitions

- KS 2566-2: 2015 has referenced definitions as per the ones provided in KS 2584.

d)Classification

- This section contains the general classification of the fixed dome digester, the classification of the fixed dome biogas plants, mixing chamber (inlet tank), the digester chamber, expansion chamber (outlet tank), and the fixed dome plant variants.
- Additional tables and figures have been provided under this standard's section including; figure 1 – Parts of fixed dome biogas type plants, figure 2 – fixed dome plant – Deenbandhu design, figure 3 – fixed dome plant Camartec design, figure 4 – General layout of modified GGC biogas plant, and the Table 1- Dimensions for the various plant sizes in Figure 4.

e) Design and Construction

- KS 2566-2: 2015 explains the pre-project considerations, construction materials and equipment, design considerations, functional requirement of biogas plant components, construction and installation requirements of a biogas plant. All these are referenced to the KS 2566-1.
- The above are detailed in the sections 5.1 to 5.5.12 with an additional figure 5 – schemic for condensate drain valve in gas line.

f)Testing.

- This section of the standard explains the testing to be done as per clause 6 of KS 2566-1

g)Operation and maintenance of domestic biogas plants.

- KS 2566-2: 2015 has provided guidelines on the general commissioning and start-up, operation and maintenance of a biogas plant as per clause 7 provided in KS 2566-1.

h)Guarantee and after sales services.

- This section of KS 2566-2: 2015 explains on the need to guarantee certification of 1 year in structural part, pipeline and appliances to be provided by the installer. It further provides he details of the after-sale services to be provided by the installer.


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ii)Standard Annexes

- KS 2566-2: 2015 has provided an informative annex; Annex A explaining the construction of modified GGC 2047 Model providing the determination of plant size, selection of construction materials, construction site selection, site layout, excavation, construction of digester main chamber, dome construction, outlet tank construction, construction of inlet tank, lay-out of pipeline, and compost pit. Annex B elaborates details on the modular biogas plant.
- Annexes as well provided figures and tables explaining instructions including; Table A.1 -Biogas plant construction materials, Table A.2 – Dimensions of outlet tank slabs, and figure B.1 – Modular polymer plastic biogas plant.

12) KS 2566-3: 2015: Design and Construction of domestic biogas plants – Code of Practice: -Part 3: Floating drum

KS 2566-3: 2015 was prepared by the Biogas Technical Sub-Committee under the guidance of Standards Project Committee. These standard references IS 9478, Family size biogas plants-Code of practice, SLS 1292, Code of practice for design and construction of biogas systems part 1- Domestic biogas systems, and the Philippine Agricultural Engineering Standard, PAES 413: 2001, Agricultural structures – Biogas Plant.

Detailed Composition of the KS 2566-3: 2015

a)Scope

- This standard's scope outlines requirements for design and construction of domestic biogas plants that are specific to the floating design and its variants. It shall be read in conjunction with KS 2566-1.

b)Normative references.

- Referenced in the standard are KS 2584-1; Design and construction of domestic biogas plants – Code of practice – part 1: General, and KS 2584, Biogas – Glossary, abbreviations and fundamental principles.

c) Definitions

- KS 2566-3: 2015 has referenced definitions as per the ones provided in KS 2584.

d)Design features

- This section explains the features attributed to the design of the floating drum plants. It further provides figure 1 – parts of water jacket floating type plant with external guide frame. This includes the input tank, digester, gas chamber, bio-slurry store, main gas pipe, inlet pipe and the guide frame.

e)Design and Construction

- KS 2566-3: 2015 explains the pre-project considerations, construction materials and equipment, design considerations, functional requirement of biogas plant components, construction and installation requirements of a biogas plant. All these are referenced to the KS 2566-1.
- The above are detailed in the sections 5.1 to 5.5.10 with an additional figure 2 – A metal gasholder with internal guide frame.

f) Testing.

- This section of the standard explains the testing to be done as per clause 6 of KS 2566-1

g)Operation and maintenance of domestic biogas plants.

- KS 2566-3: 2015 has provided guidelines on the general commissioning and start-up, operation and maintenance of a biogas plant as per clause 7 provided in KS 2566-1.

h)Guarantee and after sales services.

- This section of KS 2566-3: 2015 explains on the need to guarantee certification of 1 year in structural part, pipeline and appliances to be provided by the installer. It further provides the details of the after-sale services to be provided by the installer.

i) Standard Annexes

- KS 2566-3: 2015 has provided an informative annex; Annex A – KVIC biogas plant, and Annex B – Pragati model biogas plant.
- Annex A provides both figures and tables to guide on the standard usage. These are; Table A.1 – dimensions of KVIC floating drum type biogas plant, Figure A.1 – KVIC floating drum biogas plant (1,2 and 3m3), Figure A.2 – KVIC floating drum biogas lant (4m3 and above).
- Annex B as well has provided both tables and figures. These are; Table B.1 – dimensions of pragati model biogas plants and details for various capacities, Figure B.1 – pragati model biogas plant, and, Figure B.2, B.3 and B.4 – details of gasholder for pragati model.



13) KS 2520:2014: Domestic Biogas Stoves - Specification

This is a Kenyan standard prepared by the Biogas Technical Sub-Committee and in compliance with Annex 3 of the WTO/TB Agreement. This standard therefore establishes the parameters to be used to ensure that biogas stoves utilized in Kenya are of requisite efficiency, safety and durability.

Detailed Composition of the KS 2520: 2014

a)Scope.

- This standard's scope applies to the construction, operation, safety requirements and methods of test for stoves intended for use with biogas.

b)Normative references.

- Referenced in the standard are EAS 123, ISO 196, BS EN 12165, BS EN 12420, BS EN 1172, BS EN 1982, BS EN 10089, ISO 8458-1, ISO 6361, ISO 2177, ISO/TR 11728, ISO 16151, and ISO 7-1, Pipe threads where pressure -tight joints are made on the threads – Part 1: Dimensions, tolerances and designation.

c) Definitions

- Several definitions are provided with the standard document including; air regulator, burn back, burner, burner clearance, burner cap, burner cup, burner head, burner pipe, burner nozzle, calorific value, combustion efficiency, combustion stability, complete combustion, excess air, flame blow-off, flame lift, flame speed, flash back (light back) , fuel-air ratio (FAR), flue gases, gas combustion rate, gas flow meter, heat flow, heat rate, injector jet, mixing tube, pan support, primary air, prongs, secondary air, soundness, specific gravity or rela tive density, specific heath flow/capacity, stoichiometric mixture, stove, STP, Support frame, taper, thermal(heat) efficiency, throat, and turn down, knobs, self-ignition?.

d)General and Construction requirements.

- Detailed in this section are the general requirements, materials, design for maintenance, rigidity and stability, gas taps, finishes, electroplated body, paints or similar finishes, concealed gas supplies, screws, nuts, bolts and springs, injector jets, burners, pan support, gas inlet connections, gas soundness, and strength test.
- Details of figures are provided within the section as; Figure 1 – Types of tap handles, Figure 2 – Simmer gas-way in taps (axial flow), Figure 3- Details of gas cock allowance, Figure 4 – Paint scratch test apparatus, Figure 5 – Burner assembly, and Figure 6- Inlet nozzle.

g)Performance

- The standard document elaborates on test requirement for performance on the general condition of tests, gas consumption, ignition and flame travel, flame stability, noise control, formation of soot, flashback, combustion, surface temperature, thermal efficiency, ignition rate and performance of an electric igniter, durability, and the classification of tests.
- The above are detailed in the sections 5; 5.1 - 5.13 of the standard document. Tables and illustrations are as well provided for various parameters such as Table 1 – Testing instruments, and Table 2 – Aluminium pans for thermal efficiency test.

h) Process Quality assurance control

- This standard requires the manufacture to adhere to the consistent check of quality of the biogas product during various stages of its manufacturing.
- For the process quality assurance control, these parameters have to be checked for quality; raw materials, dimension, machining, welding, and quality plan.

i) Instructions, Marking and Packing

- Guidelines are provided in both section 7, 8 and 9 of the standard on how the biogas stoves should be marked and instruction of use to be provided as an instruction sheet, card or leaflet.
- This section as well provides an option of the use of the Standard Mark on the biogas stoves.
- The standard provided guidance on the proper package of the biogas stove for purposes of damage prevention during transportation. This is further instructed to have a label with contents as shown in section 8 of this standard document.

j) Sampling

- This section of the standards has clarified on the sampling plan to be followed for lot wise inspection of products. These includes; batch, lot, defective sample, random sampling, sampling plan for visual inspection and dimensional check, and the supervision inspection.
- Table 3 – sampling plan, and Table 4- Disqualification item classification and determination methods have been provided alongside the sampling section.


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k)Standard Annexes

- Annexes are provided for guidance to the use of the standard. These are all normative annexes such as; Annex A – method of test for plastic components, Annex B – Method for flash back test for materials of burners, Annex C -Test appropriate to vitreous enamelled components, Annex D – method of test for gas soundness, Annex E – strength test, Annex F -Gas consumption and thermal efficiency test, and Annex G – Method for determination of carbon monoxide.
- Figures demonstrating the annexes' provisions are well displayed in the standard for selected annex section; Figure 7 – Impact test machine, Figure 8- Bubble leak indicator, Figure 9 – strength test, and Figure 10 – Thermal efficiency test for biogas stove.

14) KS IEC 60335-1:2020: Household and similar electrical appliances – Safety

KS IEC 60335-1:2020 recognizes the internationally accepted level of protection against hazards such as electrical, mechanical, thermal, fire and radiation of appliances when operated taking into account the manufacturer's instructions.

Detailed Composition of the KSIEC60335-1: 2020

a)Scope

- This is an adopted international standard dealing with the safety of electrical appliances for household and similar purposes with a rated voltage being not more than 250V for single phase appliances, and 480 V for other appliances including direct currents.
- KSIEC60335-1: 2020 covers reasonably foreseeable hazards presented by appliances that are encountered by all persons, however, it does not take into account persons including children whose physical, sensory or mental capabilities, or, lack of experience and knowledge prevents them from using the appliances safely, without supervision or instruction. The standard as well doesn't account for the children playing with the appliance.

b) Normative references.

- This standard document has referenced a number of IEC standards. These referenced standards provide additional details to the usage of the standard. See section 2.


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c)Terms and Definitions

- KSIEC60335-1: 2020 has provided a link to the ISO and IEC terminological database; http://www.electropedia.org/ and http://www.iso.org/obp .
- Further, the section has provided for categories of definitions i.e.; definitions relating to physical characteristics, means of connection, protection against electric shock, extra-low voltage, types of appliances, parts of appliances, safety components, miscellaneous matters, electronic circuits, battery charging and discharging, and definitions relating to remote functionality.

d)General requirements

- This standard requires the appliances' construction to take into account the safety of use without causing danger to persons or surrounding, even in the event of carelessness occurring during normal use.
- It demands performance of all the relevant tests to fulfil the safety of the household and similar appliances.

e)General Conditions for the tests

- This standard provides the test clauses which has to be adhered to while performing the appliances' tests. The clauses are clearly outlined from section 5.1 to 5.22 of the KSIEC60335-1: 2020.

f) Classification.

- KSIEC60335-1:2020 classifies appliances into five classes in respect to protection against electric shock. Hence the compliance for the above classes has to be checked by inspection and by relevant tests.
- Further, the section requires an appliance to have appropriate degree of protection against harmful ingress of water. See section 6 of the standard.

g)Marking and Instructions

- This section 7 of the standard provides for the guidance on the rated voltage marking, rated frequency symbol and other required markings and instructions for the appliances.
- Similarly, the section provides the instructions for marking of the stationary appliances, appliances having a range of rated values and which can be operated without adjustment among other appliances. These are provided for from section 7.1 to 7.16 of the KSIEC 60335-1:2020.
- Notes are provided for the compliance checks for the relevant marking and instruction specifications.

h) Protection against access to live parts

This covers section 8 of the standard document and explains on the need to ensure construction and enclosing of appliances for adequate protection against accidental contact with live parts. This section further gives instructions on the protection requirements of the appliances from clause 8.1 to clause 8.3.

i)Starting of motor-operated appliances

This section makes reference to the requirements and tests specified in part 2 of the KSIEC60335.

j)Power input and current

This section provides illustration as Table 1 – power input deviation, as well as Table 2 – Current deviation. These are well explained and instructions provide on how to undertake various tests on power input and current. See section 10.1 and 10.2 of the standard.

k)Heating

As per the section 11.1 and 11.8 of the KSIEC 60335-1:2020, there is provision for the appliances and their surrounding not to attain excessive temperatures while in their normal use. The compliance checks are clearly illustrated within this section. Similarly, Tables 3 is providing as per this standard section to guide on the Maximum normal temperature rise.

l) Charging of metal-ion batteries

Explanation is provided on the safety while charging battery that uses metal-ion under normal operations. Compliance checks are provided for under this section 12 of the standard.

m) Leakage current and electric strength at operating temperature

This section of part 1 of KSIEC60335 guides on the checks for the leakage current of the appliances at operating temperatures. Tests for compliance on these are provided in accordance to clause 13.2 and 13.3.

Table 4 – voltage for electric strength test, and Table 5 – characteristics of high -voltage sources are provided for guidance.

n) Transient over-voltages

This section 14 of the standard provides for the compliance check for appliance to withstand the transient over-voltage its subjected to.

It further provides for table 6, guiding on the impulse test voltage.

w) Internal wiring

This section describes the requirements and compliance checks for the internal wiring needs of the appliances. This is covered from clause 23.1 to clause 23.10 with a guidance on compliance checks references to IEC 60227, IEC 60245, IEC 62821, and IEC 60227-5:2011.

x)Components

This section describes the compliance of the appliances components as specified in the relevant IEC standards.

Compliance checks for safety are provided from clause 24.1 to 24.8 to guide on the applicable components' requirements.

y)Supply connection and external flexible cords

Section 25 of the standard explains on the requirement to have appliances other than those intended for permanently connected to fixed wiring be provided with either a supply cord, an appliance inlet having same degree of protection, or pins for insertion into socket-outlets.

Compliance checks for the above is done by inspection., with Table 10 – Dimensions of cables and conduits provided for guidance, Table 11 – minimum cross -sectional area of conductors, and Table 12 – Pull force and torque.

The section provides for additional requirements as well as compliance check guidelines for various appliances.

z)Terminals for external conductors

This section covers clauses 26.1 – 26.11 explaining the need for provision of terminals or equally effective devices such as male tabs in accordance with IEC 61210, screw type terminals in accordance with IEC 60998-2-1, screwless terminals in accordance with IEC 60998-2-2 and clamping units in accordance with IEC60999-1:1999 for the connection of external conductors.

Compliances are checked by inspection, manual test, measurements, as provided in various section clauses.

aa) Provisions for earthing

This section describes provisions for earthing for the accessible metal parts. However, it excludes class 0 appliances, class II appliances and class III appliances from having provision for protective earthing.

bb)Screws and connections

This section covering clauses 28.1 – 28.4 describes the requirements and compliance checks for fixings where the use of screws is involved. Table 14 – Torque for testing screws and nuts is provided as an additional guidance during the relevant compliance tests and checks.

cc) Clearances, creepage distances and solid insulation

- Under this section, guidance is provided for the appliances' constructions to adequately withstand electrical stresses for the clearances, creepage distances and solid insulation.
- Tables provided for guidance under various clause compliances includes; Table 15-rated impulse voltage, Table 16-Minimum clearances, Table 17 -Minimum creepage distances for basic insulation, Table 18-minimum creepage distances for functional insulation, and Table 19-minimum thickness for accessible parts of reinforced insulation consisting of a single layer.

dd)Resistance to heat and fire

- Section 30 of the standard provides for the requirements for the external parts of non-metallic material, parts of insulating material supporting live parts including connections, and parts of thermoplastic material providing supplementary insulation or reinforced insulation to have sufficient resistance to heat if their deterioration could cause the appliance to fail to comply with the standard.
- Compliance checks for these requirements are provided in subsequent clauses 30.1 to 30.2.4 for guidance.

ee) Resistance to rusting

- This section describes the requirements for ferrous parts which might lead to rusting to an extent of causing appliance failure to comply with the standard. These parts should be adequately protected against rusting.

ff) Radiation, toxicity and similar hazards

- Section 32 of the standard defines compliance checks for the appliance's radiation emissions, whereby the appliances are expected not to be emitting harmful radiation or present a toxic or similar hazard due to their operation in normal use.
- Provisions within this section to guide on compliance checks, test, and measurements are; Figure 1 – circuit diagram for leakage current measurement at operating temperature for single -phase connection of class II appliances and for parts of class II construction; Figure 2 – circuit diagram for leakage current measurement at operating temperature for single-phase connection of other than class II appliances or parts of class II construction; Figure 3- Circuit diagram for leakage current measurement at operating temperature for three-phase with neutral class II appliances and for parts of class II construction; Figure 4 – Circuit diagram for leakage current measurement at operating temperature for three-phase with neutral appliances other than those of class II or parts of class II construction; Figure 5 – Small part; Figure 6 -Example of an electronic circuit with low-power pints; Figure 7 – Test finger nail; Figure 8 – Flexing test apparatus; Figure 9 – Construction of cord anchorages; Figure 10 – An example of parts of an earthing terminal; Figure 11 -Examples of clearanc es; Figure 12 – Example of the placement of the cylinder; Figure 13 – small parts cylinder; and Figure 14 – example of a specified operating region of lithium-ion cell during charging.

gg) Standard Annexes and Bibliography

KSIEC60335-1: 2020 has referenced both informative annexes, normative annexes and bibliography. Informative annexes are provided as per Annex A – Routine tests. Similarly, normative annexes are provided as per Annex B – Battery-operated appliances, separable batteries and detachable batteries for battery-operated appliances; Annex C – Ageing test on motors; Annex D – Thermal motor protectors; Annex E -Needle-flame test; Annex F – capacitors; Annex G – safety isolating transformers; Annex H -switches; Annex I – motors having basic insulation that is inade quate for the rated voltage of the appliance; Annex J – Coated printed circuit boards; Annex K – Overvoltage categories; Annex L- Guidance for the measurement of clearances and creepage distances; Annex M – Pollution degree; Annex N – Proof tracking test; Annex O – selection and sequence of the tests of Clause 30; Annex P – Guidance for the application of this standard to appliances used in tropical climates; Annex Q – Sequence of tests for the evaluation of electronic circuits; Annex R – Software evaluation; Annex S – Guidance for the application of this standard on measurement of power input and current based on the requirements of 10.1 and 10.2 concerning the representative period; Annex T – UV-C radiation effect on non-metallic materials; and Annex U – Appliances intended for remote communication through public networks.

15) KSIEC60335-2-13:2016: Household and similar electrical appliances - Safety Part 2-13: Particular requirements for deep fat fryers, frying pans and similar appliances

KSIEC60335-2-13 recognizes the internationally accepted level of protection against hazards such as electrical, mechanical, thermal, fire and radiation of appliances when operated taking into account the manufacturer's instructions.

Detailed Composition of the KSIEC60335-2-13

a)Scope

This standard's scope explains the use of the KSIEC60335-2-13, having to deal with the safety of electric deep fat fryers, frying pans and other appliances in which oil is used for cooking specifically for household use, with a rated voltage not more than 250V.

The scope further explains that the standard doesn't take into account the use of appliances by young children or infirm persons without supervision, as well as playing with the appliances by young children.

KSIEC60335-2-13 does not apply to the deep fat fryers having a recommended maximum quantity of oil exceeding 4ltrs., commercial multi-purpose cooking pans and appliances intended to be used in locations where special conditions prevail, such as the presence of corrosive or explosive atmosphere i.e. dust, vapour or gas.

b)Normative references.

This standard makes full reference of the normative reference clauses as in the KSIEC60335- 1.

c)Definitions

KSIEC60335-2-13 has referenced definitions as per the ones provided in the part 1 of the KSIEC60335 with an exception for the definition of normal operation, which is provided within the standard to highlight the temperature requirements.

Definitions provided therefore includes those relating to physical characteristics; means of connection; protection against electric shock; extra-low voltage; types of appliances; parts of an appliance; safety components; miscellaneous matters; electronic circuits; battery charging and discharging; and remote functionality.

d)General requirements

This KSIEC60335-2-13 has referenced the general requirements as per the provisions in the part 1 of the KSIEC60335. This clarifies the appliances' construction taking safety of use into consideration without causing danger to persons or surrounding, even in the event of carelessness occurring during normal use.

e)General Conditions for the tests

This section of the standard has referenced the clauses of the Part 1 of KSIEC60335, with an exception of the requirements for test of 15.101 which requires three additional samples. Similarly, the section clarifies that the deep fat fryers that can also be used as frying pans need to be tested as deep fat fryers or as frying pans on the basis of the most favorable tests.

f)Classification.

This section of the standard explains the testing to be done as per clauses provided in part 1 of the KSIEC60335.

g)Marking and Instructions

KSIEC60335-2-13 has referenced the clauses in KSIEC60335-1, with additions on the deep fat fryers need to be marked with the maximum oil level and minimum oil level unless they can be used as frying pans.

Similarly, the section provides the instructions for appliances incorporating an appliance inlet and intended to be partially or completely immersed in water for cleaning.

h) Protection against access to live parts

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

i) Starting of motor-operated appliances

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

j) Power input and current

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

k)Heating

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335 with exceptions on the provision to placement of the portable appliances, determination of the temperature rise of the oil in deep fat fryers, establishment of the steady operation of the appliances, and measurement of the temperature of the oil in deep fat fryers and similar appliances. All these are additions to the already available clauses in part 1 of KSIEC60335.

l) Void

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

m) Leakage current and electric strength at operating temperature

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

n) Transient over-voltages

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

o) Power input and current

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335 with an exception of the appliances intended to be partially or completely immersed in water for cleaning. Checks for the test compliances are provided for the same within this section.

i) Starting of motor-operated appliances

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

j)Power input and current

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

k)Heating

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335 with exceptions on the provision to placement of the portable appliances, determination of the temperature rise of the oil in deep fat fryers, establishment of the steady operation of the appliances, and measurement of the temperature of the oil in deep fat fryers and similar appliances. All these are additions to the already available clauses in part 1 of KSIEC60335.

l)Void

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

m)Leakage current and electric strength at operating temperature

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

n) Transient over-voltages

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

o)Power input and current

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335 with an exception of the appliances intended to be partially or completely immersed in water for cleaning. Checks for the test compliances are provided for the same within this section.

p) Leakage current and electric strength

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

q) Overload protection of transformers and associated circuits

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

r) Endurance

- This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

s) Abnormal operation

- This section of the standard referenced clauses as provided in part 1 of the KSIEC60335. An exception is provided however for the deep fat fryers incorporating a thermal cut-out of the capillary type, as well as deep fat fryers with detachable heating elements. A clarification is provided for the frying pans not to be subjected to the tests of 19.4 and 19.5 of the standard.
- Further, this section provides additional requirements for the temperature of the oil in deep fat fryers and the temperature at the centre of the heated surface of the frying pan.

t) Stability and mechanical hazards

- This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

u)Mechanical strength

- This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

v)Construction

- This section of the standard referenced clauses as provided in part 1 of the KSIEC60335, with an additional provision on the handles and similar parts of accessories that do not incorporate electrical components.

w)Internal wiring

- This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

x)Components

- This section of the standard referenced clauses as provided in part 1 of the KSIEC60335. Additional provisions are address for the appliance's couplers incorporating thermostats, thermal cut-outs or fuses in the connector, for this the IEC 60320-1 is to be applied with other exceptions provided.

y)Supply connection and external flexible cords

- This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.
- Additions are provided for this section for appliances incorporating an appliance inlet that does not comply with the standard sheets of KSIEC 60320-1 as well as the rubber sheathed cords.
- This section of the standard confirms to not apply the section 25.7 of the KSIEC 60320-1.

z) Terminals for external conductors

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

aa) Provisions for earthing

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

bb) Screws and connections

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

cc) Clearances, creepage distances and solid insulation

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335 with an additional clarification on the microenvironment pollution degree.

dd) Resistance to heat and fire

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335. However, additional reference clauses for applicability are provided for frying pans, and deep fat fryers.

ee) Resistance to rusting

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

ff) Radiation, toxicity and similar hazards

This section of the standard referenced clauses as provided in part 1 of the KSIEC60335.

gg) Standard Annexes and Bibliography

KSIEC60335-1 has been referenced for annexes and bibliography. Additional bibliography is as well provided within this section.



example of a deep fat fryer

Additional Sector Guiding Documents/Protocols

16) Global LEAP Electric Pressure Cooker Test Method Version 1.

The Global LEAP Electric Pressure cooker test method aims at ensuring the electric pressure cookers (EPCs) are evaluated for quality, performance, and safety. The guideline elaborates the two categories of tests for the EPC, as non-destructive test, and destructive tests or potentially-destructive test.

The test method references several tests and protocols such as; Water Boiling Test v 4.2.3 (March 2014, Global Alliance for Clean Cookstoves); BS EN 12778:2002. Cookware – Pressure Cookers for domestic use; Biomass Stoves Safety Protocol v. 1.1 (Global Alliance for Clean Cookstoves); Emissivity Chart. FLIR Instruction manual for ETS3xx series; and Current Carrying Capacity Chart. NFPA 70 National Electrical Code (NEC) 2014 Table 310.15 (B)(16)

Detailed Composition of the Global LEAP EPC Test Method Version 1.

a)Quality Test Procedure

- This section guides on the quality tests for the EPC. It considers various test procedures like Visual inspection, and workmanship & materials evaluation.
- Visual inspection involves the photo documentation where the guideline requires the documentation of the basic product information, capture of the various pictures of the EPC as directed in the guideline document.
- Product packaging and quality is another consideration while undertaking the visual inspection. The guideline instructs the need to rate the quality of packaging and its ability to protect the product. This can be rated as Good; Satisfactory; Needs improvement or Poor.
- Other test requirements explained under the visual inspection include the marking and labeling; user manual; warranty and ingress protection.
- For the workmanship & Materials evaluation, the test method requires the workmanship inspection of external and internal surfaces; examination of the lid seal
- Design, quality, and durability; assessment of the mechanical functionality of handles and lifting grips; as well as the evaluation of the coating compliance.
- The Global LEAP EPC test method document provides the test instructions of the above test requirements. Refer to the procedures in the various document sections.

b)Performance Test Procedure

- Illustration is provided on how to conduct Energy Performance and service delivery test which measures the power consumption and temperature of the EPC over time.
- This test is conducted to determine the thermal efficiency and effectiveness of the EPC when cooking and to determine how well the cooker holds heat.
- For the Energy performance and service delivery test, guidelines are provided on the Pre-Test preparation; heating test – cold start; pressure cooking test; cooling test; sauté cooking test; as well as low and high voltage test.
- This test procedure provides the required water capacity for test, the heating strength, the materials needed for various tests, and the period of heating during each test. The test results need to be recorded as guided under the sections.

c)Safety Test Procedure

- The test procedure guides on the various test requirements for safety, these includes the exterior temperature test; tipping test; control & safety device tests; and circuitry & wiring durability tests. Each test has its own instructions of operation, as well as the requirement to document/record comments out of each test.
- These tests require key equipment as guided in the test procedures. These must be well calibrated and in good working conditions. The test therefore should clearly follow the provide pre-test preparations, the test procedures and documentation of results.
- While testing for the control & safety of the device, the test methods has elaborated on the tests for the following functionalities; control device functionality; pressure indicator functionality; decompression device functionality; safety device identification; safety device testing; safety device functionality; and safe opening system functionality.
- The tests also consider safety of the circuitry and wiring durability, which explains the tests on quality of circuitry and wiring; cord durability test; cord quality rating; current carrying capacity of cable; shock hazard test; on/off switch presence and quality/front panel quality.

d)Test Method Annexes.

- The Global LEAP Electric Pressure Cooker Test Method has annexed additional test for the deviation of pot shape; and heating test – hot start.

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